THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS.
THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

WITH A STUDY OF THE RELATIONS OF LIVING AND EXTINCT FAUNAS AS ELUCIDATING THE PAST CHANGES OF THE EARTH'S SURFACE.

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CONTENTS OF THE SECOND VOLUME.

PART III. (continued).

ZOOLOGICAL GEOGRAPHY: A REVIEW OF THE CHIEF FORMS OF ANIMAL LIFE IN THE SEVERAL REGIONS AND SUB-REGIONS, WITH THE INDICATIONS THEY AFFORD OF GEOGRAPHICAL MUTATIONS.

CHAPTER XIV.

THE NEOTROPICAL REGION.

General Zoological Features of the Neotropical Region (p. 5)—Distinctive Characters of Neotropical Mammalia (p. 6)—Of Neotropical Birds (p. 7)—Neotropical Reptiles (p. 9)—Fresh-water Fishes (p. 12)—Insects (p. 13)—Coleoptera (p. 15)—Land Shells (p. 19)—Marine Shells (p. 20)—Brazilian Sub-region (p. 21)—Its Mammalia (p. 23)—Its Birds (p. 24)—Islands of Tropical South America, Galapagos (p. 29)—Chilian Sub-region (p. 36)—Birds (p. 38)—Reptiles and Amphibia (p. 40)—Fresh-water Fishes (p. 42)—Lepidoptera (p. 42)—Coleoptera (p. 44)—Islands of South Temperate America (p. 49)—Mexican Sub-region (p. 51)—Mammalia and Birds (p. 52)—Reptiles and Fishes (p. 54)—Insects (p. 55)—Relations of the Mexican Sub-region to the North and South American Continents (p. 57)—Islands of the Mexican Sub-region (p. 59)—The Antillean Sub-region (p. 60)—Its Mammalia (p. 62)—Its Birds (p. 64)—Table of the Resident Land Birds of the Antilles (p. 68)—Reptiles (p. 72)—Insects (p. 73)—Land Shells (p. 75)—Past History of the Antilles (p. 78)—Summary of the Past History of the Neotropical Region (p. 80)—Table I. Families of Animals inhabiting the Neotropical Region (p. 85)—Table II. Genera of Terrestrial Mammalia and Birds of the Neotropical Region (p. 91) . . . . 1—113
CONTENTS OF THE SECOND VOLUME.

CHAPTER XV.

THE NEARCTIC REGION.

Zoological Characteristics of the Nearctic Region (p. 115)—List of Typical Nearctic Genera of Land Birds (p. 118)—Summary of Nearctic Vertebrata (p. 120)—Insects (p. 122)—Terrestrial and Fluvial Mollusca (p. 124)—The Californian Sub-region (p. 127)—The Rocky Mountain Sub-region (p. 129)—The Alleghany Sub-region (p. 131)—The Bermudas (p. 134)—The Canadian Sub-region (p. 135)—Greenland (p. 138)—Table I. Families of Animals inhabiting the Nearctic Region (p. 140)—Table II. Genera of Terrestrial Mammalia and Birds of the Nearctic Region (p. 145).

CHAPTER XVI.

SUMMARY OF THE PAST CHANGES AND GENERAL RELATIONS OF THE SEVERAL REGIONS 154—164

PART IV.

GEOGRAPHICAL ZOOLOGY: A SYSTEMATIC SKETCH OF THE CHIEF FAMILIES OF LAND ANIMALS IN THEIR GEOGRAPHICAL RELATIONS.

INTRODUCTION 167—169

CHAPTER XVII.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF MAMMALIA.

CONTENTS OF THE SECOND VOLUME. vii

CHAPTER XVIII.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF BIRDS.


CHAPTER XIX.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF REPTILES AND AMPHIBIA.


CHAPTER XX.

THE DISTRIBUTION OF THE FAMILIES OF FISHES, WITH THE RANGE OF SUCH GENERA AS INHABIT FRESH WATER.

Acanthopterygii (p. 424)—Acanthopterygii Pharyngognathi (p. 437)—Anacanthini (p. 439)—Physostomii (p. 441)—Lophobranchii (p. 456)—Plectognathi (p. 457) Sirenoidæ (p. 458)—Ganoidei (p. 458)—Chondropterygii (p. 460)—Cyclostomata (p. 463)—Leptocardii (p. 464)—Remarks on the Distribution of Fishes (p. 464) 424–467
CHAPTER XXI.

THE DISTRIBUTION OF SOME OF THE MORE IMPORTANT FAMILIES AND GENERA OF INSECTS.

Lepidoptera (p. 470)—General Remarks on the Distribution of the Diurnal Lepidoptera and Sphingidea (p. 483)—Coleoptera (p. 486)—Cicindelidæ (p. 486)—Carabidæ (p. 488)—Lucanidæ (p. 492)—Cetoniidæ (p. 494)—Buprestidæ (p. 495)—Longicornia (p. 498)—General Observations on the Distribution of Coleoptera (p. 502) . . . . . . 468—503

CHAPTER XXII.

AN OUTLINE OF THE GEOGRAPHICAL DISTRIBUTION OF MOLLUSCA.

Cephalopoda (p. 505)—Gasteropoda (p. 507)—Pulmonifera (p. 512)—General Observations on the Distribution of Land Mollusca (p. 522)—Pteropoda (p. 531)—Brachiopoda (p. 532)—Conchifera (p. 533)—General Remarks on the Distribution of Marine Mollusca (p. 537) . . . . . 504—539

CHAPTER XXIII.

SUMMARY OF THE DISTRIBUTION AND LINES OF MIGRATION OF THE SEVERAL CLASSES OF ANIMALS.

Mammalia (p. 540)—Lines of Migration of the Mammalia (p. 544)—Birds (p. 545)—Reptiles (p. 547)—Amphibia (p. 548)—Fresh-water Fishes (p. 549)—Insects (p. 550)—Terrestrial Mollusca (p. 551)—Conclusion (p. 552) . 540—553

GENERAL INDEX . . . . . . . . . . . . . . . 557
MAPS AND ILLUSTRATIONS IN VOL. II.

1. Map of the Neotropical Region ........................................... 3
2. Plate XIV. A Brazilian Forest with Characteristic Mammalia ........... 24
3. Plate XV. A Scene on the Upper Amazon, with some Characteristic Birds ...................................................... 28
4. Plate XVI. The Chilian Andes, with Characteristic Animals ............ 40
5. Plate XVII. A Scene in Cuba, with Characteristic Animals ........... 67
6. Map of the Nearctic Region .................................................... 115
7. Plate XVIII. Scene in California with some Characteristic Birds ....... 123
8. Plate XIX. The North American Prairies with Characteristic Mammalia 130
9. Plate XX. A Canadian Forest with Characteristic Mammalia ........... 136
THE
GEOGRAPHICAL DISTRIBUTION
OF ANIMALS.

PART III. (continued.)

ZOOLOGICAL GEOGRAPHY:

A REVIEW OF THE CHIEF FORMS OF ANIMAL LIFE IN THE
SEVERAL REGIONS AND SUB-REGIONS, WITH THE INDICATIONS THEY AFFORD OF GEOGRAPHICAL MUTATIONS.
CHAPTER XIV.

THE NEOTROPICAL REGION.

This region, comprehending not only South America but Tropical North America and the Antilles, may be compared as to extent with the Ethiopian region; but it is distinguished from all the other great zoological divisions of the globe, by the small proportion of its surface occupied by deserts, by the large proportion of its lowlands, and by the altogether unequalled extent and luxuriance of its tropical forests. It further possesses a grand mountain range, rivalling the Himalayas in altitude and far surpassing them in extent, and which, being wholly situated within the region and running through eighty degrees of latitude, offers a variety of conditions and an extent of mountain slopes, of lofty plateaus and of deep valleys, which no other tropical region can approach. It has a further advantage in a southward prolongation far into the temperate zone, equivalent to a still greater extension of its lofty plateaus; and this has, no doubt, aided the development of the peculiar alpine forms of life which abound in the southern Andes. The climate of this region is exceptionally favourable. Owing to the lofty mountain range situated along its western margin, the moisture-laden trade winds from the Atlantic have free access to the interior. A sufficient proportion of this moisture reaches the higher slopes of the Andes, where its condensation gives rise to innumerable streams, which cut deep ravines and carry down such an amount of sediment, that they have formed the vast plains of the Amazon, of Para-
guay, and of the Orinooko out of what were once, no doubt, arms of the sea, separating the large islands of Guiana, Brazil, and the Andes. From these concurrent favourable conditions, there has resulted that inexhaustible variety of generic and specific forms with a somewhat limited range of family and ordinal types, which characterise neotropical zoology to a degree nowhere else to be met with.

Together with this variety and richness, there is a remarkable uniformity of animal life over all the tropical continental portions of the region, so that its division into sub-regions is a matter of some difficulty. There is, however, no doubt about separating the West Indian islands as forming a well-marked subdivision; characterised, not only by that poverty of forms which is a general feature of ancient insular groups, but also by a number of peculiar generic types, some of which are quite foreign to the remainder of the region. We must exclude, however, the islands of Trinidad, Tobago, and a few other small islands near the coast, which zoologically form a part of the main land. Again, the South Temperate portion of the continent, together with the high plateaus of the Andes to near the equator, form a well-marked subdivision, characterised by a peculiar fauna, very distinct both positively and negatively from that of the tropical lowland districts. The rest of Tropical South America is so homogeneous in its forms of life that it cannot be conveniently subdivided for the purposes of a work like the present. There are, no doubt, considerable differences in various parts of its vast area, due partly to its having been once separated into three or more islands, in part to existing diversities of physical conditions; and more exact knowledge may enable us to form several provinces or perhaps additional sub-regions. A large proportion of the genera, however, when sufficiently numerous in species, range over almost the whole extent of this sub-region wherever the conditions are favourable. Even the Andes do not seem to form such a barrier as has been supposed. North of the equator, where its western slopes are moist and forest-clad, most of the genera are found on both sides. To the south of this line its western valleys are arid and its lower plains almost deserts; and thus the absence of a
number of groups to which verdant forests are essential, can be traced to the unsuitable conditions rather than to the existence of the mountain barrier. All Tropical South America, therefore, is here considered to form but one sub-region.

The portion of North America that lies within the tropics, closely resembles the last sub-region in general zoological features. It possesses hardly any positive distinctions; but there are several of a negative character, many important groups being wholly confined to South America. On the other hand many genera range into Mexico and Guatemala from the north, which never reach South America; so that it is convenient to separate this district as a sub-region, which forms, to some extent, a transition to the Nearctic region.

General Zoological Features of the Neotropical Region.—Richness combined with isolation is the predominant feature of Neotropical zoology, and no other region can approach it in the number of its peculiar family and generic types. It has eight families of Mammalia absolutely confined to it, besides several others which are rare elsewhere. These consist of two families of monkeys, Cebidae and Hapalidae, both abounding in genera and species; the Phyllostomidae, or blood-sucking bats; Chinchillidae and Caviidae among rodents; besides the greater part of the Octodontidae, Echimyidae and Cereolabidae. Among edentata, it has Bradypodidae, or sloths, Dasypodidae, or armadillos, and Myrmecophagidae, or anteaters, constituting nearly the entire order; while Procyonidae, belonging to the carnivora, and Didelphidae, a family of marsupials, only extend into the Nearctic region. It has also many peculiar groups of carnivora and of Muridae, making a total of full a hundred genera confined to the region. Hardly less remarkable is the absence of many wide-spread groups. With the exception of one genus in the West Indian islands and a Sorex which reaches Guatemala and Costa Rica, the Insectivora are wholly wanting; as is also the extensive and wide-spread family of the Viverridae. It has no oxen or sheep, and indeed no form of ruminant except deer and llamas; neither do its vast forests and grassy plains support a single form of non-ruminant ungulate, except the tapir and the peccary.
Birds.—In birds, the Neotropical region is even richer and more isolated. It possesses no less than 23 families wholly confined within its limits, with 7 others which only extend into the Nearctic region. The names of the peculiar families are: Caeræbidae, or sugar-birds; Phytotomidae, or plant-cutters; Pipridæ, or manakins; Cotingidae, or chatterers; Formicariidae, or ant-thrushes; Dendrocolaptidae, or tree-creepers; Pteroptochidae; Rhamphastidae, or toucans; Bucconidae, or puff-birds; Galbulidae, or jacamaras; Todidae, or todies; Momotidæ, or motmots; Steatornithidae, or guacharo, or oil-bird; Cracidae, or curassows; Tinamidae, or tinamous; Opisthocomidae, the hoazin; Thinocoridae; Cariamidae; Pteroptochidae; Rhamphastidae, or toucans; Bucconidae, or puff-birds; Galbulidae, or jacamaras; Todidae, or todies; Momotidæ, or motmots; Steatornithidae, or guacharo, or oil-bird; Cracidae, or curassows; Tinamidae, or tinamous; Opisthocomidae, the hoazin; Thinocoridae; Cariamidae; Aramidae; Psophiidae, or trumpeters; Eurypygidae, or sun-bitterns; and Palamedeidae, or horned-screamers. The seven which it possesses in common with North America are: Vireonidæ, or greenlets; Mniotiltilidae, or wood-warblers; Tanagridæ, or tanagers; Icteridæ, or hang-nests; Tyrannidæ, or tyrant-shrikes; Trochilidæ, or humming-birds; and Conuridæ, or macaws. Most of these families abound in genera and species, and many are of immense extent; such as Trochilidæ, with 115 genera, and nearly 400 species; Tyrannidæ, with more than 60 genera and nearly 300 species; Tanagridæ, with 43 genera and 300 species; Dendrocolaptidae with 43 genera and more than 200 species; and many other very large groups. There are nearly 600 genera peculiar to the Neotropical region; but in using this number as a basis of comparison with other regions we must remember, that owing to several ornithologists having made the birds of South America a special study, they have perhaps been more minutely subdivided than in the case of other entire tropical regions.

Distinctive Characters of Neotropical Mammalia.—It is important also to consider the kind and amount of difference between the various animal forms of this region and of the Old World. To begin with the Quadrumana, all the larger American monkeys (Cebidae) differ from every Old World group in the possession of an additional molar tooth in each jaw; and it is in this group alone that the tail is developed into a prehensile organ of wonderful power, adapting the animals to a purely arboreal life. Four of the genera, comprising more than half the
species, have the prehensile tail, the remainder having this organ either short, or lax as in the Old World monkeys. Other differences from Old World apes, are the possession of a broad nasal septum, and a less opposable thumb; and the absence of cheek-pouches, ischial callosities, and a bony ear-tube. The Hapalidae, or marmozets, agree with the Cebidae in all these characters, but have others in addition which still more widely separate them from the Simiidae; such as an additional premolar tooth, acute claws, and thumb not at all opposable; so that the whole group of American monkeys are radically different from the remainder of the order.

The Procyonidae are a distinct family of Carnivora, which make up for the scarcity of Mustelidae in South America. The Suidae are represented by the very distinct genus *Dicotyles* (Peccary) forming a separate sub-family, and differing from all other genera in their dentition, the absence of tail and of one of the toes of the hind feet, the possession of a dorsal gland, and only two mammae. The rodents are represented by the Chinchillidae and Caviidae, the latter comprising the largest animals in the order. The Edentata are almost wholly confined to this region; and the three families of the sloths (Bradypodidae), armadillos (Dasypodidae), and ant-eaters (Myrmecophagidae), are widely separated in structure from any Old World animals. Lastly, we have the opossums (Didelphyidae), a family of marsupials, but having no close affinity to any of the numerous Australian forms of that order. We have already arrived at the conclusion that the presence of marsupials in South America is not due to any direct transference from Australia, but that their introduction is comparatively recent, and that they came from the Old World by way of North America (vol. i., p. 155). But the numerous and deep-seated peculiarities of many other of its mammalia, would indicate a very remote origin; and a long-continued isolation of South America from the rest of the world is required, in order to account for the preservation and development of so many distinct groups of comparatively low-type quadrupeds.

**Distinctive Characters of Neotropical Birds.**—The birds which are especially characteristic of this region, present similar distinctive features. In the enormous group of Passerine
birds which, though comprising nearly three-fourths of the entire class, yet presents hardly any well-marked differences of structure by which it can be subdivided—the families confined to America are, for the most part, more closely related to each other than to the Old World groups. The ten families forming the group of "Formicaroid Passeres," in our arrangement (vol. i., p. 94), are characterised by the absence of singing muscles in the larynx, and also by an unusual development of the first primary quill; and seven of this series of families (which are considered to be less perfectly developed than the great mass of Old World passeræ) are exclusively American, the three belonging to the Eastern hemisphere being of small extent. Another group of ten families—our "Tanagroid Passeres," are characterised by the abortion or very rudimentary condition of the first quill; and of these, five are exclusively American, and have numerous genera and species, while only two are non-American, and these are of small extent. On the other hand the "Turdoid Passeres," consisting of 23 families and comprising all the true "singing-birds," is poorly represented in America; no family being exclusively Neotropical, and only three being at all fully represented in South America, though they comprise the great mass of the Old World passeræ. These peculiarities, which group together whole series of families of American birds, point to early separation and long isolation, no less surely than the more remarkable structural divergences presented by the Neotropical mammalia.

In the Picaræ, we have first, the toucans (Rhamphastidae); an extraordinary and beautiful family, whose enormous gaily-coloured bills and long feathered tongues, separate them widely from all other birds. The Galbulidæ or jacamars, the motmots (Momotidae), and the curious little todies (Todidae) of the Antilles, are also isolated groups. But most remarkable of all is the wonderful family of the humming-birds, which ranges over all America from Tierra del Fuego to Sitka, and from the level plains of the Amazon to above the snow-line on the Andes; which abounds both in genera, species, and individuals, and is yet strictly confined to this continent alone! How vast must have been the time required to develop those beautiful and
highly specialized forms out of some ancestral swift-like type; how complete and long continued the isolation of their birthplace to have allowed of their modification and adaptation to such divergent climates and conditions, yet never to have permitted them to establish themselves in the other continents. No naturalist can study in detail this single family of birds, without being profoundly impressed with the vast antiquity of the South American continent, its long isolation from the rest of the land surface of the globe, and the persistence through countless ages of all the conditions requisite for the development and increase of varied forms of animal life.

Passing on to the parrot tribe, we find the peculiar family of the Conuridae, of which the macaws are the highest development, very largely represented. It is in the gallinaceous birds however that we again meet with wholly isolated groups. The Cracidae, including the curassows and guans, have no immediate relations with any of the Old World families. Professor Huxley considers them to approach nearest to (though still very remote from) the Australian megapodes; and here, as in the case of the marsupials, we probably have divergent modifications of an ancient type once widely distributed, not a direct communication between the southern continents. The Tinamidae or tinamous, point to a still more remote antiquity, since their nearest allies are believed to be the Struthiones or ostrich tribe, of which a few representatives are scattered widely over the globe. The hoazin of Guiana (Opisthocomus) is another isolated form, not only the type of a family, but perhaps of an extinct order of birds. Passing on to the waders, we have a number of peculiar family types, all indicative of antiquity and isolation. The Cariama of the plains of Brazil, a bird somewhat intermediate between a bustard and a hawk, is one of these; the elegant Psophia or trumpeter of the Amazonian forests; the beautiful little sun-bittern of the river banks (Eurypyga); and the horned screamers (Palamedea), all form distinct and isolated families of birds, to which the Old World offers nothing directly comparable.

Reptiles.—The Neotropical region is very rich in varied forms of reptile life, and the species are very abundant. It has six
altogether peculiar families, and several others which only range into the Nearctic region, as well as a very large number of peculiar or characteristic genera. As the orders of reptiles differ considerably in their distributional features, they must be considered separately.

The snakes (Ophidia) differ from all other reptiles, and from most other orders of vertebrates, in the wide average distribution of the families; so that such an isolated region as the Neotropical possesses no peculiar family, nor even one confined to the American continent. The families of most restricted range are—the Scytalidæ, only found elsewhere in the Philippine islands; the Amblycephalidæ, common to the Oriental and Neotropical regions; and the Tortricidæ, most abundant in the Oriental region, but found also in the Austro-Malay islands and Tropical South America. Sixteen of the families of snakes occur in the region, the Colubridæ, Amblycephalidæ, and Pythonidæ, being those which are best represented by peculiar forms. There are 25 peculiar or characteristic genera, the most important being Dromicus (Colubridæ); Boa, Epicrates, and Ungalia (Pythonidæ); Elaps (Elapidæ); and Craspeodecephalus (Crotalidæ).

The lizards (Lacertilia) are generally more restricted in their range; hence we find that out of 15 families which inhabit the region, 5 are altogether peculiar, and 4 more extend only to N. America. The peculiar families are Helodermidæ, Anadiadæ, Chirolidæ, Iphisiadæ, and Cercosauridæ; but it must be noted that these all possess but a single genus each, and only two of them (Chirolidæ and Cercosauridæ) have more than a single species. The families which range over both South and North America are Chirotidæ, Chalcidæ, Teidæ, and Iguanidæ; the first and second are of small extent, but the other two are very large groups, the Teidæ possessing 12 genera and near 80 species; the Iguanidæ 40 genera and near 150 species; the greater part of which are Neotropical. There are more than 50 peculiar or highly characteristic genera of lizards, about 40 of which belong to the Teidæ and Iguanidæ, which thus especially characterize the region. The most important and characteristic genera are the following: Ameiva (Teidæ); Gymnophthalmus (Gymnophthalmidæ);
Celestus and Diploglossus (Scincidæ); Spheroadaeopturus (Gecko-tidæ); Liocephalus, Liolemus, Proctotretus, and many smaller genera (Iguanidæ). The three extensive Old World families Varanidæ, Lacertidæ, and Agamidæ, are absent from the entire American continent.

In the order Crocodilia, America has the peculiar family of the alligators (Alligatoridæ), as well as several species of true crocodiles (Crocodilidæ). The Chelonia (tortoises) are represented by the families Testudinidæ and Chelydridæ, both of wide range; but there are six peculiar genera,—Dermatemys and Stau-rotypus belonging to the former family,—Peltoccephalus, Podocnemis, Hydromedusa, and Chelys, to the latter. Some of the Amazon river-turtles of the genus Podocnemys rival in size the largest species of true marine turtles (Cheloniidæ), and are equally good for food.

Amphibia.—The Neotropical region possesses representatives of sixteen, families of Amphibia of which four are peculiar; all belonging to Anoura or tail-less Batrachians. The Cæciliidæ or snake-like amphibia, are represented by two peculiar genera, Siphonopsis and Rhinatrema. Tailed Batrachians are almost unknown, only a few species of Spelerpes (Salamandridæ) entering Central America, and one extending as far south as the Andes of Bogota in South America. Tail-less Batrachians on the other hand, are abundant; there being 14 families represented, of which 4,—Rhinophryndæ, Hylaplesidæ, Plectromantidæ, and Pipidæ are peculiar. None of these families contain more than a single genus, and only the second more than a single species; so that it is not these which give a character to the South American Amphibia-fauna. The most important and best represented families are, Ranidæ (true frogs), with eleven genera and more than 50 species; Polypedatidæ (tree-frogs) with seven genera and about 40 species; Hylidæ (tree-frogs) with eight genera and nearly 30 species; Engystomidæ (toads) (5 genera), Bombinatoridæ (frogs), (4 genera), Phryniscidæ and Bufonidæ (toads), (each with 2 genera), are also fairly represented. All these families are widely distributed, but the Neotropical genera are, in almost every case, peculiar.
**Fresh-water fishes.**—The great rivers of Tropical America abound in fish of many strange forms and peculiar types. Three families, and three sub-family groups are peculiar, while the number of peculiar genera is about 120. The peculiar families are Polycentridae, with two genera; Gymnotidae, a family which includes the electric eels, (5 genera); and Trygonidae, the rays, which are everywhere marine except in the great rivers of South America, where many species are found, belonging to two genera. Of the extensive family Siluridae, three sub-families Siluridae anomalo- ptera, S. olisthoptera, and S. branchiote, are confined to this region. The larger and more important of the peculiar genera are the following: Percilia, inhabiting Chilian and Percichthys South Temperate rivers, belong to the Perch family (Percidae); Acharnes, found only in Guiana, belongs to the Nandidae, a family of wide range in the tropics; the Chromidae, a family of exclusively fresh-water fishes found in the tropics of the Ethiopian, Oriental and Neotropical regions, are here represented by 15 genera, the more important being Acara (17 sp.), Heros (26 sp.), Crenicichla (9 sp.), Satanoperca (7 sp.). Many of these fishes are beautifully marked and coloured. The Siluridae proteropodes are represented by 14 genera, of which Pimelodus (42 sp.), and Platystoma (11 sp.), are the most important; the Siluridae stenobranchiae by 11 genera, the chief being Doras (13 sp.), Auchenipterus (9 sp.), and Ocydoras (7 sp.). The Siluridae proteropodes are represented by 16 genera, many of them being among the most singular of fresh-water fishes, clothed in coats of mail, and armed with hooks and serrated spines. The following are the most important,—Charstomus (25 sp.), Loricaria (17 sp.), Plecostonus (15 sp.) and Callichthys (11 sp.). The Characinidae are divided between Tropical America and Tropical Africa, the former possessing about 40 genera and 200 species. The Haplochitonidae are confined to South America and Australia; the American genus being Haplochiton. The Cyprinodontidae are represented by 18 genera, the most important being Pacilia (16 sp.), Girardinus (10 sp.), and Gambusia (8 sp.) The Osteoglossidae, found in Australian and African rivers, are represented in South America by the peculiar Arapaima, the “pirarucu” of the
Amazon. The ancient Sirenoidei, also found in Australia and Africa, have the *Lepidosiren* as their American representative. Lastly, *Ellipisurus* is a genus of rays peculiar to the fresh waters of South America. We may expect these numbers to be largely increased and many new genera to be added, when the extensive collections made by Agassiz in Brazil are described.

Summary of Neotropical Vertebrates.—Summarizing the preceding facts, we find that the Neotropical region possesses no less than 45 families and more than 900 genera of Vertebrata which are altogether peculiar to it; while it has representatives of 168 families out of a total of 330, showing that 162 families are altogether absent. It has also representatives of 131 genera of Mammalia of which 103 are peculiar to it, a proportion of $\frac{4}{5}$; while of 683 genera of land-birds no less than 576 are peculiar, being almost exactly $\frac{5}{6}$ of the whole. These numbers and proportions are far higher than in the case of any other region.

Insects.

The Neotropical region is so excessively rich in insect life, it so abounds in peculiar groups, in forms of exquisite beauty, and in an endless profusion of species, that no adequate idea of this branch of its fauna can be conveyed by the mere enumeration of peculiar and characteristic groups, to which we are here compelled to limit ourselves. Our facts and figures will, however, furnish data for comparison; and will thus enable those who have some knowledge of the entomology of any other country, to form a better notion of the vast wealth of insect life in this region, than a more general and picturesque description could afford them.

*Lepidoptera.*—The Butterflies of South America surpass those of all other regions in numbers, variety and beauty; and we find here, not only more peculiar genera and families than elsewhere, but, what is very remarkable, a fuller representation of the whole series of families. Out of the 16 families of butterflies in all parts of the world, 13 are found here, and 3 of these are wholly peculiar—Brassolidæ, Heliconidæ, and Eurygonidæ, with a fourth, Erycinidæ, which only extends into the Nearctic
region; so that there are 4 families peculiar to America. These four families comprise 68 genera and more than 800 species; alone constituting a very important feature in the entomology of the region. But in almost all the other families there are numbers of peculiar genera, amounting in all to about 200, or not far short of half the total number of genera in the world—(431). We must briefly notice some of the peculiarities of the several families, as represented in this region. The Danaidæ consist of 15 genera, all peculiar, and differing widely from the generally sombre-tinted forms of the rest of the world. The delicate transparent-winged Ithomias of which 160 species are described, are the most remarkable. Melitinea, Napeogenes, Ceratina and Dryas are more gaily coloured, and are among the chief ornaments of the forests. The Satyrîdæ are represented by 25 peculiar genera, many of great beauty; the most remarkable and elegant being the genus Haetera and its allies, whose transparent wings are delicately marked with patches of orange, pink, or violet. The genus Morpho is perhaps the grandest development of the butterfly type, being of immense size and adorned with the most brilliant azure tints, which in some species attain a splendour of metallic lustre unsurpassed in nature. The Brassolidæ are even larger, but are crepuscular insects, with rich though sober colouring. The true Heliconii are magnificent insects, most elegantly marked with brilliant and strongly contrasted tints. The Nymphalidæ are represented by such a variety of gorgeous insects that it is difficult to select examples. Prominent are the genera Catagramma and Callithea, whose exquisite colours and symmetrical markings are unique and indescribable; and these are in some cases rivalled by Agrias and Prepona, which reproduce their style of coloration although not closely allied to them. The Erycinidæ, consisting of 59 genera and 560 species, comprise the most varied and beautiful of small butterflies; and it would be useless to attempt to indicate the unimaginable combinations of form and colour they present. It must be sufficient to say that nothing elsewhere on the globe at all resembles them. In Lycaenidæ the world-wide genus Thecla is wonderfully developed, and the South
American species not only surpass all others in size and beauty, but some of them are so gorgeous on the under surface of their wings, as to exceed almost all the combinations of metallic tints we meet with in nature. The last family, Hesperidæ, is also wonderfully developed here, the species being excessively numerous, while some of them redeem the character of this generally sober family, by their rich and elegant coloration.

In the only other group of Lepidoptera we can here notice, the Sphingina, the Neotropical region possesses some peculiar forms. The magnificent diurnal butterfly-like moths, Urania, are the most remarkable; and they are rendered more interesting by the occurrence of a species closely resembling them in Madagascar. Another family of day-flying moths, the Castniidæ, is almost equally divided between the Neotropical and Australian regions, although the genera are more numerous in the latter. The American Castnias are large, thick-bodied insects, with a coarse scaly surface and rich dull colours; differing widely from the glossy and gaily coloured Agaristas, which are typical of the family in the East.

Coleoptera.—This is so vast a subject that, as in the case of the regions already treated, we must confine our attention to a few of the more important and best known families as representatives of the entire order.

Cicindelidæ.—We find here examples of 15 out of the 35 genera of these insects; and 10 of these genera are peculiar. The most important are Oxychila (11 sp.), Hiresia (14 sp.), and Ctenostoma (26 sp.). Odontochila (57 sp.) is the most abundant and characteristic of all, but is not wholly peculiar, there being a species in the Malay archipelago. Tetracha, another large genus, has species in Australia and a few in North America and Europe. The small genus Peridezia is divided between Brazil and Madagascar,—a somewhat similar distribution to that of Urania noticed above. One genus, Agrius, is confined to the southern extremity of the continent.

Carabidæ.—Besides a considerable number of cosmopolitan or wide-spread genera, this family is represented by more than 100 genera which are peculiar to the Neotropical region. The
most important of these are Agra (150 sp.), Ardistonus (44 sp.), Schizogenius (25 sp.), Peleciurn (24 sp.), Calophea (22 sp.), Aspidoglossa (21 sp.), and Lia, Camptodonotus, Stenocrepis, and Lachnophorus, with each more than 12 species. These are all tropical; but there are also a number of genera (26) peculiar to Chili and South Temperate America. The most important of these are Antarctica (29 sp.), all except two or three confined to South Temperate America; Scolodontis (10 sp.), mostly Chilian; Feromonomorpha (6 sp.) all Chilian; and Tropidopterus (4 sp.), all Chilian. Helluomorpha (18 sp.), is confined to North and South America; Galerita, Callida, and Tetragonoderus, are large genera which are chiefly South American but with a few species scattered over the other tropical regions. Casonia and Lebia are cosmopolite, but most abundant in South America. Pachyteleles is mostly South American but with a few species in West Africa; while Lobodonotus has one species in South America and two in Africa.

Lucanidae.—The Neotropical species of this family almost all belong to peculiar genera. Those common to other regions are Syndesmus, confined to Tropical South America and Australia, and Platymerus which is Palaearctic and Nearctic, with one species in Brazil. The most remarkable genus is undoubtedly Chiasognathus, confined to Chili. These are large insects of metallic green colours, and armed with enormous serrated mandibles. The allied genera, Pholidotus and Sphenognathus, inhabit Tropical South America. Streptocerus confined to Chili, is interesting, as being allied to the Australian Lamprina. The other genera present no remarkable features; but Sclerognathus and Leptinoptera are the most extensive.

Cetoniidae.—These magnificent insects are but poorly represented in America; the species being mostly of sombre colours. There are 14 genera, 12 of which are peculiar. The most extensive genus is Gymnetis, which, with its allies Cotinis and Allorrhina, form a group which comprehends two-thirds of the Neotropical species of the family. The only other genera of importance are, Inea (7 sp.), remarkable for their large size, and being the only American group in which horns are developed on the head;
and *Trigonopeltastes (6 sp.),* allied to the European *Trichius.* The non-peculiar genera are, *Stethodesma,* of which half the species are African and half tropical American; and *Euphoria,* confined to America both North and South.

**Buprestidae.**—In this fine group the Neotropical region is tolerably rich, having examples of 39 genera, 18 of which are peculiar to it. Of these, the most extensive are *Conognatha* and *Halecia,* which have a wide range over most parts of the region; and *Dactylozodes,* confined to the south temperate zone. Of important genera which range beyond the region, *Dicera* is mainly Neartic and Palæartic; *Cinyra* has a species in North America and one in Australia; *Curis* is divided between Chili and Australia; the Australian genus *Stigmodera* has a species in Chili; *Polycesta* has a species in Madagascar, two in the Mediterranean region, and a few in North America; *Acherusia* is divided between Australia and Brazil; *Plosima* has one species in south temperate America, the rest widely scattered from North America to the Philippines; *Actenodes* has a single species in North America and another in West Africa; *Colobogaster* has two in West Africa, one in Java and one in the Moluccas. The relations of South America and Australia as indicated by these insects has already been sufficiently noticed under the latter region.

**Longicornia.**—The Neotropical Longicorn Coleoptera are overwhelming in their numbers and variety, their singularity and their beauty. In the recent Catalogue of Gemminger and Harold, it is credited with 516 genera, 489 of which are peculiar to it; while it has only 5 genera in common (exclusively) with the Nearctic, and 4 (in the same way) with the Australian region. Only the more important genera can be here referred to, under the three great families into which these insects are divided.

The Prionidae are excessively numerous, being grouped in 64 genera, more than double the number possessed by any other region; and 61 of these are peculiar. The three, common to other regions, are, *Parandra* and *Mallodon,* which are widely distributed; and *Ergates,* found also in California and Europe. The most remarkable genera are, the magnificently-coloured *Psalidognathus* and *Pyrodes*; the large and strangely marked
Macrodontia; and Titanus, the largest insect of the entire family.

Of the Cerambycidae there are 233 genera, exceeding by one-half, the number in any other region; and 225 of these are peculiar. Only 2 are common to the Neotropical and Nearctic regions exclusively, and 3 to the Neotropical and Australian. The most extensive genera are the elegant Ibidiom (80 sp.); the richly-coloured Chrysoprisis (47 sp.); the prettily-marked Trachyderes (53 sp.); with Odontocera (25 sp.); Criodon (22 sp.); and a host of others of less extent, but often of surpassing interest and beauty. The noteworthy genera of wide range are, Oeme and Cyrtomerus, which have each a species in West Africa, and Hammatocera, which has one in Australia.

The Lamiidae have 219 genera, and this is the only tropical region in which they do not exceed the Cerambycidae. This number is almost exactly the same as that of the Oriental genera, but here there are more peculiar groups, 203 against 160 in the other region. The most extensive genera are Hemilophus (80 sp.), Colobothea (70 sp.), Acanthoderes (56 sp.), Onocerodes (48 sp.), Lepturus (40 sp.), Hyposioma (32 sp.), and Taniotes (20 sp.). Macropus longimanus, commonly called the harlequin beetle, is one of the largest and most singularly-marked insects in the whole family. Leptostylus has a single species in New Zealand; Acanthoderes has one species in Europe, W. Africa, and Australia, respectively; Spalacopsis has a species in W. Africa; Pachypeza is common to S. America and the Philippines; Mesosa is Oriental and Palaearctic, but has one species on the Amazon; Apomecyna ranges through the tropics of the Eastern Hemisphere, but has two species in S. America; Acanthocinus has one species in Tasmania, and the rest in South America, North America, and Europe; Phaoa is wholly Neotropical, except two species in the Philippine Islands.

General Conclusions as to the Neotropical Insect-fauna.—Looking at the insects of the Neotropical region as a whole, we are struck with the vast amount of specialty they present; and, considering how many causes there are which must lead to the dispersal of insects, the number of its groups which are scattered
over the globe is not nearly so great as we might expect. This points to a long period of isolation, during which the various forms of life have acted and reacted on each other, leading to such a complex yet harmoniously-balanced result as to defy the competition of the chance immigrants that from time to time must have arrived. This is quite in accordance with the very high antiquity we have shown most insect-forms to possess; and it is no doubt owing to this antiquity, that such a complete diversity of generic forms has been here brought about, without any important deviation from the great family types which prevail over the rest of the globe.

Land Shells.—The Neotropical region is probably the richest on the globe in Terrestrial Mollusca, but this is owing, not to any extreme productiveness of the equatorial parts of the continent, where almost all other forms of life are so largely developed, but to the altogether exceptional riches of the West India Islands. The most recent estimates show that the Antilles contain more species of land shells than all the rest of the region, and almost exactly as many as all continental America, north and south.

Mr. Thomas Bland, who has long studied American land shells, points out a remarkable difference in the distribution of the Operculated and Inoperculated groups, the former being predominant on the islands, the latter on the continent. The Antilles possess over 600 species of Operculata, to about 150 on the whole American continent, the genera being as 22 to 14. Of Inoperculata the Antilles have 740, the Continent 1,250, the genera being 18 and 22. The proportions of the two groups in each country are, therefore:

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The extensive family of the Helicidae is represented by 22 genera, of which 6 are peculiar. *Spiraxis* is confined to Central America and the Antilles; *Stenopus* and *Sagda* are Antillean only; *Orthalicus, Macroceramus,* and *Bulimus* have a wider range, the last two extending into the southern United
States. Important and characteristic genera are, *Glandina*, in all the tropical parts of the region; *Cylindrella*, in Central America and the Antilles; *Bulimus*, containing many large and handsome species in South America; *Stenogyra*, widely spread in the tropics; and *Streptaxis*, in Tropical South America.

Among the Operculata, the Aciculidae are mostly Antillean, two genera being peculiar there, and one, *Truncateella*, of wide distribution, but most abundant in the West Indian Islands. The Cyclostomidae are represented by 15 genera, 9 being peculiar to the region, and 5 of these (belonging to the sub-family Licinidae) to the Antilles only. Of these peculiar genera *Cistula* and *Chondropoma* are the most important, ranging over all the tropical parts of the region. Other important genera are *Cyclotus* and *Megalomastoma*; while *Cyclophorus* also occurs all over the region. The Helicinidae are mostly Neotropical, six out of the seven genera being found here, and four are peculiar. *Stoastoma*, is one of the largest genera; and, with *Trochatella* and *Aleadia*, is confined to the Antilles, while the wide-spread *Helicina* is most abundant there.

The Limacidae, or Old World slugs, are absent from the region, their place being taken by the allied family, Oncidiidae.

Marine Shells.—We go out of our usual course to say a few words about the marine shells of this region, because their distribution on the two sides of the continent is important, as an indication of the former separation of North and South America, and the connection of the Atlantic and Pacific Oceans. It was once thought that no species of shells were common to the two sides of the Central American Isthmus, and Dr. Mörch still holds that opinion; but Dr. Philip Carpenter, who has paid special attention to the subject, considers that there are at least 35 species absolutely identical, while as many others are so close that they may be only varieties. Nearly 70 others are distinct but representative species. The genera of marine mollusca are very largely common to the east and west coasts, more than 40 being so named in the lists published by Mr. Woodward. The West Indian Islands being a rich shell district, produce a number of peculiar forms, and the west coast of
South America is, to some extent, peopled by Oriental and Pacific genera of shells. On the west coast there is hardly any coral, while on the east it is abundant, showing a difference of physical conditions that must have greatly influenced the development of mollusca. When these various counteracting influences are taken into consideration, the identity or close affinity of about 140 species and 40 genera on the two sides of the Isthmus of Panama becomes very important; and, combined with the fact of 48 species of fish (or 30 per cent. of those known) being identical on the adjacent coasts of the two oceans (as determined by Dr. Günther), render it probable that Central America has been partially submerged up to comparatively recent geological times. Yet another proof of this former union of two oceans is to be found in the fossil corals of the Antilles of the Miocene age, which Dr. Duncan finds to be more allied to existing Pacific forms, than to those of the Atlantic or even of the Caribbean Sea.

Neotropical Sub-regions.

In the concluding part of this work devoted to geographical zoology, the sub-regions are arranged in the order best adapted to exhibit them in a tabular form, and to show the affinities of the several regions; but for our present purpose it will be best to take first in order that which is the most important and most extensive, and which exhibits all the peculiar characteristics of the region in their fullest development. We begin therefore with our second division.

II. Tropical South-America, or the Brazilian Sub-region.

This extensive district may be defined as consisting of all the tropical forest-region of South America, including all the open plains and pasture lands, surrounded by, or intimately associated with, the forests. Its central mass consists of the great forest-plain of the Amazons, extending from Paranaiba on the north coast of Brazil (long. 42° W.) to Zamora, in the province of Loja (lat. 4° S., long. 79° W.), high up in the Andes, on the west;—a distance in a straight line of more than 2,500 English miles,
along the whole of which there is (almost certainly) one continuous virgin forest. Its greatest extent from north to south, is from the mouths of the Orinooko to the eastern slopes of the Andes near La Paz in Bolivia and a little north of Sta. Cruz de la Sierra (lat. 18° S.), a distance of about 1,900 miles. Within this area of continuous forests, are included some open "campos," or patches of pasture lands, the most important being,—the Campos of the Upper Rio Branco on the northern boundary of Brazil; a tract in the interior of British Guiana; and another on the northern bank of the Amazon near its mouth, and extending some little distance on its south bank at Santarem. On the northern bank of the Orinooko are the Llanos, or flat open plains, partly flooded in the rainy season; but much of the interior of Venezuela appears to be forest country. The forest again prevails from Panama to Maracaybo, and southwards in the Magdalen valley; and on all the western side of the Andes to about 100 miles south of Guayaquil. On the N.E. coast of Brazil is a tract of open country, in some parts of which (as near Ceara) rain does not fall for years together; but south of Cape St. Roque the coast-forests of Brazil commence, extending to lat. 30° S., clothing all the valleys and hill sides as far inland as the higher mountain ranges, and even penetrating up the great valleys far into the interior. To the south-west the forest country reappears in Paraguay, and extends in patches and partially wooded country, till it almost reaches the southern extension of the Amazonian forests. The interior of Brazil is thus in the position of a great island-plateau, rising out of, and surrounded by, a lowland region of ever-verdant forest. The Brazilian sub-region comprises all this forest-country and its included open tracts, and so far beyond it as there exists sufficient woody vegetation to support its peculiar forms of life. It thus extends considerably beyond the tropic in Paraguay and south Brazil; while the great desert of Chaco, extending from 25° to 30° S., lat. between the Parana and the Andes, as well as the high plateaus of the Andean range, with the strip of sandy desert on the Pacific coast as far as to about 5° of south latitude, belong to south temperate America, or the sub-region of the Andes.
Having already given a sketch of the zoological features of the Neotropical region as a whole, the greater part of which will apply to this sub-region, we must here confine ourselves to an indication of the more important groups which, on the one hand, are confined to it, and on the other are absent; together with a notice of its special relations to other regions.

**Mammalia.**—Many of the most remarkable of the American monkeys are limited to this sub-region; as *Lagothrix, Pithecia,* and *Brachypurus,* limited to the great Amazonian forests; *Eriodes* to south-east Brazil; and *Callithrix* to tropical South America. All the marmosets (*Hapalidæ*) are also confined to this sub-region, one only being found at Panama, and perhaps extending a little beyond it. Among other peculiar forms, are 8 genera of bats; 3 peculiar forms of wild dog; *Pteronura,* a genus of otters; *Inia,* a peculiar form of dolphin inhabiting the upper waters of the Amazon; tapirs of the genus *Tapirus* (a distinct genus being found north of Panama); 4 genera of *Muridae,* *Otomys,* a genus of *Octodontidæ,* the whole family of *Echimyidae,* or spiny rats, (as far as the American continent is concerned) consisting of 8 genera and 28 species; *Choitomys,* a genus of *Cercolabidæ,* the capybara (*Hydrochoerus*) the largest known rodent, belonging to the *Caviidæ,* the larger ant-eaters (*Myrmecophaga,* sloths of the genus *Bradypus;* 2 genera of armadillos (*Dasypodidæ,* and two peculiar forms of the opossum family (*Didelphyidae,* No group that is typically Neotropical is absent from this sub-region, except such as are peculiar to other single sub-regions and which will be noticed accordingly. The occurrence of a solitary species of hare (*Lepus braziliensis*) in central Brazil and the Andes, is remarkable, as it is cut off from all its allies, the genus not being known to occur elsewhere on the continent further south than Costa Rica. The only important external relation indicated by the Mammalia of this sub-region is towards the Ethiopian region, 2 genera of *Echimyidae,* *Aulacodes* and *Petromys,* occurring in South and South-east Africa.

**Plate IV. Characteristic Neotropical Mammalia.**—Our illustration represents a mountainous forest in Brazil, the part of South America where the Neotropical Mammalia are perhaps best
developed. The central and most conspicuous figure is the collared
ant-eater, \((Tamandua tetradactyla)\), one of the handsomest of the
family, in its conspicuous livery of black and white. To the left
are a pair of sloths \((Arctopithecus flaeceidus)\) showing the curious
black spot on the back with which many of the species are marked,
and which looks like a hole in the trunk of a tree; but this mark
seems to be only found on the male animal. The fur of many of
the sloths has a greenish tinge, and Dr. Seemann remarked its
resemblance to the \textit{Tillandsia usneoides}, or “vegetable horsehair,”
which clothes many of the trees in Central America; and this
probably conceals them from their enemies, the harpy-eagles. On
the right are a pair of opossums \((Didolphys azarae)\), one of them
swinging by its prehensile tail. Overhead in the foreground are
a group of howling monkeys \((Mycetes ursinus)\) the largest of the
American Quadrungulata, and the noisiest of monkeys. The large
hollow vessel into which the hyoid bone is transformed, and
which assists in producing their tremendous howling, is alto-
gether unique in the animal kingdom. Below them, in the dis-
tance, are a group of Sapajou monkeys \((Cebus sp.)\); while gaudy
screaming macaws complete the picture of Brazilian forest life.

\textit{Birds.}—A very large number of genera of birds, and some
entire families, are confined to this sub-region, as will be seen
by looking over the list of genera at the end of this chapter.
We can here only notice the more important, and summarize the
results. More than 120 genera of Passeres are thus limited,
belonging to the following 12 families: \textit{Sylviidae} (1), \textit{Troglo-
dytidae} (2), \textit{Coerebidae} (4), \textit{Tanagridae} (26), \textit{Fringillidae} (8), \textit{Icteridae} (5), \textit{Pteroptochidæ} (3), \textit{Dendrocolaptidae} (12), \textit{Formi-
cariidae} (16), \textit{Tyrrannidae} (22), \textit{Cotingidae} (16), \textit{Pipridæ} (10). Of
the \textit{Picariffi} there are 76 peculiar genera belonging to 9 families,
viz., \textit{Picidæ} (2), \textit{Rhamphastidæ} (1), \textit{Cuculidæ} (1), \textit{Bucconidæ}
(2), \textit{Galbulidæ} (5), \textit{Momotidæ} (2), \textit{Podargidæ} (1), \textit{Caprimulgidæ}
(4) \textit{Trochilidæ} (58). There are 3 peculiar genera of \textit{Psittaci}, 8
of \textit{Gallinæ}, the only genus of \textit{Opisthocomidae}, 3 of \textit{Accipitres},
1 of \textit{Rallidæ}, \textit{Psophia} and \textit{Eurypygæ} types of distinct families,
and 1 genus of \textit{Ardeidæ}, \textit{Palamedeidæ}, and \textit{Anatidæ} respectively.
The preceding enumeration shows how very rich this sub-region
is in peculiar types of all the most characteristic American families, such as the Tanagridae, Tyrannidae, Cotingidae, Formicariidae, Trochilidae, and Galbulidae. A considerable proportion of the genera of the Chilian and Mexican sub-regions also occur here, so that out of about 680 genera of Neotropical land-birds more than 500 are represented in this sub-region.

Without entering minutely into the distribution of species it is difficult to sub-divide this extensive territory with any satisfactory result. The upland tract between the Amazon and Orinoko, which may be termed Guiana, was evidently once an island, yet it possesses few marked distinctive features. Brazil, which must have formed another great island, has more speciality, but the intermediate Amazonian forests form a perfect transition between them. The northern portion of the continent west of the Orinoko has more character; and there are indications that this has received many forms from Central and North America, and thus blended two faunas once more distinct than they are now. The family of wood-warblers (Mniotiltnidae) seems to have belonged to this more northern fauna; for out of 18 genera only 5 extend south of the equator, while 6 range from Mexico or the Antilles into Columbia, some of these being only winter immigrants and no genus being exclusively South American. The eastern slopes of the Andes constitute, however, the richest and best marked province of this sub-region. At least 12 genera of tanagers (Tanagridae) are found here only, with an immense number of Fringillidae,—the former confined to the forests, the latter ranging to the upland plains. The ant-thrushes (Formicariidae) on the other hand seem more abundant in the lowlands, many genera being peculiar to the Amazonian forests. The superb chatters (Cotingidae) also seem to have their head-quarters in the forests of Brazil and Guiana, and to have thence spread

1 Messrs. Sclater and Salvin, and Professor Newton, divide the Neotropical Region into six sub-regions, of which our "Brazilian sub-region" comprises three—the "Brazilian," the "Amazonian," and the "Columbian"; but, after due consideration, it does not seem advisable to adopt this subdivision in a general work which treats of all the classes of terrestrial animals. (See p. 27.)
into the Amazonian valley. Guiana still boasts such remarkable forms as the cardinal chatterer (*Phoenicoecerus*), the military chatterer (*Hammatoderus*), as well as *Querula*, *Gymnoderus*, and *Gymnocephalus*; but the first three pass to the south side of the Lower Amazon. Here also belong the cock of the rock (*Rupicola*), which ranges from Guiana to the Andes, and the marvellous umbrella-birds of the Rio Nigro and Upper Amazon (*Cephalopterus*), which extends across the Ecuadorian Andes and into Costa Rica. Brazil has *Ptilocthoris*, *Casiornis*, *Tijuca*, *Phialura*, and *Calyptura*; while not a single genus of this family, except perhaps *Helioclera*, is confined to the extensive range of the Andes. Almost the same phenomena are presented by the allied Pipridae or manakins, the greater part of the genera and species occurring in Eastern South America, that is in Brazil, Guiana, and the surrounding lowlands rather than in the Andean valleys. The same may be said of the jacamars (Galbulidae) and puff-birds (Bucconidae); but the humming-birds (Trochilidae) have their greatest development in the Andean district. Brazil and Guiana have each a peculiar genus of parrots; Guiana has three peculiar genera of Cracidae, while the Andes north of the equator have two. The Tinamidae on the other hand have their metropolis in Brazil, which has two or three peculiar genera, while two others seem confined to the Andes south of the equator. The elegant trumpeters (Psophiidae) are almost restricted to the Amazonian valley.

Somewhat similar facts occur among the Mammalia. At least 3 genera of monkeys are confined to the great lowland equatorial forests and 1 to Brazil; *Ictieyon* (Canidae) and *Pteronura* (Mustelidae) belong to Guiana and Brazil; and most of the Echimyidae are found in the same districts. The sloths, anteaters, and armadillos all seem more characteristic of the eastern districts than of the Andean; while the opossums are perhaps equally plentiful in the Andes.

The preceding facts of distribution lead us to conclude that the highlands of Brazil and of Guiana represent very ancient lands, dating back to a period long anterior to the elevation of the Andean range (which is by no means of great geological anti-
quity) and perhaps even to the elevation of the continuous land which forms the base of the mountains. It was, no doubt, during their slow elevation and the consequent loosening of the surface, that the vast masses of debris were carried down which filled up the sea separating the Andean chain from the great islands of Brazil and Guiana, and formed that enormous extent of fertile lowland forest, which has created a great continent; given space for the free interaction of the distinct faunas which here met together, and thus greatly assisted in the marvellous development of animal and vegetable life, which no other continent can match. But this development, and the fusion of the various faunas into one homogeneous assemblage must have been a work of time; and it is probable that most of the existing continent was dry land before the Andes had acquired their present altitude. The blending of the originally distinct sub-faunas has been no doubt assisted by elevations and depressions of the land or of the ocean, which have alternately diminished and increased the land-area. This would lead to a crowding together at one time, and a dispersion at others, which would evidently afford opportunity for many previously restricted forms to enter fresh areas and become adapted to new modes of life.

From the preceding sketch it will appear, that the great sub-region of Tropical South America as here defined, is really formed of three originally distinct lands, fused together by the vast lowland Amazonian forests. In the class of birds sufficient materials exist for separating these districts; and that of the Andes contains a larger series of peculiar genera than either of the other sub-regions here adopted. But there are many objections to making such a sub-division here. It is absolutely impossible to define even approximate limits to these divisions—to say for example where the "Andes" ends and where "Brazil" or "Amazonia" or "Guiana" begins; and the unknown border lands separating these are so vast, that many groups, now apparently limited in their distribution, may prove to have a very much wider range. In mammalia, reptiles, and insects, it is even more difficult to maintain such divisions, so that on the whole it seems better to treat the entire area as one sub-region,
although recognizing the fact of its zoological and geographical diversity, as well as its vast superiority over every other sub-region in the number and variety of its animal forms.

The reptiles, fishes, mollusca, and insects of this sub-region have been sufficiently discussed in treating of the entire region, as by far the larger proportion of them, except in the case of land-shells, are found here.

*Plate XV. Characteristic Neotropical Birds.*—To illustrate the ornithology of South America we place our scene on one of the tributaries of the Upper Amazon, a district where this class of animals is the most prominent zoological feature, and where a number of the most remarkable and interesting birds are to be found. On the left we have the umbrella-bird (*Cephalopterus ornatus*), so called from its wonderful crest, which, when expanded, completely overshadows its head like an umbrella. It is also adorned with a long tassel of plumes hanging from its breast, which is formed by a slender fleshy tube clothed with broad feathers. The bird is as large as a crow, of a glossy blue-black colour, and belongs to the same family as the exquisitely tinted blue-and-purple chatterers. Flying towards us are a pair of curl-crested toucans (*Pteroglossus beauharnaisii*), distinguished among all other toucans by a crest composed of small black and shining barbless plumes, resembling curled whalebone. The general plumage is green above, yellow and red beneath, like many of its allies. To the right are two of the exquisite little whiskered hummers, or “frill-necked coquettes,” as they are called by Mr. Gould, (*Lophornis gouldi*). These diminutive birds are adorned with green-tipped plumes springing from each side of the throat, as well as with beautiful crests, and are among the most elegant of the great American family of humming-birds, now numbering about 400 known species. Overhead are perched a pair of curassows (*Crax globulosa*), which represent in America the pheasants of the Old World. There are about a dozen species of these fine birds, most of which are adorned with handsome curled crests. That figured, is distinguished by the yellow caruncular swellings at the base of the bill. The tall crane-like bird near the water is one of the trumpeters, (*Psophia leucoptera*), elegant
birds with silky plumage peculiar to the Amazon valley. They are often kept in houses, where they get very tame and affectionate; and they are useful in catching flies and other house insects, which they do with great perseverance and dexterity.

Islands of Tropical South America.

These are few in number, and, with one exception, not of much interest. Such islands as Trinidad and Sta. Catherina form parts of South America, and have no peculiar groups of animals. The small islands of Fernando Noronha, Trinidad, and Martin Vaz, off the coast of Brazil, are the only Atlantic islands somewhat remote from land; while the Galapagos Archipelago in the Pacific is the only group whose productions have been carefully examined, or which present features of special interest.

Galapagos Islands.—These are situated on the equator, about 500 miles from the coast of Ecuador. They consist of the large Albemarle island, 70 miles long; four much smaller (18 to 25 miles long), named Narborough, James, Indefatigable, and Chatham Islands; four smaller still (9 to 12 miles long), named Abingdon, Bindloes, Hood's, and Charles Islands. All are volcanic, and consist of fields of black basaltic lava, with great numbers of extinct craters, a few which are still active. The islands vary in height from 1,700 to 5,000 feet, and they all rise sufficiently high to enter the region of moist currents of air, so that while the lower parts are parched and excessively sterile, above 800 or 1,000 feet there is a belt of comparatively green and fertile country.

These islands are known to support 58 species of Vertebrates,—1 quadruped, 52 birds and 5 reptiles, the greater part of which are found nowhere else, while a considerable number belong to peculiar and very remarkable genera. We must therefore notice them in some detail.

Mammalia.—This class is represented by a mouse belonging to the American genus Hesperomys, but slightly different from any found on the continent. A true rat (Mus), slightly differing from any European species, also occurs; and as there can be little doubt that this is an escape from a ship, somewhat
changed under its new conditions of life (the genus Mus not being indigenous to the American continent), it is not improbable, as Mr. Darwin remarks, that the American mouse may also have been imported by man, and have become similarly changed.

**Birds.**—Recent researches in the islands have increased the number of land-birds to thirty-two, and of wading and aquatic birds to twenty-three. All the land birds but two or three are peculiar to the islands, and eighteen, or considerably more than half, belong to peculiar genera. Of the waders 4 are peculiar, and of the swimmers 2. These are a rail (Porzana spilonota); two herons (Butorides plumbea and Nycticorax pauper); a flamingo (Phoenicopterus glyphorhynchus); while the new aquatics are a gull (Larus fuliginosus), and a penguin (Spheniscus mendiculus).

The land-birds are much more interesting. All except the birds of prey belong to American genera which abound on the opposite coast or on that of Chili a little further south, or to peculiar genera allied to South American forms. The only species not peculiar are, Dolichonyx oryzivorius, a bird of very wide range in America and of migratory habits, which often visits the Bermudas 600 miles from North America,—and Asio accipitrinus, an owl which is found almost all over the world. The only genera not exclusively American are Buteo and Strix, of each of which a peculiar species occurs in the Galapagos, although very closely allied to South American species. There remain 10 genera, all either American or peculiar to the Galapagos; and on these we will remark in systematic order.

1. *Mimus*, the group of American mocking-thrushes, is represented by three distinct and well-marked species. 2. *Dendroica*, an extensive and wide-spread genus of the wood-warblers (Mniotiltidae), is represented by one species, which ranges over the greater part of the archipelago. The genus is especially abundant in Mexico, the Antilles, and the northern parts of

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1 Mr. Salvin, who has critically examined the ornithological fauna of these islands, has kindly corrected my MS. List of the Birds, his valuable paper in the Transactions of the Zoological Society not having been published in time for me to make use of it.
tropical America, only one species extending south as far as Chili. 3. Certhidea, a peculiar genus originally classed among the finches, but which Mr. Sclater, who has made South American birds his special study, considers to belong to the Cerebidae, or sugar-birds, a family which is wholly tropical. Two species of this genus inhabit separate islands. 4. Progne, the American martins (Hirundinidae), is represented by a peculiar species. 5. Geospiza, a peculiar genus of finches, of which no less than eight species occur in the archipelago, but not more than four in any one island. 6. Camarhynchus (6 sp.) and 7. Cactornis (4 sp.) are two other peculiar genera of finches; some of the species of which are confined to single islands, while others inhabit several. 8. Pyrocephalus, a genus of the American family of tyrant-flycatchers (Tyrannidae), has one peculiar species closely allied to T. rubineus, which has a wide range in South America. 9. Myiarchus, another genus of the same family which does not range further south than western Ecuador, has also a representative species found in several of the islands. 10. Zeraida, an American genus of pigeons, has a species in James Island and probably in some of the others, closely allied to a species from the west coast of America.

It has been already stated that some of the islands possess peculiar species of birds distinct from the allied forms in other islands, but unfortunately our knowledge of the different islands is so unequal and of some so imperfect, that we can form no useful generalizations as to the distribution of birds among the islands themselves. The largest island is the least known; only one bird being recorded from it, one of the mocking-thrushes found nowhere else. Combining the observations of Mr. Darwin with those of Dr. Habel and Prof. Sundevall, we have species recorded as occurring in seven of the islands. Albemarle island has but one definitely known species; Chatham and Bindloe islands have 11 each; Abingdon and Charles islands 12 each; Indefatigable island and James island have each 18 species. This shows that birds are very fairly distributed over all the islands, one of the smallest and most remote (Abingdon) furnishing as many as the much larger Chatham Island, which is also the nearest
to the mainland. Taking the six islands which seem tolerably explored, we find that two of the species (*Dendroica auricola* and *Geospiza fortis*) occur in all of them; two others (*Geospiza stenua* and *Myiarchus magnirostris*) in five; four (*Mimus melanotis, Geospiza fuliginosa, G. parvula,* and *Camarhynchus prosthemelas*) in four islands; five (*Certhidea olivacea, Caetornis scandens, Pyrocephalus nanus*), and two of the birds of prey, in three islands; nine (*Certhidea fusca, Progne concolor, Geospiza nebulosa, G. magnirostris, Camarhynchus psittacus, C. variegatus, C. habeli* and *Asio accipitrinus*) in two islands; while the remaining ten species are confined to one island each. These peculiar species are distributed among the islands as follows. James, Charles and Abingdon islands, have 2 each; Bindloeis, Chatham, and Indefatigable, 1 each. The amount of speciality of James Island is perhaps only apparent, owing to our ignorance of the fauna of the adjacent large Albemarle island; the most remote islands north and south, Abingdon and Charles, have no doubt in reality most peculiar species, as they appear to have. The scarcity of peculiar species in Chatham Island is remarkable, it being large, very isolated, and the nearest to the mainland. There is still room for exploration in these islands, especially in Albemarle, Narborough, and Hood’s islands of which we know nothing.

Reptiles.—The few reptiles found in these islands are very interesting. There are two snakes, a species of the American genus *Herpetodryas*, and another which was at first thought to be a Chilian species (*Psammophis Temmincki*), but which is now considered to be distinct. Of lizards there are four at least, belonging to as many genera. One is a species of *Phyllocladylus*, a wide-spread genus of Geckotidæ; the rest belong to the American family of the Iguanas, one being a species of the Neotropical genus *Leiocephalus*, the other two very remarkable forms, *Trachycephalus* and *Oreocéphalus* (formerly united in the genus *Amblyrhynchus*). The first is a land, the second a marine, lizard; both are of large size and very abundant on all the islands; and they are quite distinct from any of the very numerous genera of Iguanidae, spread all over the American continent. The last
reptile is a land tortoise (*Testudo nigra*) of immense size, and also abundant in all the islands. Its nearest ally is the equally large species of the Mascarene Islands; an unusual development due, in both cases, to the absence of enemies permitting these slow but continually growing animals to attain an immense age. It is believed that each island has a distinct variety or species of tortoise.

**Insects.**—Almost the only insects known from these islands are some Coleoptera, chiefly collected by Mr. Darwin. They consist of a few peculiar species of American or wide ranging genera, the most important being, a *Calosoma*, *Pecelus*, *Solenophorus*, and *Notaphus*, among the Carabidae; an *Oryctes* among the Lamellicornes; two new genera of obscure Heteromera; two Curculionidae of wide-spread genera; a Longicorn of the South American genus *Eburia*; and two small Phytophaga,—a set of species highly suggestive of accidental immigrations at rare and distant intervals.

**Land-Shells.**—These consist of small and obscure species, forming two peculiar sub-genera of *Bulimus*, a genus greatly developed on the whole West coast of America; and a single species of *Buliminus*, a genus which ranges over all the world except America. As in the case of the birds, most of the islands have two or three peculiar species.

**General Conclusions.**—These islands are wholly volcanic and surrounded by very deep sea; and Mr. Darwin is of opinion, not only that the islands have never been more nearly connected with the mainland than at present, but that they have never been connected among themselves. They are situated on the Equator, in a sea where gales and storms are almost unknown. The main currents are from the south-west, an extension of the Peruvian drift along the west coast of South America. From their great extent, and their volcanoes being now almost extinct, we may assume that they are of considerable antiquity. These facts exactly harmonize with the theory, that they have been peopled by rare accidental immigrations at very remote intervals. The only peculiar genera consist of birds and lizards, which must therefore have been the earliest
immigrants. We know that small Passerine birds annually reach the Bermudas from America, and the Azores from Europe, the former travelling over 600, the latter over 1000 miles of ocean. These groups of islands are both situated in stormy seas, and the immigrants are so numerous that hardly any specific change in the resident birds has taken place. The Galapagos receive no such annual visitants; hence, when by some rare accident a few individuals of a species did arrive, they remained isolated, probably for thousands of generations, and became gradually modified through natural selection under completely new conditions of existence. Less rare and violent storms would suffice to carry some of these to other islands, and thus the archipelago would in time become stocked. It would appear probable, that those which have undergone most change were the earliest to arrive; so that we might look upon the three peculiar genera of finches, and Certhidea, the peculiar form of Cerebidae, as among the most ancient inhabitants of the islands, since they have become so modified as to have apparently no near allies on the mainland. But other birds may have arrived nearly at the same time, and yet not have been much changed. A species of very wide range, already adapted to live under very varied conditions and to compete with varied forms of life, might not need to become modified so much as a bird of more restricted range, and more specialized constitution. And if, before any considerable change had been effected, a second immigration of the same species occurred, crossing the breed would tend to bring back the original type of form. While, therefore, we may be sure that birds like the finches, which are profoundly modified and adapted to the special conditions of the climate and vegetation, are among the most ancient of the colonists; we cannot be sure that the less modified form of tyrant-flycatcher or mocking-thrush, or even the unchanged but cosmopolitan owl, were not of coeval date; since even if the parent form on the continent has been changed, successive immigrations may have communicated the same change to the colonists.

The reptiles are somewhat more difficult to account for. We know, however, that lizards have some means of dispersal over
the sea, because we find existing species with an enormous range. The ancestors of the *Amblyrhynchus* must have come as early, probably, as the earliest birds; and the same powers of dispersal have spread them over every island. The two American genera of lizards, and the tortoises, are perhaps later immigrants. Latest of all were the snakes, which hardly differ from continental forms; but it is not at all improbable that these latter, as well as the peculiar American mouse, have been early human importations. Snakes are continually found on board native canoes whose cabins are thatched with palm leaves; and a few centuries would probably suffice to produce some modification of a species completely isolated, under conditions widely different from those of its native country. Land-shells, being so few and small, and almost all modifications of one type, are a clear indication of how rare are the conditions which lead to their dispersal over a wide extent of ocean; since two or three individuals, arriving on two or three occasions only during the whole period of the existence of the islands, would suffice to account for the present fauna. Insects have arrived much more frequently; and this is in accordance with their habits, their lower specific gravity, their power of flight, and their capacity for resisting for some time the effects of salt water.

We learn, then, from the fauna of these islands, some very important facts. We are taught that tropical land-birds, unless blown out of their usual course by storms, rarely or never venture out to sea, or if they do so, can seldom pass safely over a distance of 500 miles. The immigrants to the Galapagos can hardly have averaged a bird in a thousand years. We learn, that of all reptiles lizards alone have some tolerably effective mode of transmission across the sea; and this is probably by means of currents, and in connection with floating vegetation. Yet their transmission is a far rarer event than that of land-birds; for, whereas three female immigrants will account for the lizard population, at least eight or ten ancestors are required for the birds. Land serpents can pass over still more rarely, as two such transmissions would have sufficed to stock the islands with their snakes; and it is not certain that either of these occurred without the aid of man.
It is doubtful whether mammals or batrachians have any means of passing, independently of man's assistance; the former having but one doubtfully indigenous representative, the latter none at all. The remarkable absence of all gay or conspicuous flowers in these tropical islands, though possessing a zone of fairly luxuriant shrubby vegetation, and the dependence of this phenomenon on the extreme scarcity of insects, has been already noticed at Vol. I. p. 461, when treating of a somewhat similar peculiarity of the New Zealand fauna and flora.

I. South Temperate America, or the Chilian Sub-region.

This sub-region may be generally defined as the temperate portion of South America. On the south, it commences with the cold damp forests of Tierra del Fuego, and their continuation up the west coast to Chiloe and northward to near Santiago. To the east we have the barren plains of Patagonia, gradually changing towards the north into the more fertile, but still treeless, pampas of La Plata. Whether this sub-region should be continued across the Río de la Plata into Uruguay and Entre-rios, is somewhat doubtful. To the west of the Parana it extends northward over the Chaco desert, till we approach the border of the great forests near St. Cruz de la Sierra. On the plateau of the Andes, however, it must be continued still further north, along the "paramos" or alpine pastures, till we reach 5° of South latitude. Beyond this the Andes are very narrow, having no double range with an intervening plateau; and although some of the peculiar forms of the temperate zone pass on to the equator or even beyond it, these are not sufficiently numerous to warrant our extending the sub-region to include them. Along with the high Andes it seems necessary to include the western strip of arid country, which is mostly peopled by forms derived from Chili and the south temperate regions.

Mammalia.—This sub-region is well characterised by the possession of an entire family of mammalia having Neotropical affinities—the Chinchillidae. It consists of 3 genera—Chinchilla (2 sp.), inhabiting the Andes of Chili and Peru as far as 9° south latitude, and at from 8,000 to 12,000 feet altitude; Lagidium (3 sp.), ranging over the Andes of Chili, Peru, and South Ecuador,
from 11,000 to 16,000 feet altitude; and Lagostomus (1 sp.), the "viscacha," confined to the pampas between the Uruguay and Rio Negro. Many important genera are also confined to this subregion. Auchenia (4 sp.), including the domesticated llamas and alpacas, the vicugna which inhabits the Andes of Peru and Chili, and the guanaco which ranges over the plains of Patagonia and Tierra del Fuego. Although this genus is allied to the Old World camels, it is a very distinct form, and its introduction from North America, where the family appear to have originated, may date back to a remote epoch. Ursus ornatus, the "spectacled bear" of the Chilian Andes, is a remarkable form, supposed to be most allied to the Malay bear, and probably forming a distinct genus, which has been named Tremarctos. Four genera of Octodontidae are also peculiar to this sub-region, or almost so; Habrocomus (1 sp.) is Chilian; Spalacopus (2 sp.) is found in Chili and on the east side of the southern Andes; Octodon (3 sp.) ranges from Chili into Peru and Bolivia; Ctenomys (6 sp.) from the Straits of Magellan to Bolivia, with one species in South Brazil. Dolichotis, one of the Cavies, ranges from Patagonia to Mendoza, and on the east coast to 37½° S. latitude. Myopotamus (1 sp.), the coypu (Echimyidae), ranges from 33° to 48° S. latitude on the west side of the Andes, and from the frontiers of Peru to 42° S. on the east side. Reithrodon and Acodon, genera of Muridae, are also confined to Temperate South America; Tolypteutes and Chlamydophorus, two genera of armadillos, the latter very peculiar in its organization and sometimes placed in a distinct family, are found only in La Plata and the highlands of Bolivia, and so belong to this sub-region. Otaria, one of the "eared seals" (Otaridae), is confined to the coasts of this subregion and the antarctic islands. Deer of American groups extend as far as Chiloe on the west, and the Straits of Magellan on the east coast. Mice of the South American genera Hesperomys and Reithrodon, are abundant down to the Straits of Magellan and into Tierra del Fuego, Mr. Darwin having collected more than 20 distinct species. The following are the genera of Mammalia which have been observed on the shores of the Straits of Magellan, those marked * extending into Tierra del Fuego:

**Birds.**—Three families of Birds are confined to this sub-region, — Phytotomidae (1 genus, 3 sp.), inhabiting Chili, La Plata, and Bolivia; Chionididae (1 genus, 2 sp.) the "sheath-bills," found only at the southern extremity of the continent and in Kerguelen's Island, which with the other antarctic lands perhaps comes best here; Thinocoridae (2 genera, 6 species) an isolated family of waders, ranging over the whole sub-region and extending northward to the equatorial Andes. Many genera are also peculiar: 3 of Fringillidae, and 1 of Icteridae; 9 of Dendrocolaptidae, 6 of Tyrannidae, 3 of Trochilidae, and 4 of Pteroptochidae,—the last four South American families. There is also a peculiar genus of parrots (*Henicognathus*) in Chili; two of pigeons (*Metriopelia* and *Gymnopelia*) confined to the Andes and west coast from Peru to Chili; two of Tinamous, *Tinamotes* in the Andes, and *Calodromus* in La Plata; three of Charadriidae, *Phagornis, Pluvianellus*, and *Oreophilus*; and *Rhea*, the American ostriches, inhabiting all Patagonia and the pampas. Perhaps the Caria-midae have almost as much right here as in the last sub-region, inhabiting as they do, the "pampas" of La Plata and the upland "campos" of Brazil; and even among the wide-ranging aquatic birds, we have a peculiar genus, *Merganetta*, one of the duck family, which is confined to the temperate plateau of the Andes.

Against this extensive series of characteristic groups, all either of American type or very distinct forms of Old World families, and therefore implying great antiquity, we find, in mammalia and birds, very scanty evidence of that direct affinity with the north temperate zone, on which some naturalists lay so much stress. We cannot point to a single terrestrial genus, which is characteristic of the north and reappears in this south temperate region without also occurring over much of the intervening land. *Mustela* seems only to have reached Peru; *Lepus* is isolated in Brazil; true *Ursus* does not pass south of Mexico. In birds, the northern groups rarely go further south than Mexico or the Columbian Andes; and the only case of discontinuous
distribution we can find recorded is that of the genus of ducks, *Camptolæmus*, which has a species on the east side of North America and another in Chili and the Falkland Islands, but these, Professor Newton assures me, do not properly belong to the same genus. Out of 30 genera of land-birds collected on the Rio Negro in Patagonia, by Mr. Hudson, only four extend beyond the American continent, and the same exclusively American character applies equally to its southern extremity. No list appears to have been yet published of the land-birds of the Straits of Magellan and Tierra del Fuego. The following is compiled from the observations of Mr. Darwin, the recent voyage of Professor Cunningham, and other sources; and will be useful for comparison.

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<tr>
<th>Order</th>
<th>Species</th>
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<tr>
<td>TURDIDÆ</td>
<td>1. <em>Turdus falklandicus</em></td>
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<td>2. <em>Troglodytes magellanicus</em></td>
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<td>Fringillidæ</td>
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<td>8. <em>Zonotrichia pileata</em></td>
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<td>Icteridæ</td>
<td>9. <em>Sturnella militaris</em></td>
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<td>10. <em>Curceus aterrimus</em></td>
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<td>Hirundinidæ</td>
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<td>Tyrannidæ</td>
<td>12. <em>Thamnophilus pyrope</em></td>
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<td>13. <em>Myotheretes rufiventris</em></td>
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<td>14. <em>Muscisaxicola mentalis</em></td>
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<td>15. <em>Centrites niger</em></td>
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<td>16. <em>Ameretis parulus</em></td>
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<td>17. <em>Elainea griseogularis</em></td>
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<td>Dendrocolaptidæ</td>
<td>*18. <em>Upucerthia dumetoria</em></td>
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<td>*19. <em>Cinclodes patagonicus</em></td>
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<td>*20. &quot; fuscus.</td>
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<td>*21. <em>Oxyurus spinicauda.</em></td>
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<td>Pteroptochidæ</td>
<td>*22. <em>Scytalopus magellanicus</em></td>
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<td>Picidæ</td>
<td>*23. <em>Campephilus magellanicus</em></td>
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<td>24. <em>Picus lignarius</em></td>
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<td>Alcedinidæ</td>
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<td>Trochilidæ</td>
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<td>Conuridæ</td>
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<td>Vulturidæ</td>
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<td>29. <em>Sarcorhamphus gryphus</em></td>
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<td>Falconidæ</td>
<td>30. <em>Circus macropterus</em></td>
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<td>31. <em>Buteo erythronotus</em></td>
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<td>32. <em>Geranoaëtes melanoleucus</em></td>
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<td>33. <em>Accipiter chilensis</em></td>
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<td>34. <em>Cerchneis sparverius</em></td>
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<td>35. <em>Milvago albogularis</em></td>
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<td>36. <em>Polyborus tharus</em></td>
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<td>Strigidæ</td>
<td>37. <em>Asio accipitrinus</em></td>
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<td>38. <em>Bubo magellanicus</em></td>
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<td>39. <em>Pholeoptynx cunicularia</em></td>
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<td>40. <em>Glaucidium nanum</em></td>
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<td>41. <em>Syrnium ruipes</em></td>
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<tr>
<td>Struthionidæ</td>
<td>42. <em>Rhea darwinii</em></td>
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In the above list the species marked * extend to Tierra del Fuego. It is a remarkable fact that so many of the species belong to genera which are wholly Neotropical, and that the specially South American families of Icteridae, Tyrannidae, Dendrocolaptidae, Pteroptochidæ, Trochilidæ, and Conuridæ, should supply more than one-third of the species; while the purely South American genus Phrygilus, should be represented by four species, three of which abound in Tierra del Fuego.

Plate XVI. A Scene in the Andes of Chili, with characteristic Animals.—The fauna of South Temperate America being most fully developed in Chili, we place the scene of our illustration in that country. In the foreground we have a pair of the beautiful little chinchillas (Chinchilla lanigera), belonging to a family of animals peculiar to the sub-region. There are only two species of this group, both confined to the higher Andes, at about 8000 feet elevation. Coming round a projecting ridge of the mountain, are a herd of vicunas (Auchenia vicugna), one of that peculiar form of the camel tribe found in South America and confined to its temperate and alpine regions. The upper bird is a plant-cutter (Phytotoma rara), of sober plumage but allied to the beautiful chatterers, though forming a separate family. Below, standing on a rock, is a plover-like bird, the Thinocorus oribignianus, which is considered to belong to a separate family, though allied to the plovers and sheath-bills. Its habits are, however, more those of the quails or partridges, living inland in dry and desert places, and feeding on plants, roots, and insects. Above is a condor, the most characteristic bird of the high Andes.

Reptiles and Amphibia.—These groups show, for the most part, similar modifications of American and Neotropical forms, as those we have seen to prevail among the birds. Snakes do not seem to go very far south, but several South American genera of Colubridæ and Dendrophidæ occur in Chili; while Enophrys is peculiar to La Plata, and Callorhinus to Patagonia, both belonging to the Colubridæ. The Elapidæ do not extend into the temperate zone; but Craspedocephalus, one of the Crotalidæ, occurs at Bahia Blanca in Patagonia (Lat. 40° S.)
PLATE XVI.

THE CHILIAN ANDES, WITH CHARACTERISTIC ANIMALS.
Lizards are much more numerous, and there are several peculiar and interesting forms. Three families are represented; Teiidae by two genera—Callopistes peculiar to Chili, and Ameiva which ranges over almost the whole American continent and is found in Patagonia; Geckotidae by four genera, two of which,—Caudivelera and Homonota—are peculiar to Chili, while Sphyrnodactylus and Cubina are Neotropical, the former ranging to Patagonia, the latter to Chili; and lastly the American family Iguanidae represented by eight genera, no less than six being peculiar, (or almost so,) to the South temperate region. These are Leiodera, Diplomemus and Proctotreutes, ranging from Chili to Patagonia; Leiolepis, from Peru to Patagonia; Phrymaturus, confined to Chili, and Ptygderus peculiar, to Patagonia and Tierra del Fuego. The other two genera, Oplurus and Leiosaurus, are common to Chili and tropical South America.

Tortoises appear to be scarce, a species of Hydromedusa only being recorded. Of the Amphibia, batrachia (frogs and toads) alone are represented, and appear to be tolerably abundant, seventeen species having been collected by Mr. Darwin in this sub-region. Species of the South American genera Phryniscus, Hylaplesia, Telmatobius, Cacotus, Hylodes, Cyclohamphus, Pleurodema, Cystignathus, and Leinuperus, are found in various localities, some extending even to the Straits of Magellan,—the extreme southern limit of both Reptilia and Amphibia, except one lizard (Ptygoderus) found by Professor Cunningham in Tierra del Fuego. There are also four peculiar genera, Rhinoderma belonging to the Engystomidae; Alsodes and Nannophryne to the Bombinatoridae; Opisthodelphys to the Hylidae; and Calyptocephalus to the Discoglossidae.

It thus appears, that in the Reptiles all the groups are typically American, and that most of the peculiar genera belong to families which are exclusively American. The Amphibia, on the other hand, present some interesting external relations, but these are as much with Australia as with the North temperate regions. The Bombinatoridae are indeed Palæarctic, but a larger proportion are Neotropical, and one genus inhabits New Zealand. The Chilian genus Calyptocephalus is allied to Australian tropical genera.
The Neotropical genera of Ranidae, five of which extend to Chili and Patagonia, belong to a division which is Australian and Neotropical, and which has species in the Oriental and Ethiopian regions.

*Fresh-water Fishes.*—These present some peculiar forms, and some very interesting phenomena of distribution. The genus *Percilia* has been found only in the Rio de Maypu in Chili; and *Percichthys*, also belonging to the perch family, has five species confined to the fresh waters of South Temperate America, and one far away in Java. *Nematogenys* (1 sp.) is peculiar to Chili; *Trichomycterus* reaches 15,000 feet elevation in the Andes,—both belonging to the Siluridae; *Chirodon* (2 sp.), belonging to the Characiniidae, is peculiar to Chili; and several other genera of the same family extend into this sub-region from Brazil. The family *Haplochitonidae* has a remarkable distribution; one of its genera, *Haplochiton* (2 sp.), inhabiting Tierra del Fuego and the Falkland Islands, while the other, *Prototroctes*, is found only in South Australia and New Zealand. Still more remarkable is *Galaxias* (forming the family *Galaxiidae*), the species of which are divided between Temperate South America, and Australia, Tasmania, and New Zealand; and there is even one species (*Galaxias attenuatus*) which is found in the Chatham Islands, New Zealand, and Tasmania, as well as in the Falkland Islands and Patagonia. *Fitzroya* (1 sp.) is found only at Montevideo; *Orestias* (6 sp.) is peculiar to Lake Titicaca in the high Andes of Bolivia; *Jenynsia* (1 sp.) in the Rio de la Plata—all belonging to the characteristic South American family of the *Cyprinodontidae*.

*Insects.*—It is in insects more than in any other class of animals, that we find clear indications of a not very remote migration of northern forms, along the great mountain range to South Temperate America, where they have established themselves as a prominent feature in the entomology of the country. The several orders and families, however, differ greatly in this respect; and there are some groups which are only represented by modifications of tropical forms, as we have seen to be almost entirely the case in birds and reptiles.
Lepidoptera.—The butterflies of the South Temperate Sub-region are not numerous, only about 29 genera and 80 species being recorded. Most of these are from Chili, which is sufficiently accounted for by the general absence of wood on the east side of the Andes from Buenos Ayres to South Patagonia. The families represented are as follows: Satyridae, with 11 genera and 27 species, are the most abundant; Nymphalidae, 2 genera and 8 species; Lemoniidae, 1 genus, 1 species; Lycaenidae, 3 genera, 8 species; Pieridae, 6 genera, 14 species; Papilionidae, 2 genera, 8 species; Hesperidae, 4 genera, 13 species. One genus of Satyridae (Elina) and 2 of Pieridae (Eroessa and Phulia) are peculiar to Chili. The following are the genera whose derivation must be traced to the north temperate zone:—Tetraphlybia, Neosatyrus, and 3 allied genera of 1 species each, were formerly included under Erebia, a northern and arctic form, yet having a few species in South Africa; Argyrophorus, allied to Aenesis, a northern genus; Hipparchia, a northern genus yet having a species in Brazil;—all Satyridae. The Nymphalidae are represented by the typical northern temperate genus Argynnis, with 7 species in Chili; Colias, among the Pieridae, is usually considered to be a northern genus, but it possesses representatives in South Africa, the Sandwich Islands, Malabar, New Grenada, and Peru, as well as Chili, and must rather be classed as cosmopolitan. These form a sufficiently remarkable group of northern forms, but they are accompanied by others of a wholly Neotropical origin. Such are Stibomorpha with 6 species, ranging through South America to Guatemala, and Eteona, common to Chili and Brazil (Satyridae); Apodemia (Lemoniidae) confined to Tropical America and Chili. Hesperocharis and Callidryas (Pieridae), both tropical; and Thracides (Hesperidae) confined to Tropical America and Chili. Other genera are widely scattered; as, Epinephile found also in Mexico and Australia; Cupido, widely spread in the tropics; Euryades, found only in La Plata and Paraguay, allied to South American forms of Papilio, to the Australian Eurytes, and the northern Parnassius; and Heterop- terus, scattered in Chili, North America, and Tropical Africa. We find then, among butterflies, a large north-temperate element,
intermingled in nearly equal proportions with forms derived from Tropical America; and the varying degrees of resemblances of the Chilian to the northern species, seems to indicate successive immigrations at remote intervals.

Coleoptera.—It is among the beetles of South Temperate America that we find some of the most curious examples of remote affinities, and traces of ancient migrations. The Carabidae are very well represented, and having been more extensively collected than most other families, offer us perhaps the most complete materials. Including the Cicindelidae, about 50 genera are known from the South Temperate Sub-region, the greater part from Chili, but a good number also from Patagonia and the Straits of Magellan. Of these more than 30 are peculiar, and most of them are so isolated that it is impossible to determine with precision their nearest allies.

The only remarkable form of Cicindelidae is Agrius, a genus allied to the Amblycheila and Omus of N.W. America. Two genera of Carabidae, Cascellius and Baripus, are closely allied to Promecoderus, an Australian genus; and another, Leeanonomerus, has one species in Chili and the other in Australia. Five or six of the peculiar genera are undoubtedly allied to characteristic Palaeartic forms; and such northern genera as Carabus, Pristonychus, Anchomenus, Pterostichus, Percus, Bradycellus, Trechus, and Bombidium, all absent from Tropical America, give great support to the view that there is a close relation between the insects of the northern regions and South Temperate America. A decided tropical element is, however, present. Tropopterus is near Colpodes, a Tropical and South American genus; Mimodromius and Plagiotelium are near Calleida, a South American genus; while Pachytele, Pericompus, Variorpalpus, and Calleida are widely spread American groups. The preponderance of northern forms seems, however, to be undoubted.

Six Carabidae are known from Juan Fernandez, 2 being identical with Chilian species and 3 peculiar. As the island is 350 miles from the mainland, we have here a proof of how readily insects may be transported great distances.
The Palaearctic affinity of the South Temperate Carabidae may be readily understood, if we bear in mind the great antiquity of the group, and the known long persistence of generic and specific forms of Coleoptera; the facility with which they may be transported to great distances by gales and hurricanes, either on land or over the sea; and, therefore, the probability that suitable stations would be rapidly occupied by species already adapted to them, to the exclusion of those of the adjacent tracts which had been specialised under different conditions. If, for example, we carry ourselves back to the time when the Andes had only risen to half their present altitude, and Patagonia had not emerged from the ocean (an epoch not very remote geologically), we should find nearly all the Carabidae of South America, adapted to a warm, and probably forest-covered country. If, then, a further considerable elevation of the land took place, a large temperate and cold area would be formed, without any suitable insect inhabitants. During the necessarily slow process of elevation, many of the tropical Carabidae would spread upwards, and some would become adapted to the new conditions; while the majority would probably only maintain themselves by continued fresh immigrations. But, as the mountains rose, another set of organisms would make their way along the highest ridges. The abundance and variety of the North Temperate Carabidae, and their complete adaptation to a life on barren plains and rock-strewn mountains, would enable them rapidly to extend into any newly-raised land suitable to them; and thus the whole range of the Rocky Mountains and Andes would obtain a population of northern forms, which would overflow into Patagonia, and there, finding no competitors, would develop into a variety of modified groups. This migration was no doubt effected mainly, during successive glacial epochs, when the mountain-range of the Isthmus of Panama, if moderately increased in height, might become adapted for the passage of northern forms, while storms would often carry insects from peak to peak over intervening forest lowlands or narrow straits of sea. If this is the true explanation, we ought to find no such preponderant northern element in groups which
are proportionally less developed in cold and temperate climates. Our further examination will show how far this is the case.

Lucanidæ.—Only four genera are known in the sub-region. Two are peculiar, *Chiasognathus* and *Streptocerus*, the former allied to Tropical American, the latter to Australian genera; the other two genera are exclusively South American.

Cetoniidæ.—These seem very scarce, only a few species of the Neotropical genus *Gymnetis* reaching Patagonia.

Buprestidæ.—These are rather numerous, many very beautiful species being found in Chili. Nineteen genera are represented in South Temperate America, and 5 of these are peculiar to it; 3 others are South American genera; 2 are Australian, and the remainder are wide-spread, but all are found also in Tropical America. The only north-temperate genus is *Dicerca*, and even this occurs also in the Antilles, Brazil, and Peru. Of the peculiar genera, the largest, *Daectylozodes* (26 sp.), has one species in South Brazil, and is closely allied to *Hyperantha*, a genus of Tropical America; *Epistomentis* is allied to *Naseis*, an Australian genus; *Tyndaris* is close to *Aemocodera*, a genus of wide range and preferring desert or dry countries. The other two are single species of cosmopolitan affinities. On the whole, therefore, the Buprestidæ are unmistakeably Neotropical in character.

Longicorns.—Almost the whole of the South Temperate Longicorns inhabit Chili, which is very rich in this beautiful tribe. About 75 genera and 160 species are known, and nearly half of the genera are peculiar. Many of the species are large and handsome, rivalling in beauty those of the most favoured tropical lands. Of the 8 genera of Prionidæ 6 are peculiar, but all are allied to Tropical American forms except *Microptophorus*, which belongs to a group of genera spread over Australia, Europe, and Mexico. The Cerambycidæ are much more abundant, and their affinities more interesting. Two (*Syllitus* and *Pseudocephalus*) are common to Australia and Chili. Twenty-three are Neotropical; and among these *Ibidion*, *Composocerus*, *Callideriphus*, *Trachyderes*, and *Xylocharis*, are best represented. Twenty are
altogether peculiar, but most of them are more or less closely allied to genera inhabiting Tropical America. Some, as the handsome *Cheloderus* and *Oxypeltus*, have no close allies in any part of the world. *Holopterus*, though very peculiar, shows most resemblance to a New Zealand insect. *Sibylla*, *Adalbus*, and *Phantagodorus*, have Australian affinities; while *Calydon* alone shows an affinity for north-temperate forms. One species of the northern genus, *Leptura*, is said to have been found at Buenos Ayres.

The Lamiidæ are less abundant. Nine of the genera are Neotropical. Two (*Apomecyna* and *Exocentrus*) are spread over all tropical regions. Ten genera are peculiar; and most of these are related to Neotropical groups or are of doubtful affinities. Only one, *Aeonopterus*, is decidedly allied to a northern genus, *Pogonochcerus*. It thus appears, that none of the Lamiidæ exhibit Australian affinities, although these are a prominent feature in the relations of the Cerambycidae.

It is evident, from the foregoing outline, that the insects of South Temperate America, more than any other class of animals, exhibit a connection with the north temperate regions, yet this connection is only seen in certain groups. In Diurnal Lepidoptera and in Carabidæ, the northern element is fully equal to the tropical, or even preponderates over it. We have already suggested an explanation of this fact in the case of the Carabidæ, and with the butterflies it is not more difficult. The great mass of Neotropical butterflies are forest species, and have been developed for countless ages in a forest-clad tropical country. The north temperate butterflies, on the other hand, are very largely open-country species, frequenting pastures, mountains, and open plains, and often wandering over an extensive area. These would find, on the higher slopes of mountains, a vegetation and conditions suited to them, and would occupy such stations in less time than would be required to adapt and modify the forest-haunting groups of the American lowlands. In those groups of insects, however, in which the conditions of life are nearly the same as regards both temperate and tropical species, the superior
number and variety of the tropical forms has given them the advantage. Thus we find that among the Lucanidae, Buprestidae, and Longicorns, the northern element is hardly perceptible. Most of these are either purely Neotropical, or allied to Neotropical genera, with the admixture, however, of a decided Australian element. As in the case of the Amphibia and fresh-water fishes, the Australian affinity, as shown by insects, is of two kinds, near and remote. We have a few genera common to the two countries; but more commonly the genera are very distinct, and the affinity is shown by the genera of both countries belonging to a group peculiar to them, but which may be of very great age. In the former case, we must impute some of the resemblance of the two faunas to an actual interchange of forms within the epoch of existing genera—a period of vast and unknown duration in the class of insects; while in the latter case, and perhaps also in many of the former, it seems more in accordance with the whole of the phenomena, to look upon most of the instances as survivals, in the two southern temperate areas, of the relics of groups which had once a much wider distribution. That this is the true explanation, is suggested by the numerous cases of discontinuous and scattered distribution we have had to notice, in which every part of the globe, without exception, is implicated; and there is a reason why these survivals should be rather more frequent in Australia and temperate South America, inasmuch as these two areas agree in the absence of a considerable number of otherwise cosmopolitan vertebrate types, and are also in many respects very similar in climatic and other physical conditions. The preponderating influence of the organic over the physical environment, as taught by Mr. Darwin, leads us to give most weight to the first of the above-mentioned causes; to which we may also impute such undoubted cases of survival of ancient types as the Centetidae of the Antilles and Madagascar—both areas strikingly deficient in the higher vertebrate forms. The probable mode and time of the cross migration between Australia and South America, has been sufficiently discussed in our chapter on the Australian region, when treating of the origin and affinities of the New Zealand fauna.
Islands of the South Temperate Sub-region.

These are few, and of not much zoological interest. Tierra del Fuego, although really an island, is divided from the mainland by so narrow a channel that it may be considered as forming part of the continent. The guanaco (Auchenia hueanaco) ranges over it, and even to small islands further south.

The Falkland Islands.—These are more important, being situated about 350 miles to the east of Southern Patagonia; but the intervening sea is shallow, the 100 fathom line of soundings passing outside the islands. We have therefore reason to believe that they have been connected with South America at a not distant epoch; and in agreement with this view we find most of their productions identical, while the few that are peculiar are closely allied to the forms of the mainland.

The only indigenous Mammals are a wolf-like fox (Pseudalopex antarcticus) said to be found nowhere else, but allied to two other species inhabiting Southern Patagonia; and a species of mouse, probably one of the American genera Hesperomys or Reithrodon.

Sixty-seven species of Birds have been obtained in these islands, but only 18 are land-birds; and even of these 7 are birds of prey, leaving only 11 Passeres. The former are all common South American forms, but one species, Milvago australis, seems peculiar. The 11 Passeres belong to 9 genera, all found on the adjacent mainland. Three, or perhaps four, of the species are however peculiar. These are Phrygilus melanoderus, P. xanthogrammus, Cinclodes antarcticus, and Muscisaxicola macloviana. The wading and swimming birds are of little interest, except the penguins, which are greatly developed; no less than eight species being found, five as residents and three as accidental visitors.

No reptiles are known to inhabit these islands.

Juan Fernandez.—This island is situated in the Pacific Ocean, about 400 miles west of Valparaiso in Chili. It is only a few miles in extent, yet it possesses four land-birds, excluding the powerful Accipitres. These are Turdus falklandicus; Anaretes
ferriandensis, one of the Tyrannidæ; and two humming-birds, Eustephanus fernandensis and E. galeritus. The first is a widespread South Temperate species, the two next are peculiar to the island, while the last is a Chilian species which ranges south to Tierra del Fuego. But ninety miles beyond this island lies another, called "Mas-a-fuera," very much smaller; yet this, too, contains four species of similar birds; one, Oxynurus mas-a-fuera, allied to the wide-spread South Temperate O. spinicauda, and Cinclodes fuscus, a South Temperate species—both Dendrocolaptidæ; with a humming-bird, Eustephanus leybodi, allied to the species in the larger island. The preceding facts are taken from papers by Mr. Sclater in the 1871, and a later one in the same journal by Mr. Salvin (1875). The former author has some interesting remarks on the three species of humming-birds of the genus Eustephanus, above referred to. The Chilian species, E. galeritus, is green in both sexes. E. fernandensis has the male of a fine red colour and the female green, though differently marked from the female of E. galeritus. E. leybodi (of Mas-a-fuera) has the male also red and the female green, but the female is more like that of E. galeritus, than it is like the female of its nearer ally in Juan Fernandez. Mr. Sclater supposes, that the ancient parent form of these three birds had the sexes alike, as in the present Chilian bird; that a pair (or a female having fertilised ova) reached Juan Fernandez and colonised it. Under the action of sexual selection (unchecked by some conditions which had impaired its efficacy on the continent) the male gradually assumed a brilliant plumage, and the female also slightly changed its markings. Before this change was completed the bird had established an isolated colony on Mas-a-fuera; and here the process of change was continued in the male, but from some unknown cause checked in the female, which thus remains nearer the parent form. Lastly the slightly modified Chilian bird again reached Juan Fernandez and exists there side by side with its strangely altered cousin.

All the phenomena can thus be accounted for by known laws; on the theory of very rare accidental immigrations from the
mainland. The species are here so very few, that the greatest advocate for continental extensions would hardly call such vast causes into action, to account for the presence of these three birds on so small and so remote an island, especially as the union must have continued down to the time of existing species. But if accidental immigration has sufficed here, it will also assuredly have sufficed where the islands are larger, and the chances of reaching them proportionately greater; and it is because an important principle is here illustrated on so small a scale, and in so simple a manner as to be almost undeniable, that we have devoted a paragraph to its elucidation.

A few Coleoptera from Juan Fernandez present analogous phenomena. All belong to Chilian genera, while a portion of them constitute peculiar species.

Land-shells are rather plentiful, there being about twenty species belonging to seven genera, all found in the adjacent parts of South America; but all the species are peculiar, as well as four others found on the island of Mas-a-fuera.

III. Tropical North America, or the Mexican Sub-region.

This sub-region is of comparatively small extent, consisting of the irregular neck of land, about 1,800 miles long, which connects the North and South American continents. Almost the whole of its area is mountainous, being in fact a continuation of the great range of the Rocky Mountains. In Mexico it forms an extensive table-land, from 6,000 to 9,000 feet above the sea, with numerous volcanic peaks from 12,000 to 18,000 feet high; but in Yucatan and Honduras, the country is less elevated, though still mountainous. On the shores of the Caribbean Sea and Gulf of Mexico, there is a margin of low land from 50 to 100 miles wide, beyond which the mountains rise abruptly; but on the Pacific side this is almost entirely wanting, the mountains rising almost immediately from the sea shore. With the exception of the elevated plateaus of Mexico and Guatemala, and the extremity of the peninsula of Yucatan, the whole of Central America is clothed with forests; and as its surface is much broken up into hill and valley, and the volcanic
soil of a large portion of it is very fertile, it is altogether well adapted to support a varied fauna, as it does a most luxuriant vegetation. Although many peculiar Neotropical types are absent, it yet possesses an ample supply of generic and specific forms; and, as far as concerns birds and insects, is not perhaps inferior to the richest portions of South America in the number of species to be found in equal areas.

Owing to the fact that the former Republic of Mexico comprised much territory that belongs to the Nearctic region, and that many Nearctic groups extend along the high-lands to the capital city of Mexico itself, and even considerably further south, there is much difficulty in determining what animals really belong to this sub-region. On the low-lands, tropical forms predominate as far as 28° N. latitude; while on the cordilleras, temperate forms prevail down to 20°, and are found even much farther within the tropics.

Mammalia.—Very few peculiar forms of Mammalia are restricted to tropical North America; which is not to be wondered at when we consider the small extent of the country, and the facility of communication with adjacent sub-regions. A peculiar form of tapir (Elasmognathus bairdii) inhabits Central America, from Panama to Guatemala, and, with Myxomys, a genus of Muridae, are all at present discovered. Bassaris, a remarkable form of Procyonidae, has been included in the Nearctic region, but it extends to the high-lands of Guatemala. Heteromyis, a peculiar genus of Saccomyidae or pouched rats, inhabits Mexico, Honduras, Costa Rica, and Trinidad. Five genera of monkeys extend here,—Ateles, Myocetes, Cebus, Nyctiphathecus, and Saimiris; the two former alone reaching Mexico, the last only going as far as Costa Rica. Other typical Neotropical forms are Galera, the tayra, belonging to the weasel family; Nasua, the coati-mundi; Dicotyles, the peccary; Cercolabes, the tree porcupine; Dasyprocta, the agouti; Ctenogenys, the paca; Choloepus, and Arctopithecus, sloths; Cyclothorax, an ant-eater; Tatusia, an armadillo; and Didelphys, oppossum. Of Northern forms, Sorex, Vulpes, Lepus, and Pteromys reach Guatemala.

Birds.—The productiveness of this district in bird life, may
be estimated from the fact, that Messrs. Salvin and Sclater have catalogued more than 600 species from the comparatively small territory of Guatemala, or the portion of Central America between Mexico and Honduras. The great mass of the birds of this sub-region are of Neotropical families and genera, but these are intermingled with a number of migrants from temperate North America, which pass the winter here; with some northern forms on the high-lands; and with a considerable number of peculiar genera, mostly of Neotropical affinities.

The genera of birds peculiar to this sub-region belong to the following families:—Turdidæ (2 genera); Troglodytidae (1 gen.); Vireonidæ (1 gen.); Corvidæ (2 gen.); Ampelidæ (1 gen.); Tanagridæ (1 gen.); Fringillidæ (2 gen.); Icteridae (1 gen.); Formicariidæ (2 gen.); Tyrannidæ (2 gen.); Cotingidæ (1 gen.); Momotidæ (1 gen.); Trogonidæ (1 gen.); Trochilidæ (14 gen.); Conuridæ (1 gen.); Cracidæ (2 gen.); Strigidæ (1 gen.); in all 37 genera of land-birds. The Neotropical families that do not extend into this sub-region are, Pteroptochidæ; the sub-family Furnariinæ of the Dendrocolaptidæ; the sub-family Conopha-ginæ of the Tyrannidæ; the sub-family Rupicolinae of the Cotingidæ; Phytotomidæ; Todidæ; Opisthocomidæ; Chioni-didæ; Thinocoridæ; Cariamidæ; Psophiidae; Eurypygidæ; Palamedeidæ; and Struthionidæ. On the other hand Paridæ, Certhiidae, Ampelidæ, and Phasianidæ, are northern families represented here, but which do not reach South America; and there are also several northern genera and species, of Turdidæ, Troglo-dytidæ, Mniotiltidæ, Vireonidæ, Fringillidæ, Corvidæ, Tetra-onidæ, and Strigidæ, which are similarly restricted. Some of the most remarkable of the Neotropical genera only extend as far as Costa Rica and Veragua,—countries which possess a rich and remarkable fauna. Here only are found an umbrella bird, (Cephalopterus glabricollis); a bell bird (Chasmorhynchus tricar-unculatus); and species of Daenis (Cracidæ), Buthraupis, Eucometis, Tachyphonus (Tanagridæ), Xiphorhynchus (Dendro-colaptidæ); Hypoecemis (Formicariidæ); Euscarthmus (Tyrannidæ); Attila (Cotingidæ); Piprites (Pipridæ); Capito, Tetragonops (Megalaemidæ); Selenidera (Rhamphastidæ); Neomorphus
Cuculidae; Monasa (Bucconidae); many genera of Trochilidae; and Nothocercus (Tinamidae); none of which extend further north. A considerable number of the peculiar genera noted above, are also found in this restricted area, which is probably one of the richest ornithological districts on the globe.

Reptiles.—These are much less known than the preceding classes, but they afford several peculiar and interesting forms. Snakes are perhaps the least remarkable; yet there are recorded 4 peculiar genera of Calamariidae, 1 of Colubridae, 1 of Homalopsidae, 3 of Dipsadidae; while Boa and Elaps are in common with South America. Lizards are much more specially developed. Chirotres, one of the Amphisbaenians, is confined to Mexico and the southern part of the Nearctic region; Heloderma forming a peculiar family, Helodermidae, is Mexican only; Abronia and Barissia (Zonuridae) are also Mexican, as is Sidcrolampus belonging to the Scincidae, while Blepharactitis (same family) inhabits Nicaragua; Brachydactylus, one of the geckoes, is from Costa Rica; while Phymatolepis, Lamanctus, Corytholus, Cachrix, Corythophanes and Chamaleopsis, all belonging to the Iguanidae, are confined to various parts of the sub-region. In the same family we have also the Antillean, Cyclura, and the Nearctic Phrynosoma and Tropidolepis, as well as the wide-spread American genus Anolis.

Among the tortoises, Staurotypus, allied to Chelydra, is found in Mexico and Guatemala; and another genus, Claudius, has been lately described from Mexico.

Amphibia.—These are chiefly Batrachians; Rhinophryna (forming a peculiar family) being confined to Mexico; Triprion, a genus of Hylidae, inhabiting Yucatan, with Leyla and Strobomantis (Polypedatidae) found only in Costa Rica and Veragua, are peculiar genera. The Salamandridae, so abundant in the Nearctic region, are represented by a few species of Amblystoma and Speleorps.

Fresh-water fish.—Since the British Museum catalogue was published, a valuable paper by Dr. Günther, in the Transactions of the Zoological Society for 1868, furnishes much additional information on the fishes of Central America. In that part of the region south of Mexico, 106 species of fresh-water fishes are
enumerated; and 17 of these are found in streams flowing into both the Atlantic and Pacific Oceans. On the whole, 11 families are represented among the fresh-water fish, and about 38 genera. Of these, 14 are specially Nearctic,—*Amiurus* (Siluridæ); *Fundulus* (Cyprinodontidæ); *Sclerognathus* (Cyprinidæ); and *Lepidosteus* (Ganoidei). A much larger number are Neotropical; and several Neotropical genera, as *Heros* and *Pacilia*, are more largely developed here than in any other part of the region. There are also a considerable number of peculiar genera;—*Petenia*, *Theraps*, and *Neotrophus* (Chromidæ); *Ælurichthys* (Siluridæ); *Chalei-nopsis* (Characniidæ); *Characodon*, *Belonesox*, *Pseudoxiphophorus*, *Platypoecilus*, *Mollienesia*, and *Xiphophorus* (Cyprinodontidæ).

A few peculiar Antillean forms are also present; as *Agonostoma* (Mugilidæ); *Gambusia* and *Girardinus* (Cyprinodontidæ). The other families represented are Percidæ (1 genus); Pristopomatidæ (2 gen.); Gobiidæ (1 gen.); Clupeidæ (2 gen.); and Gymnotidæ (1 genus).

On the whole the fish-fauna is typically Neotropical, but with a small infusion of Nearctic forms. There are a considerable proportion of peculiar genera, and almost all the species are distinct from those of other countries. The predominant family is that of the Cyprinodontidæ, represented by 12 genera; and the genus *Heros* (Chromidæ) has here its maximum development, containing between thirty and forty species. Dr. Günther considers that a number of sub-faunas can be distinguished, corresponding to some extent, with the islands into which the country would be divided by a subsidence of about 2,000 feet. The most important of these divisions is that separating Honduras from Costa Rica, and as it also divides a very marked ornithological fauna we have every reason to believe that such a division must have existed during the latter portion of the tertiary epoch. We shall find some farther evidence of this division in the next class.

*Insects.*—The butterflies of various parts of Central America and Mexico, having been largely collected, offer us some valuable evidence as to the relations of this sub-region. Their general character is wholly Neotropical, about one half of the

Vol. II.—5
South American genera being found here. There are also a few peculiar genera, as, Drucina (Satyridæ); Microtia (Nymphalidæ); Eumæus (Lycænidæ); and Eucheira (Pieridæ). Clothilda (Nymphalidæ) is confined to this sub-region and the Antilles. The majority of the genera range over the whole sub-region from Panama to Mexico, but there are a considerable number, comprising many of the most characteristic South American forms, which do not pass north of Costa Rica or Nicaragua. Such are Lycorea, Ituna, Thyridia, Callithomia, Oleria and Ceratina, —all characteristic South American groups of Danaidæ; Pronophila and Dynastor (Satyridæ); Protagonius, Pycina, Prepona, Nica, Ectima and Colœnis (Nymphalidæ); Eurybia and Methonella (Nemeobiidæ); Hades, and Panthemos (Erycinidæ).

Coleoptera.—These present some interesting features, but owing to their vast number only a few of the more important families can be noticed.

Cicindelidæ.—The only specially Neotropical genera recorded as occurring in this sub-region, are Ctenostoma and Hiresia, both reaching Mexico.

Carabidæ.—Several genera are peculiar. Molobrus is found in all parts of the sub-region, while Onychopterygyia, Phymatocephalus, and Antisotarsus are Mexican only. There are about 20 South American genera, most of which extend to Mexico, and include such characteristic Neotropical forms as Agra, Callida, Coptodera, Pachyteles, Ardismus, Aspidoglossa, Stenocrepis, and Pelecium.

Lucanidæ.—Of this important family there is, strange to say, not a single species recorded in Gemminger and Harold’s catalogue up to 1868! It is almost impossible that they can be really absent; yet their place seems to be, to some extent, supplied by an unusual development of the allied Passalidæ, of which there are five South American and six peculiar genera.

Cetoniidæ.—All the larger South American genera extend to Mexico, which country possesses 3 peculiar forms, Ischnoscelis, Psilocenemis, and Dialithus; while Trigonopeltastes is characteristic, having 4 Mexican, 1 Brazilian, and 1 North American species.
Buprestidæ.—In this family there are no peculiar genera. All the large South American groups are absent, the only important and characteristic genus being *Stenogaster*.

Longicorns.—This important group is largely developed, the country being well adapted to them; and their distribution presents some features of interest.

In the Prionidæ there are 6 peculiar genera, the largest being *Holomotus* with 3 species; two others, *Derotrachus* and *Mallaspis*, are characteristic; 3 more are common to South America, and 1 to Cuba. The Cerambycidæ are much more numerous, and there are 24 peculiar genera, the most important being *Sphenotheceus*, *Entomosterna*, and *Cyphosterna*; while *Crioprosopus* and *Metaleptus* are characteristic of the sub-region, although extending into South America; about 12 Neotropical genera extend to Mexico or Guatemala, while 12 more stop short, as far as yet known, at Nicaragua. Lamiidæ have a very similar distribution; 13 genera are peculiar, the most important being *Monilema*, *Hamatoderus*, and *Carneades*, while *Phaxa* and *Lagoehirus* are characteristic. About sixteen typical Neotropical genera extend to Mexico, and 15 more only reach Nicaragua, among which are such important genera as *Anisopus*, *Lepturgus*, and *Callia*.

The land-shells are not sufficiently known to furnish any corresponding results. They are however mostly of South American genera, and have comparatively little affinity for those of the Antilles.

**Relations of the Mexican sub-region to the North and South American Continents.**—The sudden appearance of numerous South American forms of Edentata in temperate North America, in Post-Tertiary times, as narrated in Chapter VII., together with such facts as the occurrence of a considerable number of identical species of sea fish on the two sides of the Central American isthmus, render it almost certain that the union of North and South America is comparatively a recent occurrence, and that during the Miocene and Pliocene periods, they were separated by a wide arm of the sea. The low country of Nicaragua was probably the part submerged, leaving the highlands of Mexico and Guatemala still united with the North
American continent, and forming part of the Tertiary "Nearctic region." This is clearly indicated both by the many Nearctic forms which do not pass south of Nicaragua, of which the turkeys (*Meleagris*) are a striking example, and by the comparative poverty of this area in typical Neotropical groups. During the Miocene period there was not that marked diversity of climate between North and South America that now prevails; for when a luxuriant vegetation covered what are now the shores of the Arctic Ocean, the country south of the great lakes must have been almost or quite tropical. At an early Tertiary period, the zoological differences of the Nearctic and Neotropical regions were probably more radical than they are now, South America being a huge island, or group of islands—a kind of Australia of the New World, chiefly inhabited by the imperfectly organized Edentata; while North America abounded in Ungulata and Carnivora, and perhaps formed a part of the great Old World continent. There were also one or more very ancient unions (in Eocene or Miocene times) of the two continents, admitting of the entrance of the ancestral types of Quadrumana into South America, and, somewhat later, of the Camelidae; while the isthmus south of Nicaragua was at one time united to the southern continent, at another made insular by subsidence near Panama, and thus obtained that rich variety of Neotropical types that still characterises it. When the final union of the two continents took place, the tropical climate of the lower portions of Guatemala and Mexico would invite rapid immigration from the south; while some northern forms would extend their range into and beyond the newly elevated territory. The Mexican sub-region has therefore a composite character, and we must not endeavour too rigidly to determine its northern limits, nor claim as exclusively Neotropical, forms which are perhaps comparatively recent immigrants; and it would perhaps be a more accurate representation of the facts, if we were to consider all the highlands of Mexico and Guatemala above the limits of the tropical forests, as still belonging to the Nearctic region, of which the whole country so recently formed a part.

The long-continued separation of North and South America
by one or more arms of the sea, as above indicated, is further rendered necessary by the character of the molluscan fauna of the Pacific shores of tropical America, which is much more closely allied to that of the Caribbean sea, and even of West Africa, than to that of the Pacific islands. The families and many of the genera are the same, and a certain proportion of very closely allied or identical species, shows that the union of the two oceans continued into late Tertiary times. When the evidence of both land and sea animals support each other as they do here, the conclusions arrived at are almost as certain as if we had (as we no doubt some day shall have) geological proof of these successive subsidences.

Islands of the Mexican Sub-region.—The only islands of interest belonging to this sub-region, are Tres Marias and Socorro, recently investigated by Col. Grayson for some of the American Natural History societies.

Tres Marias consist of four small islands lying off the coast of north-western Mexico, about 70 miles from San Blas. The largest is about 15 miles long by 10 wide. They are of horizontally stratified deposits, of moderate height and flat-topped, and everywhere covered with luxuriant virgin forests. They appear to lie within the 100 fathom line of soundings. Fifty-two species of birds, of which 45 were land-birds, were collected on these islands. They consisted of 19 Passeres; 11 Picariæ (7 being humming-birds); 10 Accipitres; 2 parrots, and 3 pigeons. All were Mexican species except 4, which were new, and presumably peculiar to the islands, and one tolerably marked variety. The new species belong to the following genera;—Parula and Granatellus (Mniotiltidae); Icterus (Icteridae); and Amazilia (Trochilidae). A small Psittacula differs somewhat from the same species on the mainland.

There are a few mammalia on the islands; a rabbit (Lepus) supposed to be new; a very small opossum (Didelphys), and a racoon (Procyon). There are also several tree-snakes, a Boa, and many lizards. The occurrence of so many mammalia and snakes is a proof that these islands have been once joined to the mainland; but the fact that some of the species of both birds and
mammals are peculiar, indicates that the separation is not a very recent one. At the same time, as all the species are very closely allied to those of the opposite coasts when not identical, we may be sure that the subsidence which isolated them is not geologically remote.

Socorro, the largest of the Revillagigedo Islands, is altogether different from the Tres Marias. It is situated a little further south (19 S. Latitude), and about 300 miles from the coast, in deep water. It is about 2,000 feet high, very rugged and bare, and wholly volcanic. No mammalia were observed, and no reptiles but a small lizard, a new species of a genus (Uta) characteristic of the deserts of N.-Western Mexico. The only observed land-shell (Orthalicus undatus) also inhabits N.-W. Mexico. Only 14 species of birds were obtained, of which 9 were land-birds; but of these 4 were new species, one a peculiar variety, and another (Parula insularis) a species first found in the Tres Marias. With the exception of this bird and a Butco, all the land-birds belonged to different genera from any found on the Tres Marias, though all were Mexican forms. The peculiar species belonged to the genera Harporhynchus (Turdidae); Trog-loydies (Trogloidytae); Pipilo (Fringillidae); Zenaidura (Colom-bidae); and a variety of Conurus holochrous (Psittacidæ).

The absence of mammals and snakes, the large proportion of peculiar species, the wholly volcanic nature of these islands, and their situation in deep water 300 miles from land,—all indicate that they have not formed part of the continent, but have been raised in the ocean; and the close relation of their peculiar species to those living in N.-Western Mexico, renders it probable that their antiquity is not geologically great.

The Cocos Islands, about 300 miles S.-W. of the Isthmus of Panama, are known to possess one peculiar bird, a cuckoo of the Coccyzus type, which is considered by some ornithologists to constitute a peculiar genus, Nesococcyx.

IV. The West Indian Islands, or Antillean Sub-region.

The West Indian islands are, in many respects, one of the most interesting of zoological sub-regions. In position they
form an unbroken chain uniting North and South America, in a line parallel to the great Central American isthmus; yet instead of exhibiting an intermixture of the productions of Florida and Venezuela, they differ widely from both these countries, possessing in some groups a degree of speciality only to be found elsewhere in islands far removed from any continent. They consist of two very large islands, Cuba and Hayti; two of moderate size, Jamaica and Portorico; and a chain of much smaller islands, St. Croix, Anguilla, Barbuda, Antigua, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Barbadoes, and Grenada, with a host of intervening islets. Tobago, Trinidad, Margarita, and Curaçao, are situated in shallow water near the coast of South America, of which they form part zoologically. To the north of Cuba and Hayti are the Bahamas, an extensive group of coral reefs and islands, 700 miles long, and although very poor in animal life, belonging zoologically to the Antilles. All the larger islands, and most of the smaller ones (except those of coral formation) are very mountainous and rocky, the chains rising to about 8,000 feet in Hayti and Jamaica, and to nearly the same height in Cuba. All, except where they have been cleared by man, are covered with a luxuriant forest vegetation; the temperature is high and uniform; the rains ample; the soil, derived from granitic and limestone rocks, exceedingly fertile; and as the four larger islands together are larger than Great Britain, we might expect an ample and luxuriant fauna. The reverse is however the case; and there are probably no land areas on the globe, so highly favoured by nature in all the essentials for supporting animal life, and at the same time so poor in all the more highly organised groups of animals. Before entering upon our sketch of the main features of this peculiar but limited fauna, it will be well to note a few peculiarities in the physical structure of the islands, which have an important bearing on their past

1 This name will be used for the whole island of St. Domingo, as being both shorter and more euphonious, and avoiding all confusion with Dominica, one of the Lesser Antilles. It is also better known than "Hispaniola," which is perhaps the most correct name.
history, and will enable us to account for much that is peculiar in the general character of their natural productions.

If we draw a line immediately south of St. Croix and St. Bartholomew, we shall divide the Archipelago into two very different groups. The southern range of islands, or the Lesser Antilles, are, almost without exception, volcanic; beginning with the small detached volcanoes of Saba and St. Eustatius, and ending with the old volcano of Grenada. Barbuda and Antigua are low islands of Tertiary or recent formation, connected with the volcanic islands by a submerged bank at no great depth. The islands to the north and west are none of them volcanic; many are very large, and these have all a central nucleus of ancient or granitic rocks. We must also note, that the channels between these islands are not of excessive depth, and that their outlines, as well as the direction of their mountain ranges, point to a former union. Thus, the northern range of Hayti is continued westward in Cuba, and eastward in Portorico; while the south-western peninsula extends in a direct line towards Jamaica, the depth between them being 600 fathoms. Between Portorico and Hayti there is only 250 fathoms; while close to the south of all these islands the sea is enormously deep, from more than 1,000 fathoms south of Cuba and Jamaica, to 2,000 south of Hayti, and 2,600 fathoms near the south-east extremity of Portorico. The importance of the division here pointed out will be seen, when we state, that indigenous mammalia of peculiar genera are found on the western group of islands only; and it is on these that all the chief peculiarities of Antillian zoology are developed.

Mammalia.—The mammals of the West Indian Islands are exceedingly few, but very interesting. Almost all the orders most characteristic of South America are absent. There are no monkeys, no carnivora, no edentata. Besides bats, which are abundant, only two orders are represented; rodents, by peculiar forms of a South American family; and insectivora (an order entirely wanting in South America) by a genus belonging to a family largely developed in Madagascar and found nowhere else. The early voyagers mention "Coatis" and "Agoutis" as being
found in Hayti and the other large islands, and it is not improbable that species allied to *Nasua* and *Dasypus* did exist, and have been destroyed by the dogs of the invaders; though, on the other hand, these names may have been applied to the existing species, which do bear some general resemblance to these two forms.

The Chiroptera, or bats, are represented by a large number of species and by several peculiar genera. The American family of Phyllostomidae or vampires, has six genera in the Antilles, of which three, *Lonchorina, Brachyphylla*, and *Phyllonycteris*, are peculiar, the latter being found only in Cuba. The Vespertilionidae have four genera, of which one, *Nycticellus*, is confined to Cuba. There are six genera of Noctilionidae, of which one, *Phyllodia*, is confined to Jamaica.

The Insectivora are represented by the genus *Solenodon*, of which two species are known, one inhabiting Cuba the other Hayti. These are small animals about the size of a cat, with long shrew-like snout, bare rat-like tail, and long claws. Their peculiar dentition and other points of their anatomy shows that they belong to the family Centetidae, of which five different genera inhabit Madagascar; while there is nothing closely allied to them in any other part of the world but in these two islands.

Seals are said to be found on the shores of some of the islands, but they are very imperfectly known.

The rodents belong to the family Octodontidae, or, according to some authors, to the Echimyidae, both characteristic South American groups. They consist of two genera, *Capromys*, containing three or four species inhabiting Cuba and Jamaica; while *Plagiolontia* (very closely allied) is confined to Hayti. A peculiar mouse, a species of the American genus *Hesperomys*, is said to inhabit Hayti and Martinique, and probably other islands. A *Dasypus* or agouti, closely allied to, if not identical with, a South American species, inhabits St. Vincent, St. Lucia, and Grenada, and perhaps St. Thomas, and is the only mammal of any size indigenous to the Lesser Antilles. All the islands in which sugar is cultivated are, however, overrun with European rats and mice, and it is not improbable that these may have
starved out and exterminated some of the smaller native rodents.

**Birds.**—The birds of the Antilles, although very inferior in number and variety to those of the mainland, are yet sufficiently abundant and remarkable, to offer us good materials for elucidating the past history of the country, when aided by such indications as geology and physical geography can afford.

The total number of land-birds which are permanent residents in the West India islands is, as nearly as can be ascertained from existing materials, 203. There are, in addition to this number, according to Prof. Baird, 88 migrants from North America, which either spend the winter in some of the islands or pass on to Central or South America. These migrants belong to 55 genera, and it is an interesting fact that so many as 40 of these genera have no resident representatives in the islands. This is important, as showing that this northern migration is probably a recent and superficial phenomenon, and has not produced any (or a very slight) permanent effect on the fauna. The migratory genera which have permanent residents, and almost always representative species, in the islands, are in most cases characteristic rather of the Neotropical than of the Nearctic fauna, as the following list will show; *Turdus, Dendroæa, Vireo, Polioptila, Agelæus, Icterus, Contopus, Myiarchus, Tyrannus, Antrostomus, Chordeiles, Coccyzus, Columba.* By far the larger part of these birds visit Cuba only; 81 species being recorded as occurring in that island, while only 31 have been found in Jamaica, 12 in Porto Rico and St. Croix, and 2 in Tobago and Trinidad. Setting aside these migratory birds, as having no bearing on the origin of the true Antillean fauna, we will discuss the residents somewhat in detail.

The resident land-birds (203 in number) belong to 95 genera and 26 families. Of these families 15 are cosmopolitan or nearly so—Turdidæ, Sylviidæ, Corvidæ, Hirundinidæ, Fringillidæ, Picidæ, Cuculidæ, Caprimulgidæ, Cypselidæ, Trogonidæ, Psittacidæ, Columbidæ, Tetraonidæ, Falconidæ, and Strigidæ; 5 are American only—Vireonidæ, Mniotiltidæ, Icteridæ, Tyrannidæ, Trochilidæ; 4 are Netropical only or almost exclusively—
Coeerebidae, Tanagridae, Cotingidae, Conuridae; 1 is Antillean only—Todidae; while 1—Ampelidae—is confined (in the western hemisphere) to North America, and almost to the Nearctic region. Of the 95 genera, no less than 31, or almost exactly one-third, are peculiar; while of the 203 resident species, 177 are peculiar, the other 26 being all inhabitants of South or Central America. Considering how closely the islands approach the continent in several places—Florida, Yucatan, and Venezuela—this amount of speciality in such locomotive creatures as birds, is probably unexampled in any other part of the globe. The most interesting of these peculiar genera are the following: 4 of Turdidae, or thrushes—1 confined to the large islands, 1 to the whole archipelago, while 2 are limited to the Lesser Antilles; 2 genera of Tanagridae, confined to the larger islands; 2 of Trogonidae, also confined to the larger islands; 5 of humming-birds, 3 confined to the Greater, 1 to the Lesser Antilles; 2 of cuckoos, one represented in all the large islands, the other in Jamaica only; 2 of owls, one peculiar to Jamaica, the other represented in St. Croix, St. Thomas, Portorico, and Cuba; and lastly, Todus, constituting a peculiar family, and having representative species in each of the larger islands is especially interesting because it belongs to a group of families which are wholly Neotropical—the Momotidae, Galbulidae, and Todidae. The presence of this peculiar form, with 2 trogons 10 species of parrots, all but one peculiar; 16 peculiar humming-birds belonging to 8 genera; a genus of Cotingidae; 10 peculiar tanagers belonging to 3 genera; 9 Coerebidae of 3 genera; together with species of such exclusively Netropical genera as Coereba, Certhiola, Sycalis, Phonipara, Elainea, Pitangus, Campephilus, Chloroneras, Nectibius, Slenopsis, Lampornis, Calypte, Ara, Chrysotis, Zenaida, Leptoptila, and Geotrygon, sufficiently demonstrate the predominant affinities of this fauna; although there are many cases in which it is difficult to say, whether the ancestors of the peculiar genera or species may not have been derived from the Nearctic rather than from the Neotropical region.

The several islands differ considerably in their apparent pro-
ductiveness, but this is, no doubt, partly due to our knowledge of Cuba and Jamaica being much more complete than of Hayti. The species of resident land-birds at present known are as follows:—

<table>
<thead>
<tr>
<th>Island</th>
<th>Species</th>
<th>Peculiar Species</th>
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<tr>
<td>Cuba</td>
<td>68</td>
<td>40</td>
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<tr>
<td>Hayti</td>
<td>40</td>
<td>17</td>
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<tr>
<td>Jamaica</td>
<td>67</td>
<td>41</td>
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<tr>
<td>Portorico</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>Lesser Antilles</td>
<td>45</td>
<td>24</td>
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If we count the peculiar genera of each island, and reckon as (\(\frac{1}{2}\)) when a genus is common to two islands only, the numbers are as follows:—Cuba 7\(\frac{1}{2}\), Hayti 3\(\frac{1}{2}\), Jamaica 8\(\frac{1}{2}\), Portorico 1, Lesser Antilles 3\(\frac{1}{2}\). These figures show us, that although Jamaica is one of the smaller and the most isolated of the four chief islands, it yet stands in the first rank, both for the number of its species and of its peculiar forms of birds,—and although this superiority may be in part due to its having been more investigated, it is probably not wholly so, since Cuba has also been well explored. This fact indicates, that the West Indian islands have undergone great changes, and that they were not peopled by immigration from surrounding countries while in the condition we now see them; for in that case the smaller and more remote islands would be very much poorer, while Cuba, which is not only the largest, but nearest to the mainland in two directions, would be immensely richer, just as it really is in migratory birds.

The number of birds common to the four larger islands is very small—probably not more than half a dozen; between 20 and 30 are common to some two of the islands (counting the Lesser Antilles as one island) and a few to three; but the great mass of the species (at least 140) are confined each to some one of the five islands or groups we have indicated. This is an amount of isolation and speciality, probably not to be equalled elsewhere, and which must have required a remarkable series of physical changes to bring about. What those changes probably were, we shall be in a better position to consider when we have completed our survey of the various classes of land animals.
A SCENE IN CUBA, WITH CHARACTERISTIC ANIMALS.
In the preceding enumeration the Bahamas have been included with Cuba, as regards the birds they have in common; but they possess some half dozen species not found elsewhere, and even one central American genus of humming-birds (Doricha) not found in any other part of the Antilles. We have thus given Cuba rather more peculiar species than it really possesses, so that the proportionate richness of Jamaica is rather greater than shown by our figures.

The destruction of the forests and the increase of population, with, perhaps, the use of firearms, seem to have led to the extermination of some species of birds in the smaller islands. Professor Newton has called attention to the work of M. Ledru, who, in 1796, described the birds of St. Thomas. He mentions a parrot and a parroquet in the island, the latter only being now known, and very scarce; also a green pigeon and a tody, both now unknown. No less than six species of parrots are said to have been formerly found in Guadeloupe and Martinique, which are now extinct.

Plate XVII. Illustrating the peculiar Mammalia and Birds of the Antilles.—The scene of this illustration is Cuba, the largest of the West Indian islands, and one in which all its peculiar zoological features are well developed. In the foreground is the agouta (Solenodon cubanus), a remarkable insectivorous animal which, with another species inhabiting Hayti, has no allies on the American continent; nor anywhere in the world but in Madagascar, where a group of animals are found constituting the family Centetidae, to which Solenodon is said undoubtedly to belong. Above it are a pair of hutias (Capromys fournieri), rat-like animals belonging to the South American family Octodontidae. They live in the forests, and climb trees readily, eating all kinds of vegetable food. Three species of the genus are known, which are found only in Cuba and Jamaica. Just above these animals is a white-breasted trogon (Prionoteles temnurus), confined to Cuba, and the only species of the genus. Near the top of the picture are a pair of todies (Todus multicolor), singular little insectivorous birds allied to the motmots, but forming a very distinct family which is confined to the islands of the
Greater Antilles. They are beautifully-coloured birds,—green above, red and white beneath, and are exceedingly active in their movements. To the right are a pair of small humming-birds (*Sporadinus ricordi*), not very remarkable in this beautiful family, but introduced here because they belong to a genus which is confined to the Greater Antilles.

**Table of distribution of West-Indian Birds.**—As the birds of the West-Indian islands are particularly interesting and their peculiarities comparatively little known, we give here a table of the genera of land-birds, compiled from all available sources of information. Owing to the numerous independent observations on which it is founded, the discrepancies of nomenclature, and uncertainty in some cases as to the locality of species, it can only be looked upon as an approximative summary of the existing materials on Antillean ornithology.

**Table of the resident land-birds of the Antilles.**

*Note.*—Genera confined to the West Indies are in Italics. An (a) after (1) indicates a species common to two islands; but where there are two or more species in an island, or the localities are doubtful, this indication cannot be given. All species not otherwise noted are peculiar to the Antilles.

<table>
<thead>
<tr>
<th>Family and Genus</th>
<th>Number of Species in each Island</th>
<th>Remarks</th>
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<tbody>
<tr>
<td><strong>Turdidae.</strong></td>
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<tr>
<td>Turdus</td>
<td>Cuba, 1, 1, 1, 1</td>
<td>Five species migrate to Cuba</td>
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<tr>
<td><em>Mimocichla</em></td>
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<td><em>Rhamphocinclus</em></td>
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<td><em>Cinclerhynia</em></td>
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<td>Minus</td>
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| **Sylvidae.**   |                                  |         |
| Myiastes         |                                 |         |
| Polioptila       |                                 |         |
### The Neotropical Region

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<tr>
<th>Family and Genus</th>
<th>Number of Species in each Island</th>
<th>Remarks</th>
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<tr>
<td><strong>VIREONIDÆ.</strong></td>
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<td>Vireo</td>
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<tr>
<td>Laetes</td>
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**Totals**

- Number of families of resident land-birds in the Antilles: 26
- Genera: 95
- Species: 203

**Vol. II.**—6
Reptiles and Amphibia.—These classes not having been systematically collected, and the numerous described genera not having undergone careful revision, little trustworthy information can be derived from them. The following enumeration of the chief groups hitherto noticed or described, will, however, show very similar features to those presented by the birds—a general relation to Neotropical forms, a more special relation to those of Central America and Mexico, and a considerable number of peculiar types.

Snakes.—Arrhyton (Calamariidæ) from Cuba, Hypsirhynchus from Barbadoes, Cryptodacus from Cuba, Ialtris from Hayti, and Coloragia from Cuba (all Colubridæ), have been described as genera peculiar to the Antilles. Phylodryas and Dromicus (Colubridæ) are Antillean and Neotropical; Ahaetulla (Dendrophidæ) has the same distribution but extends to tropical Africa; Epierates and Corallus (Pythonidæ) are Neotropical and Antillean; while Chilabothrus from Jamaica and Ungulia from Cuba and Jamaica (both Pythonidæ) are found elsewhere only in Central America and Mexico. There appear to be no Crotalidæ except an introduced species of Craspedocephalus in St. Lucia.

Lizards are more numerous. Ameiva (Teidæ) is found all over America. Gerrhonotus (Zonuridæ) is Neotropical and occurs in Cuba; Gymnophthalmus is South American and Antillean. Of Scincidæ seven genera are noted. Celestes (with 9 species) is peculiar to the Antilles; Camilia (1 species) to Jamaica, Panoplus (1 species) and Embryopus (1 species) to Hayti; Diplogossus is Antillean and South American; while Plsetiodon and Mabouya are cosmopolite. Of Geckotidæ there are four genera; Phyllodactylus and Hemidactylus which are cosmopolite; Sphærodactylus which is wholly American; and Cubina found only in Martinique and Brazil. Of Iguanidæ there are six genera; Anolis, which ranges all over America; Polychrus, which is Neotropical; Iguana and Liocephalus which are South American; Tropederus found in Cuba and Brazil; and Cyclura only known from Jamaica, Cuba, and Central America.

Amphibia.—The genus Trachycephalus, belonging to the
Hylidæ or tropical tree-frogs, is almost peculiar to the Antilles; Cuba, Hayti, and Jamaica possessing seven species, while only one is recorded from South America. Other genera are, Peltaphryne (Bufonidæ) from Portorico; Phyllobates (Polypedatidæ) from Cuba; Leiuperus (Ranidæ) from Hayti,—all Neotropical. Of the Urodela, or tailed batrachians, no representative occurs, although they are so characteristic a feature of the Nearctic region.

Fresh-water fish.—The same general remarks apply to these as to the reptiles. Only one peculiar genus is noted—Lebistes, a form of Cyprinodontidæ from Barbadoes; other genera of the same family being, Haplochilus, Rivulus, and Girardinus, widely spread in the Neotropical region; while Gambusia is confined to Central America, Mexico, and the Antilles. Four other families are represented; Siluridæ by Chætostomus, found in Portorico and South America; Chromidæ by the South American Aæara; Mugillidæ by the Central American Agonostoma; and Percidæ by the North American Centrarchus, of which a species is recorded from Cuba.

Insects.—The various West Indian islands have not been well explored entomologically; one reason no doubt being, that their comparative poverty renders them little attractive to the professional collector, while the abounding riches of Central and South America lie so near at hand. We can, therefore, hardly tell whether the comparative poverty, or even total absence of some families while others seem fairly represented, is a real phenomenon of distribution, or only dependent on imperfect knowledge. Bearing this in mind, we proceed to give a sketch of what is known of the chief groups of Lepidoptera and Coleoptera.

Lepidoptera.—The Neotropical butterfly-fauna is but poorly represented, the majority of the most remarkable types being entirely wanting; yet there are a few peculiar and very characteristic forms which show great isolation, while the majority of the species are peculiar. Four genera are exclusively or characteristically Antillean,—Calisto belonging to the Satyridæ, with four species, of which one ranges to South Carolina; Clothilda
(Nymphalidae) a fine genus which has 4 Antillean species and 2 in Central America; Lucinia (Nymphalidae) 2 species, confined to Jamaica and Hayti; and Kricogonia belonging to the Pieridae, which has 2 West Indian species, while 1 inhabits Mexico and Florida. Genera which show a special relation to Central America are Euptoieta, Eumceits, and Nathalis. Almost all the other genera are South American, the total number recorded in each family as occurring in the West Indian islands, being, 3 of Danaidae; 1 of Heliconiidae; 2 of Satyridae; 18 of Nymphalidae; 1 of Erycinidae; 4 of Lycaenidae; 6 of Pieridae; 1 of Papilio-nidæ, and 10 of Hesperidae. The genus Papilio is represented by about 20 species, 2 of which are North American, 4 South American, while the rest form little characteristic groups allied to those of Central America. The most marked feature seems to be the scarcity of Satyridae and the almost total absence of Erycinidae, with a great deficiency in characteristic Neotropical forms of Danaidae and Nymphalidae.

Coleoptera.—Cicindelidae and Carabidae are very poorly represented, by a few species of wide-spread groups, and hardly any peculiar genera. No Lucanidae are recorded. Of Cetoniidae, Gymnetis only appears to be represented. Buprestidae seem to be more numerous; 15 genera being recorded, but almost all of wide distribution. One only is peculiar—Tetragonoschoma, found in Hayti; Halecia is the only exclusively South American genus; Chalcophora is widely scattered over the tropical regions but is absent from South America, yet it occurs in the Nearctic region and extends to Jamaica and Guadeloupe. We now come to the Longicorns, the only group of Coleoptera which seems to be well represented, or which has been carefully collected. No less than 40 genera are known from the West Indian islands, and 15 of these are peculiar. Prionidae are proportionately very numerous, there being 10 genera, 2 of which are widely distributed in both South and North America, 1 is North American, and 1 South American, while the following are peculiar,—Stenodontes (Hayti and Cuba); Dendroblaptus (Cuba); Monodesmus (Cuba and Jamaica); Prosternodes (Cuba); Solenoptera and Elateropsis, the two largest genera found in most of the
islands. Of Cerambycidae there are 16 genera, 2 of which range all over America, 4 are Neotropical, 1 South American only, while the following are confined to the islands.—Merostenus, Pentomacrus, and Eburiola (Jamaica); Bromiades (Cubá); Trichrous, Heterops, and Paeiloderma (Antilles). One genus, Smodicum, is widely spread, having a species in Carolina, 1 in South America, 1 in Hayti, and 1 in West Africa. Of Lamiiidae there are 14 genera, 8 of which are Neotropical, 1 common to Central America and Mexico, 1 to the United States and Cuba, while 2, Proecha and Phidola, are confined to Cuba. Several of the genera are curiously distributed;—Spalacopsis is South American, with 4 species in Cuba and Tropical Africa; Lagocheirus is Neotropical, with a species in Australia; while Leptostilus is characteristic of the Antilles and North America, with a few species in South America, and one in New Zealand. These cases of erratic distribution, so opposed to the general series of phenomena among which they occur, must be held to be sufficiently explained by the great antiquity of these groups and their former wide distribution. They may be supposed to be the remnants of types, now dying out, which were once, like Callichroma, Clytus, and many others, almost universally distributed.

All the peculiar Antillean genera of Cerambycidae and Lamiiidae are allied to Neotropical forms. The peculiar Prionidae, however, are mostly allied to Mexican and North American groups, and one, Monodesmus, belongs to a group all the other genera of which inhabit the East Indies and South Africa.

Land-shells.—This subject has already been generally treated under the Region, of which, in this class of animals, the Antilles form so important a part. We must therefore now confine ourselves mainly to the internal distribution of the genera, and to a few remarks on the general bearing of the facts.

The excessive and altogether unexampled productiveness of the West Indian islands in land-shells, may be traced to two main sets of causes. The first and least known, consist of the peculiar influences and conditions which render islands always more productive than continents. Whatever these conditions
are, they will be more effective where the islands have been long separated from the mainland, as is here undoubtedly the case. It seems most probable that the great development of land-shells in islands, is due to the absence or deficiency of the vertebrata, which on continents supply a variety of species adapted to prey upon these molluses. This view is supported by the fact, that in such islands as have been united to a continent at no very distant epoch, and still maintain a continental variety of vertebrata, no such special development of land-shells has taken place. If we compare the Philippine islands with the Sunda group, we find the development of vertebrata and land-mollusces in inverse ratio to each other. The same thing occurs if we compare New Zealand and Tasmania; and we have a still more striking example in the Antillean group itself, continental Trinidad having only 20 genera and 38 species, while the highly insular Jamaica has about 30 genera and more than 500 species.

The other causes favourable to the increase and development of land-shells are of a physical nature. A great extent of limestone-rock is one; and in the larger West Indian islands we have a considerable proportion of the surface consisting of this rock. But perhaps equally or more important, is the character of the land surface, and the texture of the exposed rock itself. A much broken surface, with numerous deep ravines, cutting up the whole country into isolated valleys and ridges, seems very favourable to the specialization of forms in this very sedentary class of animals. Equally favourable is a honeycombed and highly-fissured rock-surface, affording everywhere cracks and crannies for concealment. Now, taking Jamaica as an example of the archipelago, we find all these conditions in a wonderful degree. Over a large part of this island, a yard of level ground can hardly be found; but ridges, precipices, ravines, and rock-bound valleys, succeed each other over the whole country. At least five-sixths of the entire surface is limestone, and under the influence of tropical rains this rock is worn, fissured, and honey-combed, so as to afford ample shelter and concealment for land-shells.
It is probable that the three chief islands, Cuba, Jamaica and Hayti, are nearly equally rich in land-shells; but the last is very much less known, and therefore, perhaps, appears to be much poorer. Cuba has rather more species than Jamaica; but while the former has only 1 peculiar genus (*Diplopoma*), the latter has 3 (*Geomelania*, *Chittya*, and *Jamaicaea*), as well as two others only represented in the other islands by single species. From Hayti, only about one-third as many species are known as from the two former islands. It has no peculiar genera, but it has some forms in common with Cuba and others with Jamaica, which show that those islands have more connection with it, than with each other; just as we found to be the case in birds. Portorico and the Virgin islands have still fewer species than Hayti; and, as many of the genera common to the other three islands are wanting, there is, no doubt, here a real deficiency. In the islands farther south (Barbuda to Martinique) more Antillean genera disappear or become very rare, while some continental forms take their place. The islands from St. Lucia to Trinidad have a still more continental character; the genus *Bulimus*, so largely developed on the continent, only reaching St. Lucia. The Bahamas contain about 80 species of land-shells, of which 25 are Antillean, the rest peculiar; all the genera being Antillean. The affinity is chiefly with Hayti and Cuba, but closest with the latter island.

In the West Indian islands as a whole, there are 11 peculiar genera; 9 operculate (*Geomelania*, *Chittya*, *Jamaicaea*, *Licina*, *Choanopoma*, *Clenopoma*, *Diplopoma*, *Stoastoma*, *Lucidella*); and 2 inoperculate (*Sagda* and *Stenopus*), besides *Cyclostomus*, which belongs to the Old World and is not found on the American continent. Mr. Bland considers, that many of the Antillean land-shells exhibit decided African and Asiatic, rather than South American affinities. A species of the Asiatic genus *Diplommatina* has been found in Trinidad, and an Indian species of *Ennea* occurs in Grenada and St. Thomas; a clear indication that land-shells are liable to be accidentally imported, and to become established in the less productive islands.

Although these islands are so wonderfully rich even now,
there is good reason to believe that many species have become extinct since the European occupation of them. When small islands are much cultivated, many of these molluscs which can only live under the shade of forests, are soon extirpated. In St. Croix many species have become extinct at a comparatively recent period, from the burning of forests; and as we know that in all the islands many of the species are excessively local, being often confined to single valleys or ridges, we may be sure that wherever the native forests have disappeared before the hand of man, numbers of land-shells have disappeared with them. As some of the smaller islands have been almost denuded of their wood, and in the larger ones extensive tracts have been cleared for sugar cultivation, a very considerable number of species have almost certainly been exterminated.

General Conclusions as to the Past History of the West Indian Islands.—The preceding sketch of the peculiarities of the animal life of these islands, enables us to state, that it represents the remains of an ancient fauna of decided Neotropical type, having on the whole most resemblance to that which now inhabits the Mexican sub-region. The number of peculiar genera in all classes of animals is so great in proportion to those in common with the adjacent mainland, as to lead us to conclude that, subsequent to the original separation from the Mexican area, a very large tract of land existed, calculated to support a rich and varied fauna, and, by the interaction of competing types, give rise to peculiar and specially modified organisms. We have already shown that the outline of the present islands and the depths of the surrounding seas, give indications of the position and extent of this ancient land; which not improbably occupied the space enclosed by uniting Western Cuba with Yucatan, and Jamaica with the Mosquito Coast. This land must have stretched eastward to include Anguilla, and probably northward to include the whole of the Bahamas. At one time it perhaps extended southward so as to unite Hayti with northern Venezuela, while Panama and Costa Rica were sunk beneath the Pacific. At this time the Lesser Antilles had no existence.

The only large island of whose geology we have any detailed
account, is Jamaica; and taking this as a type of what will probably be found in Cuba and Hayti, we must place the continental period as having occurred after the close of the Miocene, or during some part of the Pliocene epoch, since a large portion of the surface of the former island consists of beds of marine limestone from 2,000 to 3,000 thick, believed to be of Pliocene age. After some time, the land between Hayti and South America subsided, and still later that between Central America and Cuba with Jamaica; but a large tract of land remained insulated, and no doubt supported a very much richer and more varied fauna than now. We have evidence of this in extinct Mammalia of large size, belonging to the peculiar South American family of the chinchillas, which have been found in caves in the small islands of Anguilla, and which, from the character of the land-shells associated with them, are believed to be of Pliocene or Post-pliocene age. This discovery is most interesting, and gives promise of very valuable results from the exploration of the numerous caverns that undoubtedly exist in the abundant limestone strata of the larger islands. This extensive Antillean land, after long continuing undivided, was at length broken up by subsidence into several islands; but as this alone would not account for the almost complete annihilation of the mammalian fauna, it seems probable that the subsidence was continued much farther, so as greatly to reduce the size and increase the number of the islands. This is indicated, by the extensive alluvial plains in Cuba and Hayti, and to a less extent in Jamaica; and by elevated beds of Post-pliocene marls in the latter island.

The series of changes now suggested, will account for all the main features of the Antillean fauna in its relations to that of the American continent. There remains the affinity with Madagascar, indicated by Solenodon, and a few cases of African and Asiatic affinity in insects and land-shells; but these are far too scanty to call for any attempt at special explanation. Such cases of remote affinity and discontinuous distribution, occur in all the regions, and in almost every group of animals; and we look upon them almost all, as cases of survival, under favourable
conditions, of once wide-spread groups. If no wild species of the genus *Equus* were now to be found, except in South Africa (where they are still most abundant), and in South Temperate America, where their fossil remains show us they did exist not very long ago, what a strong fact it would have appeared for the advocates of continental extensions! Yet it would have been due to no former union of the great southern continents, but to the former extensive range of the family or the genus to which the two isolated remnants belonged. And if such an explanation will apply to the higher vertebrata, it is still more likely to be applicable to similar cases occurring among insects or mollusca, the genera of which we have every reason to believe to be usually much older than those of vertebrates. It is in these classes that examples of widely scattered allied species most frequently occur; and the facility with which they are diffused under favourable conditions, renders any other explanation than that here given altogether superfluous.

The *Solenodon* is a member of an order of Mammalia of low type (Insectivora) once very extensive and wide-spread, but which has begun to die out, and which has left a number of curious and isolated forms thinly scattered over three-fourths of the globe. The occurrence, therefore, of an isolated remnant of this order in the Antilles is not in itself remarkable; and the fact that the remainder of the family to which the Antillean species belong has found a refuge in Madagascar, where it has developed into several distinct types, does not afford the least shred of argument on which to found a supposed independent land connection between these two sets of islands.

*Summary of the Past History of the Neotropical Region.*

We have already discussed this subject, both in our account of extinct animals, and in various parts of the present chapter. It is therefore only necessary here, briefly to review and summarise the conclusions we have arrived at.

The whole character of Neotropical zoology, whether as regards its deficiencies or its specialities, points to a long continuance of isolation from the rest of the world, with a few very distant
periods of union with the northern continent. The latest important separation took place by the submergence of parts of Nicaragua and Honduras, and this separation probably continued throughout much of the Miocene and Pliocene periods; but some time previous to the coming on of the glacial epoch, the union between the two continents took place which has continued to our day. Earlier submergences of the isthmus of Panama probably occurred, isolating Costa Rica and Veragua, which then may have had a greater extension, and have thus been able to develope their rich and peculiar fauna.

The isthmus of Tehuantepec, at the south of Mexico, may, probably, also have been submerged; thus isolating Guatemala and Yucatan, and leading to the specialization of some of the peculiar forms that now characterise those countries and Mexico.

The West Indian Islands have been long isolated and have varied much in extent. Originally, they probably formed part of Central America, and may have been united with Yucatan and Honduras in one extensive tropical land. But their separation from the continent took place at a remote period, and they have since been broken up into numerous islands, which have probably undergone much submergence in recent times. This has led to that poverty of the higher forms of life, combined with the remarkable speciality, which now characterises them; while their fauna still preserves a sufficient resemblance to that of Central America to indicate its origin.

The great continent of South America, as far as we can judge from the remarkable characteristics of its fauna and the vast depths of the oceans east and west of it, has not during Tertiary, and probably not even during Secondary times, been united with any other continent, except through the intervention of North America. During some part of the Secondary epoch it probably received the ancestral forms of its Edentates and Rodents, at a time when these were among the highest types of Mammalia on the globe. It appears to have remained long isolated, and to have already greatly developed these groups of animals, before it received, in early Tertiary times, the ancestors of its marmosets and monkeys, and, perhaps also, some of its peculiar forms of
Carnivora. Later, it received its Camelidae, peccaries, mastodons, and large Carnivora; and later still, just before the Glacial epoch, its deer, tapir, opossums, antelopes, and horses, the two latter having since become extinct. All this time its surface was undergoing important physical changes. What its earlier condition was we cannot conjecture, but there are clear indications that it has been broken up into at least three large masses, and probably a number of smaller ones; and these have no doubt undergone successive elevations and subsidences, so as at one time to reduce their area and separate them still more widely from each other, and at another period to unite them into continental masses. The richness and varied development of the old fauna of South America, as still existing, proves, however, that the country has always maintained an extensive area; and there is reason to believe that the last great change has been a long continued and steady increase of its surface, resulting in the formation of the vast alluvial plains of the Amazon, Orinoko, and La Plata, and thus greatly favouring the production of that wealth of specific forms, which distinguishes South America above all other parts of our globe.

The southern temperate portion of the continent, has probably had a considerable southward extension in late Tertiary times; and this, as well as the comparatively recent elevation of the Andes, has given rise to some degree of intermixture of two distinct faunas, with that proper to South Temperate America itself. The most important of these, is the considerable Australian element that appears in the insects, and even in the reptiles and fresh-water fishes, of South Temperate America. These may be traced to several causes. Icebergs and icefloses, and even solid fields of ice, may, during the Glacial epoch, have afforded many opportunities for the passage of the more cold-enduring groups; while the greater extension of southern lands and islands during the warm periods—which there is reason to believe prevailed in the southern as well as in the northern regions in Miocene times—would afford facilities for the passage of the reptiles and insects of more temperate zones. That no actual land-connection occurred, is proved by the total absence
of interchange of the mammals or land-birds of the two countries, no less than by the very fragmentary nature of the resemblances that do exist. The northern element consists almost wholly of insects; and is evidently due to the migration of arctic and north temperate forms along the ridges and plateaus of the Andes; and most likely occurred when these organisms were driven southward at successive cold or Glacial periods.

A curious parallel exists between the past history and actual zoological condition of South America and Africa. In both we see a very ancient land-area extending into the South Temperate zone, isolated at a very early period, and developing only a low grade of Mammalian life; chiefly Edentates and Rodents on the one, Lemurs and Insectivora in the other. Later we find an irruption into both of higher forms, including Quadrumana, which soon acquired a large and special development in the tropical portions of each country. Still later we have an irruption into both of northern forms, which spread widely over the two regions, and having become extinct in the land from whence they came, have been long held to be the original denizens of their adopted country. Such are the various forms of antelopes, the giraffe, the elephant, rhinoceros, and lion in Africa; while in America we have deer and peccaries, the tapir, opossums, and the puma.

On the whole, we cannot but consider that the broad outlines of the zoological history of the Neotropical region can be traced with some degree of certainty; but, owing to the absence of information as to the most important of the geological periods—the Miocene and Eocene—we have no clue to the character of its early fauna, or to the land connections with other countries, which may possibly have occurred in early Tertiary times.
TABLES OF DISTRIBUTION.

In drawing up these tables, showing the distribution of the various classes of animals in the Neotropical region, the following sources of information have been relied on, in addition to the general treatises, monographs, and catalogues used in the compilation of the Fourth Part of this work.

_Mammalia._—D'Orbigny, and Burmeister, for Brazil and La Plata; Darwin, and Cunningham, for Temperate S. America; Tschudi, for Peru; Frazer, for Ecuador; Salvin, for Guatemala; Frantzius, for Costa Rica; Selater, for Quadrumana N. of Panama; Gundlach, for Cuba; and papers by Dr. J. E. Gray, and Mr. Tomes.

_Birds._—Selater and Salvin's Nomenclator; Notes by Darwin, and Cunningham; Gundlach, March, Bryant, Baird, Elliot, Newton, Semper, and Sundevall, for various islands of the Antilles; and papers by Hudson, Lawrence, Grayson, Abbott, Selater, and Salvin.
TABLE I.

FAMILIES OF ANIMALS INHABITING THE NEOTROPICAL REGION.

Explanation.
Names in italics show the families which are peculiar to the region.
Names enclosed thus (...) indicate families which barely enter the region, and are not considered properly to belong to it.
Numbers correspond with those of the series of families in Part IV.

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**VOL. II.—7**
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<td>17. Pythonidae</td>
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<td>32. Teidae</td>
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<table>
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<td>Mexico</td>
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<tr>
<td>Antilles</td>
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</tbody>
</table>

- Cosmopolitan
- Ethiopian
- Oriental, N.-W. America
- All warm countries
- Oriental, Japan
- Almost cosmopolitan
- All the regions
- All tropical regions
- Oriental, Ethiopian
- All tropical regions
- Philippine Islands
- Oriental
- All tropical regions, California
- Tropical regions, Japan, S. Carolina
- Oriental, Australian, Madagascar
- Nearctic, Palearctic, Oriental
- Missouri
- Ethiopian, S. Palearctic
- Ethiopian
- Nearctic
- Nearctic, Ethiopian, S. Europe, and N. India
- Australian, Ethiopian, Palearctic
- Almost cosmopolitan
- Almost cosmopolitan
- Nearctic
- Ethiopian, Oriental, N. Australian
- Nearctic
- Ethiopian
- Nearctic
- Ethiopian
- Nearctic
- Oriental
- Ethiopian
- Nearctic
- Palearctic
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- Oriental
- Australian
- Ethiopian
- Palearctic
- Nearctic
- Oriental
- Australian
## THE NEOTROPICAL REGION.

<table>
<thead>
<tr>
<th>Order and Family</th>
<th>Su-regions</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td><strong>CHELONIA.</strong></td>
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<tr>
<td>57. Testudinidae ...</td>
<td>- - -</td>
<td>All continents but Australian, Ethiopian, Australian, Marine</td>
</tr>
<tr>
<td>58. Chelydidae ...</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>60. Cheloniidae ...</td>
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<table>
<thead>
<tr>
<th>AMPHIBIA. PSEUDOPHIDIA.</th>
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<tbody>
<tr>
<td>1. Ceciliidae ...</td>
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<td>Oriental, Ethiopian</td>
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<table>
<thead>
<tr>
<th>URODELA.</th>
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<tr>
<td>6. (Salamandridae) ...</td>
<td>- - -</td>
<td>Nearctic, Palaearctic</td>
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</table>

<table>
<thead>
<tr>
<th>ANOURA.</th>
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</thead>
<tbody>
<tr>
<td>7. Rhinophrynidae ...</td>
<td>- - -</td>
<td>Ethiopian, Australian, Java</td>
</tr>
<tr>
<td>8. Phrynosidae ...</td>
<td>- - -</td>
<td>All continents but Australia</td>
</tr>
<tr>
<td>9. Hylaplesidae ...</td>
<td>- - -</td>
<td>All regions but Palaearctic, Palaearctic, New Zealand</td>
</tr>
<tr>
<td>10. Bufonidae ...</td>
<td>- - -</td>
<td>All regions but Oriental, Australia</td>
</tr>
<tr>
<td>12. Engystomidae ...</td>
<td>- - -</td>
<td>All regions but Ethiopian, All the regions</td>
</tr>
<tr>
<td>13. Bombinatoridae ...</td>
<td>- - -</td>
<td>Almost cosmopolite, All regions but Nearctic</td>
</tr>
<tr>
<td>14. Plectroanantiidae ...</td>
<td>- - -</td>
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</tr>
<tr>
<td>15. Alytidae ...</td>
<td>- - -</td>
<td>Ethiopian, Oriental</td>
</tr>
<tr>
<td>16. Pelodyraeidae ...</td>
<td>- - -</td>
<td>All regions but Australian, Polish, Russian, Oriental</td>
</tr>
<tr>
<td>17. Hylidae ...</td>
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<td>All regions but Australian, Ethiopian, Oriental</td>
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<tr>
<td>18. Polypedatididae ...</td>
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<td>19. Ranidae ...</td>
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<td>All regions but Nearctic, Australian, Ethiopian, Oriental</td>
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<td>20. Discoglossidae ...</td>
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<td>All regions but Nearctic, Oriental</td>
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<td>21. Pipidae ...</td>
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<table>
<thead>
<tr>
<th>FISHES. (FRESHWATER). ACANTHOPTERYGI.</th>
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<tbody>
<tr>
<td>3. Percidae ...</td>
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<td>All regions but Australian, Australian, Oriental</td>
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<td>11. (Trachinidae) ...</td>
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<td>All regions but Australian, Ethiopian, Brazilian, Oriental</td>
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<tr>
<td>12. Scenidae ... (†)</td>
<td>- - (†)</td>
<td>Ethiopian, Oriental</td>
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<td>33. Nandidae ...</td>
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<td>Australian, Ethiopian</td>
</tr>
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<td>34. Polycentridae ...</td>
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<td>Ethiopian, Oriental</td>
</tr>
<tr>
<td>38. Mugillidae ... (†)</td>
<td>- - (†)</td>
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<td>52. Chromidae ...</td>
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<td>All warm regions</td>
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<th>PHYSOSTOMI.</th>
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<tr>
<td>59. Siluridae ...</td>
<td>- - -</td>
<td>All tropical regions, Ethiopian, S. Australia, S. New Zealand</td>
</tr>
<tr>
<td>60. Characidae ...</td>
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<td>Absent from Australia</td>
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<td>61. Haplochitonidae</td>
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<tr>
<td>67. Galaxida ...</td>
<td>- - -</td>
<td>S. Australian, Tasmania and New Zealand</td>
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<tr>
<td>73. Cyprinodontidae ...</td>
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<td>Oriental, Australian, Marine</td>
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<td>78. Osteoglossidae ...</td>
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<td>All tropical regions, Oriental, Australian, Marine</td>
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<tr>
<td>84. Gymnotidae ...</td>
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<td>85. Symbranchiidae ...</td>
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### ZOOLOGICAL GEOGRAPHY.

#### [PART III.]

<table>
<thead>
<tr>
<th>Order and Family</th>
<th>Sub-regions</th>
<th>Range beyond the Region</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Chil.</td>
<td>Brazil</td>
</tr>
<tr>
<td><strong>Echidna</strong></td>
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</table>

#### Dipnoi.

92. Sirenidae

<table>
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<th>Family</th>
<th>Sub-regions</th>
<th>Range beyond the Region</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Chil.</td>
<td>Brazil</td>
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#### Plagiostomata.

112. Trygonidae

<table>
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<th>Family</th>
<th>Sub-regions</th>
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<tr>
<td></td>
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#### Insects.

#### Lepidoptera (Part).

**Diurni**

*Butterflies.*

<table>
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<th>Sub-regions</th>
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<tr>
<td>1. Danaidae</td>
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<td>3. Morphidae</td>
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<td>6. Aedeidae</td>
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<td>7. Heliconidae</td>
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<td>9. Lycaenidae</td>
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<td>10. Nemeobiidae</td>
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<td>12. Eryciminae</td>
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<td>13. Lycenidae</td>
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<td>16. Hesperidae</td>
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#### Sphingidea.

<table>
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<td>18. Castniidae</td>
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<td>19. Uranidae</td>
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<td>21. Stygiidae</td>
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<tr>
<td>23. Sphingidae</td>
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</tbody>
</table>
Table II.

**Genera of terrestrial Mammalia and birds inhabiting the Neotropical Region.**

**Explanation.**

Names in *italics* show the genera peculiar to the region.
Names enclosed thus (*...*) indicate genera which barely enter the region, and are not considered properly to belong to it.
Genera undoubtedly belonging to the region are numbered consecutively.

**Mammalia.**

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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</thead>
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<td><strong>Primates.</strong></td>
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<tr>
<td>Cebidae</td>
<td></td>
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</tr>
<tr>
<td>1. <em>Cebus</em> ...</td>
<td>18</td>
<td>Costa Rica to Paraguay</td>
<td></td>
</tr>
<tr>
<td>2. <em>Lagothrix</em> ...</td>
<td>5</td>
<td>Upper Amazon and E. Andes</td>
<td></td>
</tr>
<tr>
<td>3. <em>Eriolestes</em> ...</td>
<td>3</td>
<td>East Brazil, S. of Equator</td>
<td></td>
</tr>
<tr>
<td>4. <em>Ateles</em> ...</td>
<td>14</td>
<td>Almost all tropical America</td>
<td></td>
</tr>
<tr>
<td>5. <em>Mycetes</em> ...</td>
<td>10</td>
<td>E. Guatemala to Paraguay</td>
<td></td>
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<tr>
<td>6. <em>Pithecia</em> ...</td>
<td>7</td>
<td>Equatorial Forests</td>
<td></td>
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<tr>
<td>7. <em>Brachiurus</em> ...</td>
<td>5</td>
<td>Equatorial Forests</td>
<td></td>
</tr>
<tr>
<td>8. <em>Nyctipithecus</em> ...</td>
<td>5</td>
<td>Nicaragua to Amazonia</td>
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<tr>
<td>9. <em>Saimiri</em> ...</td>
<td>3</td>
<td>Costa Rica to Brazil and Bolivia</td>
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<tr>
<td>10. <em>Callithrix</em> ...</td>
<td>11</td>
<td>Panama to Paraguay</td>
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<tr>
<td><strong>Hapalidae.</strong></td>
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</tr>
<tr>
<td>11. <em>Hapale</em> ...</td>
<td>9</td>
<td>Brazil and Upper Amazon</td>
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</tr>
<tr>
<td>12. <em>Midas</em> ...</td>
<td>24</td>
<td>Equatorial America to Panama</td>
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</tr>
<tr>
<td><strong>Chiroptera.</strong></td>
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<tr>
<td>Phyllostomidae.</td>
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<tr>
<td>13. <em>Lonchorina</em> ...</td>
<td>1</td>
<td>West Indian Islands</td>
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<tr>
<td>14. <em>Macrophylax</em> ...</td>
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<td>Brazil</td>
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<td>15. <em>Vampyrus</em></td>
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</tr>
<tr>
<td>16. <em>Lophistomia</em> ...</td>
<td>25</td>
<td>Tropical America and Chili</td>
<td>California</td>
</tr>
<tr>
<td>17. <em>Phyllostoma</em> ...</td>
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<td>18. <em>Macrotus</em> ...</td>
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<td>20. <em>Brachyphylla</em> ...</td>
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<td>21. <em>Glossophaga</em> ...</td>
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<td>22. <em>Phyllonycteris</em></td>
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<td>23. <em>Artibeus</em> ...</td>
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<td>25. <em>Sturnira</em> ...</td>
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<td>26. <em>Desmodus</em> ...</td>
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<td>Neare., Austral., Oriens.</td>
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<td>Neare., India, Tropical</td>
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<td>Africa</td>
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<td>32. Vespertilio...</td>
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<td>Ethiopian, Oriental, Austro-Malayan</td>
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<td>35. Furipterus...</td>
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<td>36. Thyropus...</td>
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<td>38. Taphozous...</td>
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<td>2</td>
<td>Paraguay to W. Indies</td>
<td>S. Neare., Oriens, Madag.</td>
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<td>41. Mormops...</td>
<td>1</td>
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<td>Ethiopian, S. Palæarct.,Australian</td>
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<td>La Plata to Antilles &amp; Costa Rica</td>
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<td>46. Molossus...</td>
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<td>All regions but Austral.</td>
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<td>2</td>
<td>Mexico to Costa Rica</td>
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<td>51. Lycalopex...</td>
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<td>52. Pseudalopex...</td>
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<td>S. America, Falkland Islands, &amp;</td>
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<td>53. Thous...</td>
<td>2</td>
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<td>All other reg. but Austrl.</td>
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<td>55. Galictis...</td>
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<td>S. America to Chili &amp; Patagonia</td>
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<td>56. Lontra...</td>
<td>3</td>
<td>Central and S. America to Chonos</td>
<td>Archipelago</td>
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<td>57. Nutria...</td>
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<td>W. coast of N. America</td>
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<td>58. <em>Pteronura</em></td>
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<td>Nearctic to Canada</td>
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<td>California and Texas</td>
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<td>Mexico and Guatemala</td>
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<td>New Zealand</td>
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<td>Falkland Islands &amp; Cape Horn</td>
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<td>New Zealand</td>
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<td>68. <em>Lobodon</em></td>
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<td>S. Australia</td>
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<td>California, S. temp. zone</td>
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<td>73. <em>Inia</em></td>
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<td>Gulf of Mexico to N. Brazil, Amazon R.</td>
<td>W. Africa</td>
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<td>UNGULATA.</td>
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<td>75. <em>Tapirus</em></td>
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<td>Indo-Malaya</td>
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<td>76. <em>Elastomorphus</em></td>
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<td>Panama to Guatemala</td>
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<td>SUIDÆ.</td>
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<td>77. <em>Dicotyles</em></td>
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<td>Mexico to Paraguay</td>
<td>Texas</td>
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<td>78. <em>Auchenia</em></td>
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<td>RODENTIA.</td>
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<td>MURIDÆ.</td>
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<td>80. <em>Reithron</em></td>
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<td>South Temp. America to Tierra del Fuego</td>
<td>United States</td>
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<td><em>Acodon</em> ...</td>
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<td>Peru, 14,000 ft. elevation</td>
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<td><em>Myxomys</em> ...</td>
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<td><em>Hesperomys</em> ...</td>
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<td>The whole region</td>
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<td><em>Holochilus</em> ...</td>
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<td><em>Oxymycterus</em> ...</td>
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<td>Brazil and La Plata</td>
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<td><em>Drymomys</em> ...</td>
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<td>Peru</td>
<td></td>
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<tr>
<td><em>Neotomys</em> ...</td>
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<td>S. America</td>
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<tr>
<td>(Fiber ...</td>
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<td>Mexico</td>
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**SACCOMYIDÆ.**

88. *Heteromys* ... 6 Mexico, Honduras, Costa Rica & Trinidad

**SCIRIDÆ.**

89. *Sciurus* ... 30 Mexico to Paraguay

**CHINCHILLIDÆ.**

90. *Chinchilla* ... 2 Andes of Chili and Peru

91. *Lagidiium* ... 3 Chili to E. of Panama (11,000 to 16,000 ft.)

92. *Lagostomus* ... 1 Uruguay to Rio Negro of Patagonia

**OCTODONTIDÆ.**

93. *Habrocomus* ... 2 Chili

94. *Capsomys* ... 3 Cuba and Jamaica

95. *Plagiodontia* ... 1 Hayti

96. *Spatalacopus* ... 2 Chili and E. of Andes

97. *Octodon* ... 3 Chili, Peru, and Bolivia

98. *Ctenomys* ... 6 S. Brazil to Tierra del Fuego

**ECHIMYIDÆ.**

99. *Dactylonys* ... 2 Guiana and Brazil

100. *Cercochyta* ... 1 Central Brazil

101. *Lasiomys* ... 1 St. Paul, Brazil

102. *Myopotamus* ... 1 S. half of tropical S. America

103. *Carterodon* ... 1 Central Brazil

104. *Mesoonyx* ... 1 Upper Amazon

105. *Echimys* ... 11 Equatorial America to Paraguay

106. *Loncheres* ... 10 New Granada to Brazil

**CERCOLABIDÆ.**

107. *Cercolabes* ... 12 Mexico to Paraguay

108. *Chactomys* ... 1 N. Brazil

**CAVILIDÆ.**

109. *Dasyprocta* ... 9 Paraguay to Mexico and Lesser Antilles

110. *Cologomys* ... 2 Guatemala to Paraguay

111. *Hydrochcerus* ... 1 Guiana to La Plata

112. *Cavia* ... 9 Brazil and Peru to Magellan Sts.

113. *Kerodon* ... 6 Brazil and Peru to Magellan Sts.

114. *Dolichotis* ... 1 The Pampas and Patagonia
<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<td>Leporidae</td>
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<td>115. Lepus ...</td>
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<td>Central Brazil and Andes, Costa Rica to Mexico</td>
<td>All regions but Austral.</td>
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<td>Costa Rica to Brazil</td>
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<td>117. Bradypus</td>
<td>2</td>
<td>Amazon to Rio de Janeiro</td>
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<td>118. Arctopithecus ...</td>
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<td>Costa Rica to Brazil and Bolivia</td>
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<td>Dasyopodidae</td>
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<td>Rio Grande, Texas, to Patagonia</td>
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<td>120. Primodontes ...</td>
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<td>Surinam to Paraguay</td>
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<td>Brazil to Chili and La Plata, Costa Rica?</td>
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<td>122. Xenopus</td>
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<td>Guiana to Paraguay, Costa Rica?</td>
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<td>123. Tolypeutes ...</td>
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<td>Bolivia and La Plata</td>
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<td>124. Chlamydophorus</td>
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<td>La Plata and Bolivia</td>
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<td>125. Myrmecophaga</td>
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<td>Costa Rica?, &amp; N. B raz., to Parag.</td>
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<td>126. Tamandua</td>
<td>2</td>
<td>Guatemala to Paraguay</td>
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<td>127. Cyclothirus ...</td>
<td>2</td>
<td>Honduras and Costa Rica to Paraguay</td>
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<td>Marsupialia</td>
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<td>Didelphidae</td>
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<td>128. Didelphys</td>
<td>20</td>
<td>Mexico to Uruguay and S. Chili</td>
<td>Temperate N. America</td>
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<td>129. Chironectes ...</td>
<td>1</td>
<td>Guiana and Brazil, Costa Rica</td>
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<td>130. Hyracodon</td>
<td>1</td>
<td>Ecuador</td>
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</tbody>
</table>

**BIRDS.**

| Turdidæ                  |               |                         | Almost cosmopolite     |
| 1. Turdus ...            | 32            | The whole reg. to Tierra del Fuego |                         |
| 2. Rhotiocichla          | 1             | Mexico to Venezuela     |                         |
| 3. Melanotula            | 1             | Honduras                |                         |
| 4. Catharus ...          | 10            | Mexico to Ecuador and Columbia |                         |
| 5. Margarops             | 4             | Hayti and Lesser Antilles |                         |
| 6. Mimus ...             | 16            | Nearly the whole region | Nearctic               |
| 7. Melanotis ...         | 2             | Mexico and Guatemala    |                         |
| 8. Galeoscoptes          | 1             | Mexico to Panama        | Nearctic               |
| 9. Miniochilis (Harprhynchus) | 4       | Cuba to Porto Rico      | Nearctic genus         |
| 10. Cinclocerithia       | 3             | Lesser Antilles         |                         |
| 11. Ramphocinclis        | 1             | Martinique and St. Lucia |                         |

**Sylvidæ**

<p>| 12. Myiadeses            | 8             | Mexico and Antilles to Peru and Bolivia | N. &amp; W. of N. America |</p>
<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>13. Cichlopsis ...</td>
<td>1 Brazil</td>
<td></td>
<td>United States &amp; Canada</td>
</tr>
<tr>
<td>(Sialis ...</td>
<td>2 Mexico and Guatemala)</td>
<td>Nearctic, Palearctic</td>
<td></td>
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<td>14. Regulus ...</td>
<td>2 Mexico and Guatemala</td>
<td>Cen. and S. U. States</td>
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<td>15. Polioptila ...</td>
<td>6 Mexico and Cuba to Bolivia and La Plata</td>
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<td><strong>CINCLOIDE.</strong></td>
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<td></td>
<td>Nearctic, Palearctic</td>
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<td>16. Cinclus ...</td>
<td>4 Mexico to Venezuela and Peru</td>
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### THE NEOTROPICAL REGION.

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<td>138. Saltator</td>
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<td>139. Diucozis</td>
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<td>140. Orchestius</td>
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<td>141. Pitlyus</td>
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**FRINGILLIDAE.**

<p>| 142. Chrysonitis        | 12            | Mexico to Brazil, Chili and Patagonia | Nearctic, Palearctic |
| 143. Sycalis            | 9             | Mexico to Chili and La Plata, Jamaica |                          |
| 144. Cocothraustes      | 2             | Mexico and Guatemala        | Nearctic, Palearctic    |
| 145. Geospiza           | 7             | Galapagos Islands           |                          |
| 146. Camorhynchus       | 5             | Galapagos Islands           |                          |
| 147. Coctornis          | 4             | Galapagos Islands           |                          |
| 148. Phrygilis          | 10            | Columbia to Fuegia and Falkland Islands |                          |
| 149. Xoeospingus        | 1             | Peru                     |                          |
| 150. Diuca              | 3             | Peru, Chili, and Patagonia  |                          |
| 151. Emberizoides       | 3             | Venezuela to Paraguay      |                          |
| 152. Donospisza         | 1             | S. Brazil and La Plata     |                          |
| 153. Chamospisza        | 1             | Mexico                   |                          |
| 154. Emberagnra         | 9             | Mexico to La Plata         |                          |
| 155. Hovenphila         | 6             | Mexico to Costa Rica      |                          |
| 156. Atlapetes          | 1             | Mexico                   |                          |
| 157. Pyrgisoma          | 5             | Mexico to Costa Rica      | Rocky Mountains          |
| 158. Pipilo             | 4             | Mexico and Guatemala      | All Nearctic region      |
| 159. Juneo              | 2             | Mexico and Guatemala      | United States            |
| 160. Zonotrichia        | 5             | Mexico to Straits of Magellan | Nearctic genus        |
| (Melospiza)             | 2             | Mexico and Guatemala      | Nearctic genus           |
| (Spizella)              | 3             | Mexico and Guatemala      | Nearctic genus           |
| (Passerculus)           | 1             | Mexico and Guatemala      | Nearctic genus           |
| (Pococetes)             | 1             | Mexico                    | Nearctic genus           |
| 161. Ammodramus         | 1             | Guatemala                 | E. &amp; N. of N. America    |
| 162. Coturnicus         | 4             | Mexico to Bolivia, Jamaica | S. E. States &amp; California |
| 163. Puecea             | 4             | Mexico                   |                          |
| 164. Tiaris             | 1             | Brazil                   |                          |
| 165. Volatinia          | 1             | Mexico to Brazil          |                          |</p>
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<th>Order, Family, and Genus</th>
<th>No. of Species</th>
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<th>Range beyond the Region</th>
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<td>S. &amp; S. Cent. U. States</td>
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<td>Southern U. States</td>
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<td>171. Poospiza ...</td>
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<td>172. Spodiornis ...</td>
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<td>North temperate genus</td>
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<td>Arizona and Texas</td>
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### The Neotropical Region

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<td>Eastern United States</td>
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**Pipridae.**

| 258. Piprites ...        | 4             | Costa Rica to Brazil    |                         |
| 259. Masius ...          | 2             | Columbia and Ecuador    |                         |
| 260. Chloropipo          | 1             | Columbia                 |                         |
| 261. Xenopipo            | 1             | Guiana and Colombia     |                         |
| 262. Pipra ...           | 19            | Trop. N. and S. America |                         |
| 263. Necipo ...          | 1             | Upper Amazon            |                         |
| 264. Macaeropeterus ...  | 4             | Columbia to Brazil      |                         |
| 265. Riciura             | 1             | Brazil                  |                         |
| 266. Chirozephia ...     | 5             | Guatemala to Brazil     |                         |
| 267. Metopria            | 1             | Brazil                  |                         |
| 268. Metopothrix         | 1             | Upper Amazon            |                         |
| 269. Chironacheris ...   | 6             | Mexico to Ecuador and Brazil |                         |
| 270. Heteropelma ...     | 10            | Mexico to Guiana and Brazil |                         |
| 271. Heterocercus ...    | 2             | Guiana and Upper Amazon |                         |
| 272. Schiffornis ...     | 2             | Upper Amazon and Brazil |                         |

**Cotingidae.**

| 273. Tityra ...          | 6             | Tropical N. and S. America |                         |
| 274. Hadrostomus ...     | 5             | Mexico to W. Ecuador & Brazil, Jamaica |                         |
| 275. Pachyhamphus        | 11            | Mexico to W. Ecuador & Brazil |                         |
| 276. Lathria ...         | 5             | Mexico to Brazil         |                         |
| 277. Aulia ...           | 3             | Veraguas to Brazil       |                         |
| 278. Lipaugus            | 3             | Guatemala to Brazil and Guiana |                         |
| 279. Ptibhloris ...      | 2             | Brazil                  |                         |
| 280. Attila ...          | 8             | Costa Rica to Brazil and Guiana |                         |
| 281. Castorina ...       | 2             | S. Brazil to Paraguay   |                         |
| 282. Ripicola            | 3             | Guiana to W. Ecuador & Bolivia |                         |
| 283. Phaniceucus ...     | 2             | Guiana and Amazonia     |                         |
| 284. Tijuca ...          | 1             | Brazil                  |                         |
| 285. Phalabora           | 1             | Brazil                  |                         |
| 286. Pippola ...         | 7             | Venezuela to Ecuador and Peru |                         |
| 287. Ampelio ...         | 4             | Columbia to Peru and Brazil |                         |
| 288. Carpodoctes ...     | 1             | Nicaragua and Costa Rica |                         |
| 289. Heliochera          | 2             | Columbia to Peru and Bolivia |                         |
| 290. Cottaga ...         | 6             | Guatemala to Peru and Brazil |                         |
| 291. Xipholena ...       | 3             | Guiana to Brazil        |                         |
| 292. Iodopleura ...      | 3             | Guiana to Brazil        |                         |
| 293. Calyptura ...       | 1             | Brazil                  |                         |
| 294. Querula ...         | 1             | Panama to Amazonia      |                         |
### THE NEOTROPICAL REGION.

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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**Vol. II.—8**
## Order, Family, and Genus

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<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>Number of Species</th>
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### Formicariidae

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### Pterooptichide

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### Order, Family, and Genus.

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### THE NEOTROPICAL REGION.

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The Eastern Hemisphere
Almost cosmopolite
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Note: The range information is speculative and based on the assumption that the text represents a list of species and their distribution areas within and beyond specific regions.
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</tr>
<tr>
<td><strong>576. Sinaragdocrysis</strong></td>
<td>1</td>
<td>Brazil</td>
<td></td>
</tr>
</tbody>
</table>

### PSITTACI.

**CONURIDE.**

| **577. Ara...**         | 15             | Trop. North and South America, Cuba, Jamaica (extinct) | |
| **578. Rhynchositta**   | 1              | Mexico                   |                         |
| **579. Henicognathus**  | 1              | Chili                    |                         |
| **580. Conurus...**     | 30             | The whole region         |                         |
| **581. Pyrrhura**       | 16             | Costa Rica to Paraguay & Bolivia | |
| **582. Bolborhynchus**  | 7              | Mexico to Peru, Central Brazil, and La Plata | |
| **583. Brotochrysys**   | 9              | Trop. North and South America | |

### PSITTACIDAE.

| **584. Cavia**          | 9              | Mexico to Amazonia       |                         |
| **585. Chrysotis**      | 32             | All the tropical sub-regions |                         |
| **586. Tridarrius**     | 1              | Brazil                   |                         |
| **587. Deroptyus**      | 1              | Guiana and Rio Negro    |                         |
| **588. Pionus**         | 9              | Costa Rica to Bolivia and Brazil | |
| **589. Urochroma**      | 7              | Venezuela to Brazil      |                         |
| **590. Psittaculus**    | 6              | Mexico to W. Ecuador & Brazil | |

### COLUMBIA.

| **591. Columba**        | 18             | Trop. sub-regions with Chili and La Plata |                         |
| **592. Zenaidera**      | 2              | Mexico to Veragua         |                         |
| **593. Chamepelea**     | 6              | Mexico to Brazil and Bolivia |                         |
| **594. Columbula**      | 2              | Brazil and La Plata to Chili |                         |
| **595. Scaredailla**    | 2              | Guatemala and Brazil      |                         |
| **596. Zenaidea**       | 10             | Antilles and S. America to Chili and La Plata |                         |

**S. & S.E. United States**

**All regions but Austral**

**Nearctic**

**S. Nearctic**
<table>
<thead>
<tr>
<th>Order</th>
<th>Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
</tr>
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<tbody>
<tr>
<td>597.</td>
<td>Melopelia</td>
<td>2</td>
<td>Mexico to Chili</td>
<td>South &amp; West Nearctic</td>
</tr>
<tr>
<td>598.</td>
<td>Peristera</td>
<td>4</td>
<td>Mexico to Brazil</td>
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<tr>
<td>599.</td>
<td>Metriopelia</td>
<td>2</td>
<td>W. America from Ecuador to Chili</td>
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<tr>
<td>600.</td>
<td>Gymnopelia</td>
<td>1</td>
<td>West Peru and Bolivia</td>
<td></td>
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<tr>
<td>601.</td>
<td>Leptoptylia</td>
<td>11</td>
<td>Tropical sub-regions</td>
<td></td>
</tr>
<tr>
<td>602.</td>
<td>Geotrygon</td>
<td>14</td>
<td>Tropical sub-regions</td>
<td></td>
</tr>
<tr>
<td>603.</td>
<td>Starnanas</td>
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<td>Cuba</td>
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**GALLINAE.**

**TETRAONIDAE.**

<table>
<thead>
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<tbody>
<tr>
<td>604.</td>
<td>Odontophorus</td>
<td>17</td>
<td>Trop. North and South America</td>
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</tr>
<tr>
<td>605.</td>
<td>Dendrocytis</td>
<td>3</td>
<td>Mexico to Costa Rica</td>
<td>California</td>
</tr>
<tr>
<td>606.</td>
<td>Cytonyx</td>
<td>3</td>
<td>Mexico to Guatemala</td>
<td>S. Central United States</td>
</tr>
<tr>
<td>607.</td>
<td>Ortyx</td>
<td>5</td>
<td>Mexico to Costa Rica, Cuba</td>
<td>Neartic to Canada</td>
</tr>
<tr>
<td>608.</td>
<td>Euphychotryx      (Callipepla)</td>
<td>5</td>
<td>Mexico to Columbia and Guiana</td>
<td>California</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order</th>
<th>Family, and Genus</th>
<th>No. of Species</th>
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<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>609.</td>
<td>Meleagris</td>
<td>2</td>
<td>Mexico and Honduras</td>
<td>Nearctic</td>
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**CRACIDAE.**

<table>
<thead>
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<th>Order</th>
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<tbody>
<tr>
<td>610.</td>
<td>Crax</td>
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<td>Mexico to Venezuela &amp; S. Brazil</td>
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<tr>
<td>611.</td>
<td>Nothocerax</td>
<td>1</td>
<td>Guiana and Upper Amazon</td>
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<tr>
<td>612.</td>
<td>Pauxi</td>
<td>1</td>
<td>Guiana and Venezuela</td>
<td></td>
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<tr>
<td>613.</td>
<td>Mitua</td>
<td>2</td>
<td>Guiana to Peru</td>
<td></td>
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<tr>
<td>614.</td>
<td>Stegnoloma</td>
<td>1</td>
<td>Columbia and Ecuador</td>
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<td>615.</td>
<td>Penelope</td>
<td>13</td>
<td>Trop. North and South America</td>
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<tr>
<td>616.</td>
<td>Penelopeina</td>
<td>1</td>
<td>Guatemala</td>
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<tr>
<td>617.</td>
<td>Ripile</td>
<td>3</td>
<td>Venezuela to Brazil and Peru</td>
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<tr>
<td>618.</td>
<td>Aburria</td>
<td>1</td>
<td>Colombia</td>
<td></td>
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<tr>
<td>619.</td>
<td>Chanaspeotes</td>
<td>2</td>
<td>Costa Rica to Peru</td>
<td>New Mexico</td>
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<tr>
<td>620.</td>
<td>Ortalida</td>
<td>18</td>
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<td>621.</td>
<td>Oreophasis</td>
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<td>Guatemala</td>
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**TINAMIDAE.**

<table>
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<th>Range within the Region</th>
<th>Range beyond the Region</th>
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</thead>
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<tr>
<td>622.</td>
<td>Tinamus</td>
<td>7</td>
<td>Trop. North and South America</td>
<td></td>
</tr>
<tr>
<td>623.</td>
<td>Nothocerucus</td>
<td>3</td>
<td>Costa Rica to Venezuela &amp; Ecuador</td>
<td></td>
</tr>
<tr>
<td>624.</td>
<td>Crypturus</td>
<td>16</td>
<td>Trop. North and South America</td>
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</tr>
<tr>
<td>625.</td>
<td>Rhynchotus</td>
<td>2</td>
<td>Brazil to Bolivia and La Plata</td>
<td></td>
</tr>
<tr>
<td>626.</td>
<td>Nothropodota</td>
<td>4</td>
<td>Ecuador to Bolivia and Chili</td>
<td></td>
</tr>
<tr>
<td>627.</td>
<td>Nothura</td>
<td>4</td>
<td>Brazil to Bolivia and La Plata</td>
<td></td>
</tr>
<tr>
<td>628.</td>
<td>Tuoniscus</td>
<td>1</td>
<td>Brazil and Paraguay</td>
<td></td>
</tr>
<tr>
<td>629.</td>
<td>Calodromus</td>
<td>1</td>
<td>La Plata</td>
<td></td>
</tr>
<tr>
<td>630.</td>
<td>Tinamotis</td>
<td>1</td>
<td>Andes of Peru and Bolivia</td>
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**OPISTHOCOMI.**

**OPISTHOCOMIDAE.**

<table>
<thead>
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<th>Family, and Genus</th>
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<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<td>631.</td>
<td>Opisthocomus</td>
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<td>Guiana and Lower Amazon</td>
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</table>
### CHAP. XIV.

#### THE NEOTROPICAL REGION.

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td><strong>ACCIPTERES</strong></td>
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<tr>
<td><strong>Vulturideæ.</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Cathartineæ.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>632. <em>Sarcorhamphus</em></td>
<td>2</td>
<td>The Andes and S. of 41° S. Lat.</td>
<td></td>
</tr>
<tr>
<td>633. <em>Cathartes</em></td>
<td>1</td>
<td>Mexico to 20° S. Lat.</td>
<td></td>
</tr>
<tr>
<td>634. <em>Catharista</em></td>
<td>1</td>
<td>Mexico to 40° S. Lat.</td>
<td>S. United States United States</td>
</tr>
<tr>
<td>635. <em>Pseudogryphus</em></td>
<td>3</td>
<td>Mexico to Falkland Isds., Cuba, Jamaica</td>
<td></td>
</tr>
<tr>
<td><strong>FALCONIDE.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>636. <em>Polyborus</em></td>
<td>2</td>
<td>The whole region</td>
<td>California and Florida</td>
</tr>
<tr>
<td>637. <em>Ibycter</em></td>
<td>8</td>
<td>Guatemala to Terra del Fuego</td>
<td>Almost cosmopolite</td>
</tr>
<tr>
<td>638. <em>Circus</em></td>
<td>3</td>
<td>Nearly the whole region</td>
<td></td>
</tr>
<tr>
<td>639. <em>Micrastur</em></td>
<td>7</td>
<td>Trop. North and South America</td>
<td>California and Texas</td>
</tr>
<tr>
<td>640. <em>Geranospiza</em></td>
<td>2</td>
<td>Trop. North and South America</td>
<td>Almost cosmopolite</td>
</tr>
<tr>
<td>641. <em>Antenor</em></td>
<td>2</td>
<td>Mexico to Chili and La Plata</td>
<td>Almost cosmopolite</td>
</tr>
<tr>
<td>642. <em>Astur</em></td>
<td>2</td>
<td>Trop. N. and S. America</td>
<td></td>
</tr>
<tr>
<td>643. <em>Accipiter</em></td>
<td>9</td>
<td>The whole region</td>
<td>California</td>
</tr>
<tr>
<td>644. <em>Heterospiza</em></td>
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<td>Trop. S. America, E. of Andes</td>
<td>Almost cosmopolite</td>
</tr>
<tr>
<td>645. <em>Tachyriorchis</em></td>
<td>2</td>
<td>Mexico to Paraguay</td>
<td>California</td>
</tr>
<tr>
<td>646. <em>Buteo</em></td>
<td>9</td>
<td>Mexico to Patagonia</td>
<td>Almost cosmopolite</td>
</tr>
<tr>
<td>647. <em>Buteola</em></td>
<td>1</td>
<td>Veragua to Amazonia</td>
<td>S.E. United States</td>
</tr>
<tr>
<td>648. <em>Astorina</em></td>
<td>7</td>
<td>Mexico to Bolivia and La Plata</td>
<td></td>
</tr>
<tr>
<td>649. <em>Busarellus</em></td>
<td>1</td>
<td>Brazil and Guiana</td>
<td></td>
</tr>
<tr>
<td>650. <em>Butogallus</em></td>
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<td>Columbia and Guiana</td>
<td></td>
</tr>
<tr>
<td>651. <em>Urubitinga</em></td>
<td>12</td>
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<tr>
<td>652. <em>Harpaliæus</em></td>
<td>1</td>
<td>Veragua to Chili &amp; N. Patagonia</td>
<td></td>
</tr>
<tr>
<td>653. <em>Morphus</em></td>
<td>1</td>
<td>Panama to Amazonia</td>
<td>Indo-Malaya</td>
</tr>
<tr>
<td>654. <em>Thraestus</em></td>
<td>1</td>
<td>Mexico to Bolivia and Paraguay</td>
<td>Africa, India, Malaya</td>
</tr>
<tr>
<td>655. <em>Lophotriorchis</em></td>
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<td>Bogota</td>
<td>S. United States</td>
</tr>
<tr>
<td>656. <em>Spizaæerus</em></td>
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<td>Guatemala to Brazil</td>
<td>Florida</td>
</tr>
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<td>657. <em>Spizaææus</em></td>
<td>4</td>
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<td>658. <em>Herpetotheres</em></td>
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<td>S. Mexico to Bolivia &amp; Paraguay</td>
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<td>659. <em>Naucerus</em></td>
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<td>Mexico to Brazil</td>
<td></td>
</tr>
<tr>
<td>660. <em>Rostrhamus</em></td>
<td>3</td>
<td>Antilles to Brazil and Peru</td>
<td></td>
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<td>661. <em>Leptodon</em></td>
<td>4</td>
<td>Central America to S. Brazil and Bolivia</td>
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</tr>
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<td><strong>Pandionide.</strong></td>
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<td>662. <em>Elanus</em></td>
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<td>663. <em>Campecyon</em></td>
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<td>665. <em>Ictinæa</em></td>
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<td>666. <em>Spizææteræx</em></td>
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<td>667. <em>Falco</em></td>
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<td>South United States</td>
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<tr>
<td>668. <em>Cerchneis</em></td>
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<td><strong>Strigide.</strong></td>
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<td>Cosmopolite</td>
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<tr>
<td>672. <em>Phoeboteæx</em></td>
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<tr>
<td>673. <em>Bubo</em></td>
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<td>N.W. America &amp; Texas</td>
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<tr>
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<td>Order, Family, and Genus</td>
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<td>Range within the Region</td>
<td>Range beyond the Region</td>
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<td>674. Scops ...</td>
<td>6</td>
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<td>675. Gymnoglaux ...</td>
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<td>676. Lophostrix ...</td>
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<td>Guatemala to Lower Amazon</td>
<td>All regions but Austral.</td>
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<tr>
<td>677. Syrmium ...</td>
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<td>Mexico to Patagonia</td>
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<td>678. Cicaba ...</td>
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<td>679. Nyctalisminus ...</td>
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<td>680. Pulsatrix ...</td>
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<td>681. Asio ...</td>
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<td>All regions but Austral.</td>
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<tr>
<td>682. Nyctalops ...</td>
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<td>Cuba and Mexico to Brazil</td>
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<td>683. Pseudoscops ...</td>
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<td>Jamaica</td>
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<td>Mexico</td>
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<tr>
<td>684. Strix ...</td>
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</tbody>
</table>

**Peculiar or very Characteristic Genera of Wading and Swimming Birds.**

**GRALLÆ.**

**RALLIDÆ.**

- Aramides ... 23 The whole region
- Heliorris ... 1 Tropical America

**SCOLOPACIDÆ.**

- Eureunetes ... 3 The whole region

**CHIONIIDÆ.**

- Chionis ... 2 Sts. of Magellan, Falkland Ids.
- Kerguelen's Island

**THINOCRIDE.**

- Attagis ... 4 Andes to Fuegia and Falkland Islands
- Thinocoris ... 2 Peru, Chili, and La Plata

**CHARADRIDE.**

- Phegornis ... 1 Temperate S. America
- Oreoophilus ... 1 Temperate S. America
- Pluvianellus ... 1 Temperate S. America
- Aphriza ... 1 W. coast of S. America
- W. coast of N. America

**CARIAMIDE.**

- Cariana ... 2 S. Brazil and La Plata

**ARAMIDE.**

- Aramus ... 5 Mexico and Cuba to Brazil

**PSPHIIDÆ.**

- Psophia ... 6 Equatorial S. America

**EUPYGYIDÆ.**

- Eupypyga ... 2 Tropical America
<table>
<thead>
<tr>
<th>Order, Family, and Genus.</th>
<th>No. of</th>
<th>Range within the Region.</th>
<th>Range beyond the Region.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ARDEIDÆ.</strong></td>
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<td>Tigrisoma ...</td>
<td>3</td>
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<tr>
<td>Cancroma ...</td>
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<td>Tropical S. America</td>
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<td><strong>PALAMEDEIDÆ.</strong></td>
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<td>Palamedea ...</td>
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<td>Equatorial America</td>
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</tr>
<tr>
<td>Chauna ...</td>
<td>2</td>
<td>Columbia, Brazil, and La Plata</td>
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<td><strong>ANATIDÆ.</strong></td>
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<td>Merganetta ...</td>
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<td>Andes</td>
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<td>Eudyptes ...</td>
<td>6</td>
<td>Temperate S. America</td>
<td>Antarctic shores</td>
</tr>
<tr>
<td>Aptenodytes</td>
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<td>Falkland Islands</td>
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CHAPTER XV.

THE NEARCTIC REGION.

This region consists almost wholly of Temperate North America as defined by physical geographers. In area it is about equal to the Neotropical region. It possesses a vast mountain range traversing its entire length from north to south, comparable with, and in fact a continuation of, the Andes,—and a smaller range near the east coast, equally comparable with the mountains of Brazil and Guiana. These mountains supply its great river-system of the Mississippi, second only to that of the Amazon; and in its vast group of fresh-water lakes or inland seas, it possesses a feature unmatched by any other region, except perhaps by the Ethiopian. It possesses every variety of climate between arctic and tropical; extensive forests and vast prairies; a greatly varied surface and a rich and beautiful flora. But these great advantages are somewhat neutralized by other physical features. It extends far towards the north, and there it reaches its greatest width; while in its southern and warmest portion it suddenly narrows. The northern mass of land causes its isothermal lines to bend southwards; and its winter temperature especially, is far lower than at corresponding latitudes in Europe. This diminishes the available area for supporting animal life; the amount and character of which must be, to a great extent, determined by the nature of the least favourable part of the year. Again, owing to the position of its mountain ranges and the direction of prevalent winds, a large extent of its interior, east of the Rocky Mountains, is bare and arid, and often almost desert; while the most favoured districts,—those east of
the Mississippi and west of the Sierra Nevada, bear but a small proportion to its whole area. Again, we know that at a very recent period geologically, it was subjected to a very severe Glacial epoch, which wrapped a full half of it in a mantle of ice, and exterminated a large number of animals which previously inhabited it. Taking all this into account, we need not be surprised to find the Nearctic region somewhat less rich and varied in its forms of life than the Palearctic or the Australian regions, with which alone it can fairly be compared. The wonder rather is that it should be so little inferior to them in this respect, and that it should possess such a variety of groups, and such a multitude of forms, in every class of animals.

**Zoological characteristics of the Nearctic Region.**—Temperate North America possesses representatives of 26 families of Mammalia, 48 of Birds, 18 of Reptiles, 11 of Amphibia, and 18 of Fresh-water Fish. The first three numbers are considerably less than the corresponding numbers for the Palearctic region, while the last two are greater—in the case of fishes materially so, a circumstance readily explained by the wonderful group of fresh-water lakes and the noble southward-flowing river system of the Mississippi, to which the Palearctic region has nothing comparable. But although somewhat deficient in the total number of its families, this region possesses its full proportion of peculiar and characteristic family and generic forms. No less than 13 families or sub-families of Vertebrata are confined to it, or just enter the adjacent Neotropical region. These are,—three of mammalia, Antilocaprinae, Saccomyidae and Haploodontidae; one of birds, Chamaeidæ; one of reptiles, Chirotidae; two of amphibia, Sirenidae and Amphiumidae; and the remaining six of fresh-water fishes. The number of peculiar or characteristic genera is perhaps more important for our purpose; and these are very considerable, as the following enumeration will show.

**Mammalia.**—Of the family of moles (Talpidae) we have 3 peculiar genera: Condylura, Scapanus, and Scalops, as well as the remarkable Urotrichus, found only in California and Japan. In the weasel family (Mustelidæ) we have Latax, a peculiar kind of otter; Taxidea, allied to the badgers; and one of the
remarkable and characteristic skunks is separated by Dr. J. E. Gray as a genus—Spilogale. In the American family Procyonidae, a peculiar genus (Bassaris) is found in California and Texas, extending south along the mountains of Mexico and Guatemala. Eumetopias, and Halicyon, are seals confined to the west coast of North America. The Bovidae, or hollow-horned ruminants, contain three peculiar forms; Antilocapra, the remarkable prong-buck of the Rocky Mountains; Aplœcrus, a goat-like antelope; and Ovibos, the musk-sheep, confined to Arctic America and Greenland. Among the Rodents are many peculiar genera: Neotoma, Sigmodon, and Fiber, belong to the Muridae, or rats; Jaculus to the Dipodidae, or jerboas. The very distinct family Sacomyidae, or pouched rats, which have peculiar cheek pouches, or a kind of outer hairy mouth, consists of five genera all confined to this region, with one of doubtful affinities in Trinidad and Central America. In the squirrel family (Sciuridae), Cynomys, the prairie-dogs, are peculiar; and Tamias, the ground squirrel, is very characteristic, though found also in North Asia. Haplodon, or sewellels, consisting of two species, forms a distinct family; and Erethizon is a peculiar form of tree porcupine (Cercolabidae). True mice and rats of the genus Mus are not indigenous to North America, their place being supplied by a distinct genus (Hesperomys), confined to the American continent.

**Birds.**—The genera of birds absolutely peculiar to the Nearctic region are not very numerous, because, there being no boundary but one of climate between it and the Neotropical region, most of its characteristic forms enter a short distance within the limits we are obliged to concede to the latter. Owing also to the severe winter-climate of a large part of the region (which we know is a comparatively recent phenomenon), a large proportion of its birds migrate southwards, to pass the winter in the West-Indian islands or Mexico, some going as far as Guatemala, and a few even to Venezuela.

In our chapter on extinct animals, we have shown, that there is good reason for believing that the existing union of North and South America is a quite recent occurrence; and that the
separation was effected by an arm of the sea across what is now Nicaragua, with perhaps another at Panama. This would leave Mexico and Guatemala joined to North America, and forming part of the Nearctic region, although no doubt containing many Neotropical forms, which they had received during earlier continental periods; and these countries might at other times have been made insular by a strait at the isthmus of Tehuantepec, and have then developed some peculiar species. The latest climatal changes have tended to restrict these Neotropical forms to those parts where the climate is really tropical; and thus Mexico has attained its present strongly marked Neotropical character, although deficient in many of the most important groups of that region.

In view of these recent changes, it seems proper not to draw any decided line between the Nearctic and Neotropical regions, but rather to apply, in the case of each genus, a test which will show whether it was probably derived at a comparatively recent date from one region or the other. The test referred to, is the existence of peculiar species of the genus, in what are undoubtedly portions of ancient North or South America. If, for example, all the species of a genus occur in North America, some, or even all, of them, migrating into the Neotropical region in winter, while there are no peculiar Neotropical species, then we must class that genus as strictly Nearctic; for if it were Neotropical it would certainly have developed some peculiar resident forms. Again, even if there should be one or two resident species peculiar to that part of Central America north of the ancient dividing strait, with an equal or greater number of species ranging over a large part of Temperate North America, the genus must still be considered Nearctic. Examples of the former case, are *Helminthophaga* and *Myiobracetes*, belonging to the Mniotiltidae, or wood-warblers, which range over all Temperate North America to Canada, where all the species are found, but in each case one of the species is found in South America, probably as a winter migrant. Of the latter, are *Ammodramus* and *Junco* (genera of finches), which range over the whole United States, but each have one peculiar species in Guatemala. These
may be claimed as exclusively Nearctic genera, on the ground that Guatemala was recently Nearctic; and is now really a transition territory, of which the lowlands have been invaded and taken exclusive possession of by a Neotropical fauna, while the highlands are still (in part at least) occupied by Nearctic forms.

In his article on "Birds," in the new edition of the "Encyclopædia Britannica" (now publishing), Professor Newton points out, that the number of peculiar genera of Nearctic birds is much less than in each of the various sub-divisions of the Neotropical region; and that the total number of genera is also less, while the bulk of them are common either to the Neotropical or Palaearctic regions. This is undoubtedly the case if any fixed geographical boundary is taken; and it would thus seem that the "Nearctic" should, in birds, form a sub-region only. But, if we define "Nearctic genera" as above indicated, we find a considerable amount of speciality, as the following list will show. The names not italicised are those which are represented in Mexico or Guatemala by peculiar species:—

**List of Typical Nearctic Genera of Land Birds.**

1. Oreoscoptes  
2. Harporhynchus  
3. Sialia  
4. Chamcea  
5. Catherpes  
6. Sulpictus  
7. Psaltriparus  
8. Auriparus  
9. Gymnokitta  
10. Picironus  
11. Mniotilta.  
12. Oporornis  
13. Icteria  
14. Helmintherus  
15. Helminthophaga  
16. Myiodyctes

17. Phaeocephalus  
18. Xanthoccephalus  
19. Scolopagus  
20. Pipilo  
21. Junco  
22. Melospiza  
23. Spizella  
24. Passerculus  
25. Poecetes  
26. Ammodromus  
27. Cyanospiza  
28. Pyrrhuloxia  
29. Csalamospiza  
30. Chondestes  
31. Centronyx  
32. Neocorys  
33. Empidias  
34. Sphyrapicus  
35. Hylocichla  
36. Trochilus  
37. Atthis  
38. Ectopistes  
39. Centrocercus  
40. Pediocetes  
41. Cupidonia  
42. Orcoryx  
43. Lophotryx  
44. Callipepla  
45. Cyrtonyx  
46. Meleagris  
47. Micrathene

The above are all groups which are either wholly Nearctic or typically so, but entering more or less into the debatable ground of the Neotropical region; though none possess any peculiar species in the ancient Neotropical land south of Nicaragua. But we have, besides these, a number of genera which we are accus-
toned to consider as typically European, or Palaearctic, having representatives in North America; although in many cases it would be more correct to say that they are Nearctic genera, represented in Europe, since America possesses more species than Europe or North Asia. The following is a list of genera which have as much right to be considered typically Nearctic as Palaearctic:

2. Certhia  10. Ampelis  17. Plectrophanes
7. Perisoreus  15. Leucosticte
8. Pica

The seven genera italicized have a decided preponderance of Nearctic species, and have every right to be considered typically Nearctic; while the remainder are so well represented by peculiar species, that it is quite possible many of them may have originated here, rather than in the Palaearctic region, all alike being quite foreign to the Neotropical.

On the whole, then, we have 47 in the first and 7 in the second table, making 54 genera which we may fairly class as typically Nearctic, out of a total of 168 genera of land birds, or nearly one-third of the whole. This is an amount of peculiarity which is comparable with that of either of the less isolated regions; and, combined with the more marked and more exclusively peculiar forms in the other orders of vertebrates, fully establishes Temperate North America as a region, distinct alike from the Neotropical and the Palaearctic.

Reptiles.—Although temperate climates are always comparatively poor in reptiles, a considerable number of genera are peculiar to the Nearctic region. Of snakes, there are, Conophis, Chilomenisens, Pituophis, and Ischnognathus, belonging to the Colubridae; Farancia, and Dimodes, Homalopsidae; Lichanotus, one of the Pythonidae; Cenchris, Crotalophorus, Uropsophorus, and Crotalus, belonging to the Crotalidae or rattlesnakes.

Of Lizards, Chirotes, forming a peculiar family; Ophisaurus, Vol. II.—9
the curious glass-snake, belonging to the Zonuridae; with Phrynosoma (commonly called horned toads), Callisaurus, Uta, Euphryne, Uma, and Holbrookia, genera of Iguanidae.

Testudinidae, or Tortoises, show a great development of the genus Emys; with Aromochelys and Chelydra as peculiar genera.

Amphibia.—In this class the Nearctic region is very rich, possessing representatives of nine of the families, of which two are peculiar to the region, and there are not less than fifteen peculiar genera. Siren forms the family Sirenidae; Menobranchus belongs to the Proteidae; Amphiama is the only representative of the Amphiumidae; there are nine peculiar genera of Salamandridae. Among the tail-less batrachians (frogs and toads) we have Scaphiopus, belonging to the Alytidae; Pseudacris to the Hylidae; and Acris to the Polypedatidae.

Fresh-water Fishes.—The Nearctic region possesses no less than five peculiar family types, and twenty-four peculiar genera of this class. The families are Aphredoderidae, consisting of a single species found in the Eastern States; Percopsidae, founded on a species peculiar to Lake Superior; Heteropygidae, containing two genera peculiar to the Eastern States; Hyodontidae and Amiidae, each consisting of a single species. The genera are as follows: Paralabrax, found in California; Huro, peculiar to Lake Huron; Pilcomia, Bolosoma, Bryttus and Pomotis in the Eastern States—all belonging to the perch family. Hypodelius and Noturus, belonging to the Siluridae. Thaleichthys, one of the Salmonidae peculiar to the Columbia river. Moxostoma, Pimephales, Hyboryhnechus, Rhinichthys, in the Eastern States; Ericymba, Exoglossum, Leucosomus, and Carpiodes, more widely distributed; Cochlognathus, in Texas; Mylaphorodon and Orthodon, in California; Meda, in the river Gila; and Acerichilus, in the Columbia river—all belonging to the Cyprinidae. Scaphirhynchus, found only in the Mississippi and its tributaries, belongs to the sturgeon family (Acipenseridae).

Summary of Nearctic Vertebrata.—The Nearctic region possesses 24 peculiar genera of mammals, 49 of birds, 21 of reptiles, and 29 of fresh-water fishes, making 123 in all. Of these 70 are mammals and land-birds, out of a total of 242
genera of these groups, a proportion of about two-sevenths. This is the smallest proportion of peculiar genera we have found in any of the regions; but many of the genera are of such isolated and exceptional forms that they constitute separate families, so that we have no less than 12 families of vertebrata confined to the region. The Palæarctic region has only 3 peculiar families, and even the Oriental region only 12; so that, judged by this test, the Nearctic region is remarkably well characterized. We must also remember that, owing to the migration of many of its peculiar forms during the Glacial period, it has recently lost some of its speciality; and we should therefore give some weight to the many characteristic groups it possesses, which, though not quite peculiar to it, form important features in its fauna, and help to separate it from the other regions with which it has been thought to be closely allied. It is thus well distinguished from the Palæarctic region by its Procyonidae, or raccoons, Hesperomys, or vesper mice, and Didelphys, or opossums, among Mammalia; by its Vireonidae, or greenlets, Mniotiltidae, or wood-warblers, Icteridae, or hang-nests, Tyrannidae, or tyrant shrikes, and Trochilidae, or humming-birds, among birds, families which, extending to its extreme northern limits must be held to be as truly characteristic of it as of the Neotropical region; by its Teiidae, Iguanidae, and Cinosternum, among reptiles; and by its Siluridae, and Lepidosteidae, among fishes. From the Neotropical region it is still more clearly separated, by its numerous insectivora; by its bears; its Old World forms of ruminants; its beaver; its numerous Arvicola, or voles; its Sciuropterus, or flying squirrels; Tamias, or ground-squirrels; and Lagomys, or marmots, among mammals; its numerous Paridae, or tits, and Tetraonidae, or grouse, among birds; its Trionychidae among reptiles; its Proteidae, and Salamandridae, among Amphibia; and its Gasterosteidae, Atherinidae, Esocidae, Umbridae, Accipenseridae, and Polydentidae, among fishes.

These characteristic features, taken in conjunction with the absolutely peculiar groups before enumerated, demonstrate that the Nearctic region cannot with propriety be combined with
any other. Though not very rich, and having many disadvantages of climate and of physical condition, it is yet sufficiently well characterized in its zoological features to rank as one of the well-marked primary divisions of the earth's surface.

There is one other consideration bearing on this question which should not be lost sight of. In establishing our regions we have depended wholly upon their now possessing a sufficient number and variety of animal forms, and a fair proportion of peculiar types; but when the validity of our conclusion on these grounds is disputed, we may supplement the evidence by an appeal to the past history of the region in question. In this case we find a remarkable support to our views. During the whole Tertiary period, North America was, zoologically, far more strongly contrasted with South America than it is now; while, during the same long series of ages, it was always clearly separated from the Eastern hemisphere or the Palaearctic region by the exclusive possession of important families and numerous genera of Mammalia, as shown by our summary of its extinct fauna in Chapter VII. Not only may we claim North America as now forming one of the great zoological regions, but as having continued to be one ever since the Eocene period.

Insects.

In describing the Palaearctic and Neotropical regions, many of the peculiarities of the insect-fauna of this region have been incidentally referred to; and as a tolerably full account of the distribution of the several families is given in the Fourth Part of our work (Chapter XXI), we shall treat the subject very briefly here.

Lepidoptera.—The butterflies of the Nearctic region have lately been studied with much assiduity, and we are now able to form some idea of their nature and extent. Nearly 500 species belonging to about 100 genera have been described; showing that the region, which a few years ago was thought to be very poor in species of butterflies, is really much richer than Europe, and probably about as rich as the more extensive Palaearctic region. There is, however, very little speciality in the
forms. A considerable number of Neotropical types enter the southern States; but there are hardly any peculiar genera, except one of the Lycaenidae and perhaps a few among the Hesperidæ. The most conspicuous feature of the region is its fine group of Papilios, belonging to types (P. turnus and P. troilus) which are characteristically Nearctic. It is also as rich as the Palaearctic region in some genera which we are accustomed to consider as pre-eminently European; such as Argynnis, Melitaea, Grapta, Chionabas, and a few others. Still, we must acknowledge, that if we formed our conclusions from the butterflies alone, we could hardly separate the Nearctic from the Palaearctic region. This identity probably dates from the Miocene period; for when our existing arctic regions supported a luxuriant vegetation, butterflies would have been plentiful; and as the cold came on, these would move southwards both in America and Europe, and, owing to the long continuance of the generic types of insects, would remain little modified till now.

Coleoptera.—Only a few indications can be given of the peculiarities of the Nearctic coleoptera. In Cicindelidæ the region possesses, besides the cosmopolite Cicindela, four other genera, two of which—Amblychile and Omus—are peculiar to the West Coast and the Rocky Mountains. Of Carabidæ it possesses Dicetus, Pasimachus, Eurytrichus, Sphaeroderus, Pina- codera, and a number of smaller genera, altogether peculiar to it; Helluomorpha, Galerita, Callida, and Tetragonoderus, in common with South America; and a large number of characteristic European forms.

The Lucanidæ are all of European types. The region is poor in Cetoniidæ, but has representatives of the South American Euphoria, as well as of four European genera. Of Buprestidæ it has the South American Actenodes; a single species of the Ethiopian and Eastern Belionota, in California; and about a dozen other genera of European and wide distribution.

Among Longicornæ it possesses fifty-nine peculiar genera, representatives of five Neotropical, and thirteen Palaearctic genera; as well as many of wider distribution. Prionus is the chief representative of the Prionidæ; Leptura and Crossidius of the
Cerambycidae; *Leptostylus, Liopus, Graphidurus, and Tetraopes*, of the Lamiidae, the latter genus being confined to the region.

**Terrestrial and Fluviatile Mollusca.**

The land-shells of temperate North America almost all belong to the Inojectulate or Pulmoniferous division; the Operculata being represented only by a few species of *Helicina* and *Truncatella*, chiefly in the Southern States. According to Mr. Binney's recent "Catalogue of the Terrestrial Air-breathing Mollusks of North America," the fauna consists of the following genera:— *Glandina* (6 sp.); *Macrocyclus* (5 sp.); *Zonites* (31 sp.); *Vitrina* (4 sp.); *Limax* (5 sp.); *Arion* (3 sp.); *Ariolimax* (3 sp.); *Prophysaon* (1 sp.); *Binneia* (1 sp.); *Hemiphillia* (1 sp.); *Patula* (16 sp.); *Helix* (80); *Holospira* (2 sp.); *Cylindrella* (2 sp.); *Macrocramus* (2 sp.); *Bulimulus* (8 sp.); *Cionella* (2 sp.); *Stenogyra* (4 sp.); *Pupa* (19 sp.); *Strophia* (1 sp.); *Vertigo* (6 sp.); *Liguus* (1 sp.); *Orthalius* (2 sp.); *Punctum* (1 sp.); *Succinea* (26 sp.); *Tebennophorus* (1 sp.); *Pallifera* (1 sp.); *Veronicella* (2 sp.).

All the larger genera range over the whole region, but the following have a more restricted distribution; *Macrocyclus* has only one species in the East, the rest being Californian or Central; *Ariolimax, Prophysaon, Binneia, and Hemiphillia*, are confined to the Western sub-region. Lower California has affinities with Mexico, 18 species being peculiar to it, of which two are true *Bulinum*, a genus unknown in other parts of the region. The Central or Rocky Mountain sub-region is chiefly characterised by six peculiar species of *Patula*. The Eastern sub-region is by far the richest, nine-tenths of the whole number of species being found in it. The Alleghany Mountains form the richest portion of this sub-region, possessing nearly half the total number of species, and at least 24 species found nowhere else. The southern States have also several peculiar species, but they are not so productive as the Alleghanies. The Canadian sub-region possesses 32 species, of which nearly half are northern forms more or less common to the whole Arctic regions, and several of this character have spread southwards all
over the United States. Species of *Vitrina*, *Zonites*, *Pupa*, and *Succinea*, are found in Greenland; and Eastern Palearctic species of *Vitrina*, *Patula*, and *Pupa* occur in Alaska. More than 30 species of shells living in the Eastern States, are found fossil in the Post-Pliocene deposits of the Ohio and Mississippi.

**Fresh-water Shells.**—North America surpasses every other part of the globe in the number and variety of its fresh-water mollusca, both univalve and bivalve. The numbers up to 1866 were as follows:—Melaniidae, 380 species; Paludinidae, 58 species; Cycladidae, 44 species; and Unionidae, 552 species. The last family had, however, increased to 832 species in 1874, according to Dr. Isaac Lea, who has made them his special study; but it is probable that many of these are such as would be considered varieties by most conchologists. Many of the species of *Unio* are very large, of varied forms, and rich internal colouring, and the group forms a prominent feature of the Nearctic fauna. By far the larger proportion of the fresh-water shells inhabit the Eastern or Alleghany sub-region; and their great development is a powerful argument against any recent extensive submergence beneath the ocean of the lowlands of North America.

**The Nearctic Sub-regions.**

The sub-divisions of the Nearctic region, although pretty clearly indicated by physical features and peculiarities of climate and vegetation, are by no means so strongly marked out in their zoology as we might expect. The same genera, as a rule, extend over the whole region; while the species of the several sub-regions are in most cases different. Even the vast range of the Rocky Mountains has not been an effectual barrier against this wide dispersal of the same forms of life; and although some important groups are limited by it, these are exceptions to the rule. Even now, we find fertile valleys and plateaus of moderate elevation, penetrating the range on either side; and both to the north and south there are passes which can be freely traversed by most animals during the summer. Previous to the glacial epoch there was probably a warm period, when every part of the range supported an abundant and varied
fauna, which, when the cold period arrived, would descend to the lowlands, and people the country to the east, west, and south, with similar forms of life.

The first, and most important sub-division we can make, consists of the Eastern United States, extending across the Mississippi and the more fertile prairies, to about the 100°th. meridian of west longitude, where the arid and almost desert country commences. Southwards, the boundary bends towards the coast, near the line of the Brazos or Colorado rivers. To the north the limits are undefined; but as a considerable number of species and genera occur in the United States but not in Canada, it will be convenient to draw the line somewhere near the boundary of the two countries, except that the district between lakes Huron and Ontario, and probably Nova Scotia, may be included in the present sub-region. As far west as the Mississippi, this was originally a vast forest country; and it is still well wooded, and clothed with a varied and luxuriant vegetation.

The next, or Central sub-region, consists of the dry, elevated, and often arid district of the Rocky Mountains, with its great plateaus, and the barren plains of its eastern slope; extending northwards to near the commencement of the great forests north of the Saskatchewan, and southward to the Rio Grande del Norte, the Gulf of California, and to Cape St. Lucas, as shown on our maps. This sub-region is of an essentially desert character, although the higher valleys of the Rocky Mountains are often well wooded, and in these are found some northern and some western types.

The third, or Californian sub-region, is small, but very luxuriant, occupying the comparatively narrow strip of country between the Sierra Nevada and the Pacific. To the north it may include Vancouver's Island and the southern part of British Columbia, while to the south it extends to the head of the Gulf of California.

The fourth division, comprises the remainder of North America; and is a country of pine forests, and of barren wastes towards the Arctic Ocean. It has fewer peculiar species to characterise it than any other, but it possesses several characteristic arctic
forms, while many of those peculiar to the south are absent; so that it is a very convenient, if it should not be considered an altogether natural, sub-region.

We will now give an outline of the most important zoological features of each of these divisions, taking them in the order in which they are arranged in the Fourth Part of this work. California comes first, as it has some tropical forms not found elsewhere, and thus forms a transition from the Neotropical region.

I. The Western or Californian Sub-region.

This small district possesses a fruitful soil and a highly favourable climate, and is, in proportion to its extent, perhaps the richest portion of the continent, both zoologically and botanically. Its winters are far milder than those of the Eastern States in corresponding latitudes; and this, perhaps, has enabled it to support several tropical forms which give a special character to its fauna. It is here only, in the whole region, that bats of the families Phyllostomidae and Noctilionidae, and a serpent of the tropical family, Pythonidae, are found, as well as several Neotropical forms of birds and reptiles.

Mammalia.—The following genera are not found in any other part of the Nearctic region. *Macrotus* (Phyllostomidae), one species in California; *Antrozous* (Vespertilionidae), one species on the West Coast; *Urotichus* (Talpidae) one species in British Columbia; sub-genus *Nesorex* (Soricidae), one species in Oregon; *Bassaris* (Procyonidae), California; *Enhydra* (Mustelidae), Pacific Coast; *Moronga* (Phocidae), California; *Haploodon* (Haploodontidae) a rat-like animal, allied to the beavers and marmots, and constituting a peculiar family found only in California and British Columbia. The following characteristic Nearctic forms also extend into this sub-region:—*Taxidea, Procyon, Didelphys, Sciuropterus, Tamias, Spermophilus, Dipodomys, Perognathus, Jaculus.*

Birds.—Few genera of birds are quite peculiar to this sub-region, since most of the Western forms extend into the central district, yet it has a few. *Glaucidium* a genus of Owls, is confined
(in the Neartic region) to California; *Chamaea*, a singular form allied to the wrens, and forming a distinct family, is quite peculiar; *Geococcyx*, a Neotropical form of cuckoo, extends to California and Southern Texas. The following genera are very characteristic of the sub-region, and some of them almost confined to it: *Myiadestes* (Sylvidae); *Psaltriparus* (Paridae); *Cyanocitta*, *Picicorvus* (Corvidae); *Hesperiphona*, *Pcucwa*, *Chondestes* (Fringillidae); *Selasphorus*, *Atthis* (Trochilidae); *Columba*, *Melopelia* (Columbidae); *Oreortyx* (Tetraonidae).

Reptiles.—The following genera are not found in any other part of the Neartic region: *Charina* (Tortricidae); *Lichanotus* (Pythonidae); *Gerrhonotus* (Zonuridae); *Phyllodactylus* (Gecko-tidae); *Anolius* and *Tropidolepis* (Iguanidae). *Sceloporus* (Iguanidae) is only found elsewhere in Florida. All the larger North American groups of lizards and snakes are also represented here; but in tortoises it is deficient, owing to the absence of lakes and large rivers.

Amphibia.—California possesses two genera of Salamandridae, *Aneides* and *Heredia*, which do not extend to the other sub-regions.

Fresh-water Fish.—There are two or three peculiar genera of Cyprinidae, but the sub-region is comparatively poor in this group.

Plate XVIII. Illustrative of the Zoology of California and the Rocky Mountains.—We have chosen for the subject of this illustration, the peculiar Birds of the Western mountains. The two birds in the foreground are a species of grouse (*Pediocetes Columbianus*), entirely confined to this sub-region; while the only other species of the genus is found in the prairies north and west of Wisconsin, so that the group is peculiar to northern and western America. The crested birds in the middle of the picture (*Oreortyx picta*), are partridges, belonging to the American sub-family Odontophorine. This is the only species of the genus which is confined to California and Oregon. The bird at the top is the blue crow (*Gymnokitta cyanoccephala*), confined to the Rocky Mountains and Sierra Nevada from New Mexico and Arizona northwards, and more properly belonging to the Central
PLATE XVIII.

SCENE IN CALIFORNIA, WITH SOME CHARACTERISTIC BIRDS.
sub-region. It is allied to the European nutcracker; but according to the American ornithologist, Dr. Coues, has also resemblances to the jays, and certainly forms a distinct genus. The grizzly bear (*Ursus ferox*) in the background, is one of the characteristic animals of the Californian highlands.

II. The Central, or Rocky Mountain Sub-region.

This extensive district is, for the greater part of its extent, from 2,000 to 5,000 feet above the sea, and is excessively arid; and, except in the immediate vicinity of streams and on some of the higher slopes of the mountains, is almost wholly treeless. Its zoology is therefore peculiar. Many of the most characteristic genera and families of the Eastern States are absent; while a number of curious desert and alpine forms give it a character of its own, and render it very interesting to the naturalist.

*Mammalia.*—The remarkable prong-horned antelope (*Antilocapra*), the mountain goat (*Aplocerus*), the mountain sheep or bighorn (*Ovis montana*), and the prairie-dog (*Cynomys*), one of the Rodentia, are peculiar to this sub-region; while the family of the Saccomyidae, or pouched rats, is represented by many forms and is very characteristic. Here is also the chief home of the bison. The glutton (*Gulo*) and marmot (*Lagomys*) enter it from the north; while it has the racoon (*Procyon*), flying squirrel (*Sciuropterus*), ground squirrel (*Tamias*), pouched marmot (*Spermophilus*) and jumping mouse (*Jaculus*) in common with the countries east or west of it.

*Plate XIX.* Illustrative of the Zoology of the Central Plains or Prairies.—We here introduce four of the most characteristic mammalia of the great American plains or prairies, three of them being types confined to North America. The graceful animals on the left are the prong-horned antelopes (*Antilocapra americana*), whose small horns, though hollow like those of the antelopes, are shed annually like those of the deer. To the right we have the prairie-dogs of the trappers (*Cynomys ludovicianus*) which, as will be easily seen, are rodents, and allied to the marmots of the European Alps. Their burrows are numerous on the prairies, and the manner in which they perch
themselves on little mounds and gaze on intruders, is noticed by all travellers. On the left, in the foreground, is one of the extraordinary pouched rats of America (*Geomys bursarius*). These are burrowing animals, feeding on roots; and the mouth is, as it were, double, the outer portion very wide and hairy, behind which is the small inner mouth. Its use may be to keep out the earth from the mouth while the animal is gnawing roots. A mouth so constructed is found in no other animals but in these North American rats. In the distance is a herd of bison (*Bison americanus*), the typical beast of the prairies.

**Birds.**—This sub-region has many peculiar forms of birds, both residents, and migrants from the south or north. Among the peculiar resident species we may probably reckon a dipper, (*Cinclus*); *Salpinetes*, one of the wrens; *Poospiza, Calamospiza*, genera of finches; *Picicorvus, Gymnokitta*, genera of the crow family; *Centrocercus* and *Pediocetes*, genera of grouse. As winter migrants from the north it has *Leucosticta* and *Plectrophanes*, genera of finches; *Perisoreus*, a genus of the crow family; *Picoides*, the Arctic woodpecker; and *Lagopus*, ptarmigan. Its summer migrants, many of which may be resident in the warmer districts, are more numerous. Such are, *Oreoscoptes*, a genus of thrushes; *Campylorhynchus* and *Catherpes*, wrens; *Paroïdes*, one of the tits; *Phaenopepla*, allied to the waxwing; *Embernagra* and *Spermophilus*, genera of finches; *Pyrocephalus*, one of the tyrant shrikes; *Callipepla* and *Cyrtonyx*, American partridges. Besides these, the more widely spread genera, *Harporhynchus, Lophophanes, Carpodacus, Spizella*, and *Cyanocitta*, are characteristic of the central district, and two genera of humming-birds—*Atthis* and *Selasphorus*—only occur here and in California. Prof. Baird notes 40 genera of birds which are represented by distinct allied species in the western, central, and eastern divisions of the United States, corresponding to our sub-regions.

It is a curious fact that the birds of this sub-region should extend across the Gulf of California, and that Cape St. Lucas, at the southern extremity of the peninsula, should be decidedly more "Central" than "Californian" in its ornithology. Prof.
Baird says, that its fauna is almost identical with that of the Gila River, and has hardly any relation to that of Upper California. It possesses a considerable number (about twenty) of peculiar species of birds, but all belong to genera characteristic of the present sub-region; and there is no resemblance to the birds of Mazatlan, just across the gulf in the Neotropical region.

Reptiles, Amphibia, and fishes.—A large number of snakes and lizards inhabit this sub-region, but they have not yet been classified with sufficient precision to enable us to make much use of them. Among lizards, Iguanidae, Geckotidae, Scincidae, and Zonuridae, appear to be numerous; and many new genera of doubtful value have been described. Among snakes, Calamariidae, Colubridae, and Crotalidae are represented. Among Amphibia, Sirendon, one of the Proteidae, is peculiar. The rivers and lakes of the Great Central Basin, and the Colorado River, contain many peculiar forms of Cyprinidae.

III. The Eastern or Alleghany Sub-region.

This sub-region contains examples of all that is most characteristic of Nearctic zoology. It is for the most part an undulating or mountainous forest-clad country, with a warm or temperate climate, but somewhat extreme in character, and everywhere abounding in animal and vegetable life. To the west, across the Mississippi, the country becomes more open, gradually rises, becomes much drier, and at length merges into the arid plains of the central sub-region. To the south, in Georgia, Florida, and Louisiana, a sub-tropical climate prevails, and winter is almost unknown. To the north, in Michigan and New England, the winters are very severe, and streams and lakes are frozen for months together. These different climates, however, produce little effect on the forms of animal life; the species to some extent change as we go from north to south, but the same types everywhere prevail. This portion of the United States, having been longest inhabited by Europeans, has been more thoroughly explored than other parts of North America; and to this more complete knowledge its superior zoological richness
may be to some extent due; but there can be little doubt that it is also positively, and not merely relatively, more productive in varied forms of animal life than either of the other sub-regions.

*Mammalia.*—There seems to be only one genus absolutely peculiar to this sub-region—the very remarkable *Condyzura*, or star-nosed mole, only found from Pennsylvania to Nova Scotia, and as far as about 94° west longitude. It also has opossums (*Didelphys*) in common with California, and three out of four species of *Scalops*, a genus of moles; as well as the skunk (*Mephitis*), American badger (*Taxidea*), racoon (*Procyon*), pouched rat (*Geomys*), beaver rat (*Fiber*), jumping mouse (*Jaculus*), tree porcupine (*Erethizon*), and other characteristic Nearctic forms.

*Birds.*—The birds of this sub-region have been carefully studied by American naturalists, and many interesting facts ascertained as to their distribution and migrations. About 120 species of birds are peculiar to the east coast of the United States, but only about 30 of these are residents all the year round in any part of it; the bird population being essentially a migratory one, coming from the north in winter and the south in summer. The largest number of species seems to be congregated in the district of the Alleghany mountains. A considerable proportion of the passerine birds winter in Central America and the West Indian Islands, and go to the Middle States or Canada to breed; so that even the luxuriant Southern States do not possess many birds which may be called permanent residents. Thus, in East Pennsylvania there are only 52, and in the district of Columbia 54 species, found all the year round, out of about 130 which breed in these localities; very much below the number which permanently reside in Great Britain.

This sub-region is well characterised by its almost exclusive possession of *Ectopistes*, the celebrated passenger pigeon, whose enormous flocks and breeding places have been so often described; and *Cupidonia*, a remarkable genus of grouse. The only Nearctic parrot, *Conurus carolinensis*, is found in the Southern States; as well as *Crotophaga*, a South American genus usually associated with the cuckoos. *Helmintherus* and
Oporornis, genera of wood-warblers, may be considered to be peculiar to this sub-region, since in each case only one of the two species migrates as far as Central America; while two other genera of the same family, Siurus and Setophaga, as well as the finch genus, Euspiza, do not extend to either of the western sub-regions. Parus, a genus of tits, comes into the district from the north; Otoeorys, an alpine lark, and Coturniculus, an American finch, from the west; and such characteristic Nearctic genera as Antrostomus (the whip-poor-will goatsuckers); Helminthophaga, Dendravea, and Myiodyctes (wood-warblers); Vireo (greenlets); Dolichonyx (rice-bird); Quiscalus (troupial); Meleagris (turkey); and Ortyx (American partridge), are wide-spread and abundant.

In Mr. J. A. Allen's elaborate and interesting paper on the birds of eastern North America, he enumerates 32 species which breed only in the more temperate portions of this province, and may therefore be considered to be especially characteristic of it. These belong to the following genera:—Turdus, Galacsoptes, Harpobodychus, Sialia, Dendravea, Wilsonia, Pyranga, Vireo, Lanctevo, Lophophanes, Coturniculus, Ammodromus, Spizella, Euspiza, Hedyseles, Cyanospiza, Pipilo, Cardinalis, Icterus, Corvus, Centurus, Melanerpes, Antrostomus, Coccozus, Ortyx, and Cupidonia.

Reptiles.—In this class the Eastern States are rich, possessing many peculiar forms not found in other parts of the region. Among snakes it has the genera Farancia and Dimodes belonging to the fresh-water snakes (Homalopsidae); the South American genus Elaps; and 3 genera of rattlesnakes, Cenchris, Crotalophorus, and Crotalus. The following genera of snakes are said to occur in the State of New York:—Coluber, Trupido- notus, Lophophis, Calamaria, Heterodon, Trigonocophalus, Crotalus, Psammophis, Helicops, Rhinostoma, Pituphos, and Elaps.

Among lizards, Chirotes, forming a peculiar family of Amphibians, inhabits Missouri and Mexico; while the remarkable glass-snake, Ophiurusaurus, belonging to the family Zonuridae, is peculiar to the Southern States; and the South American Sphaerodactylus, one of the gecko family, reaches Florida. Other genera which extend as far north as the State of New
York are, Scincus, Tropidolepis, Plestiodon, Lygosoma, Ameiva, and Phrynosoma.

Tortoises, especially the fresh-water kind, are very abundant; and the genera Aromochelys, Chelydra, Terrapene, and Trionyx, are nearly, if not quite, confined to this division of the region.

Amphibia.—Almost all the remarkable forms of Urodela, or tailed batrachians, peculiar to the region are found here only; such as Siren and Pseudobranchus, constituting the family Sirenidae; Menobranchus, allied to the Proteus of Europe; Amphiuma, an eel-like creature with four rudimentary feet, constituting the family Amphiumidae; Notopthalmus, Desmognathus, and Menopoma, belonging to the Salamandridae; together with several other genera of wider range. Of Anura, or tail-less batrachians, there are no peculiar genera, but the Neotropical genus of toads, Engystoma, extends as far as South Carolina.

Fishes.—Owing to its possession of the Mississippi and the great lakes, almost all the peculiar forms of North American fishes are confined to this sub-region. Such are Perca, Pileoma, Huro, Bryttus, and Pomotis (Percidae); the families Aphredodridae and Percopsidae; several genera of Cyprinodontidae and Cyprinidae; and the family Polydontidae.

Islands of the Alleghany Sub-region.

The Bermudas.—These islands, situated in the Atlantic, about 700 miles from the coast of Carolina, are chiefly interesting for the proof they afford of the power of a great variety of birds to cross so wide an extent of ocean. There are only 6 or 8 species of birds which are permanent residents on the islands, all common North American species; while no less than 140 species have been recorded as visiting them. Most of these are stragglers, many only noticed once; others appear frequently and in great numbers, but very few, perhaps not a dozen, come every year, and can be considered regular migrants. The permanent residents are, a greenlet (Vireo novehmacensis), the catbird (Galeoscoptes carolinensis), the blue bird (Sialia sialis), the cardinal (Cardinalis virginianus), the American crow (Corvus
americanus), and the ground dove (Chamæpelia passerina). The most regular visitants are a kingfisher (Ceryle alcyon), the wood-wagtail (Sturnus noveboracensis), the rice-bird (Dolichonyx oryzivorus), and a moorhen (Gallinula galeata). Besides the American species, four European birds have been taken at the Bermudas: Saxicola oranthae, Alauda arvensis (perhaps introduced), Crex pratensis, and Scolopax gallinago.

A common American lizard, Plestiodon longirostris, is the only land reptile found on the islands.

IV. The Sub-Arctic or Canadian Sub-region.

This sub-region serves to connect together the other three, since they all merge gradually into it; while to the north it passes into the circumpolar zone which is common to the Palæarctic and Nearctic regions. The greater portion of it is an extensive forest-district, mostly of coniferæ; and where these cease towards the north, barren wastes extend to the polar ocean. It possesses several northern or arctic forms of Mammalia, such as the glutton, lemming, reindeer, and elk, which barely enter the more southern sub-regions; as well as the polar bear and arctic fox; but it also has some peculiar forms, and many of the most characteristic Nearctic types. The remarkable musk-sheep (Ovibos) is confined to this sub-region, ranging over a considerable extent of country north of the forests, as well as Greenland. It has been extinct in Europe and Asia since the Post-pliocene epoch. Such purely Nearctic genera as Procyon, Latax, Erethizon, Jaculus, Fiber, Thomomys, and Hesperomys, abound, many of them ranging to the shores of Hudson's Bay and the barren wastes of northern Labrador. Others, such as Blarina, Condylura, and Mephitis, are found only in Nova Scotia and various parts of Canada. About 20 species of Mammalia seem to be peculiar to this sub-region.

Plate X. V. Illustrating the Zoology of Canada.—We have here a group of Mammalia characteristic of Canada and the colder parts of the United States. Conspicuous in the foreground is the skunk (Mephitis mephitis), belonging to a genus of the weasel family found only in America. This animal is
celebrated for its power of ejecting a terribly offensive liquid, the odour of which is almost intolerable. The skunks are nocturnal animals, and are generally marked, as in the species represented, with conspicuous bands and patches of white. This enables them to be easily seen at night, and thus serves to warn larger animals not to attack them. To the left is the curious little jumping mouse (Jaculus hudsonius), the American representative of the Palaearctic jerboa. Climbing up a tree on the left is the tree porcupine (Erethizon dorsatus), belonging to the family Cercalabidae, which represents, on the American continent, the porcupines of the Old World. In the background is the elk or moose (Alces americanus), perhaps identical with the European elk, and the most striking inhabitant of the northern forests of America, as the bison is of the prairies.

**Birds.**—Although the Canadian sub-region possesses very few resident birds, the numbers which breed in it are perhaps greater than in the other sub-regions, because a large number of circum-polar species are found here exclusively. From a comparison of Mr. Allen's tables it appears, that more than 200 species are regular migrants to Canada in the breeding season, and nearly half of these are land-birds. Among them are to be found a considerable number of genera of the American families Tyrannidae and Mniotilidae, as well as the American genera Sialia, Progne, Vireo, Cisto-thorus, Junco, Pipilo, Zonotrichia, Spizella, Melospiza, Molothrus, Agelaius, Cyanura, Sphyrapicus, and many others; so that the ornithology of these northern regions is still mainly Nearctic in character. Besides these, it has such specially northern forms as Surnia (Strigidae); Picoides (Picidae); Pinicola (Fringillidae); as well as Leucosticte, Plectrophanes, Perisoreus, and Lagopus, which extend further south, especially in the middle sub-region. No less than 212 species of birds have been collected in the new United States territory of Alaska (formerly Russian America), where a humming-bird (Selasphorus rufus) breeds. The great majority of these are typically American, including such forms as Colaptes, Helminthophaga, Sivrus, Dendrocæca, Myiodytes, Passerculus, Zonotrichia, Junco, Spizella, Melospiza, Passerella, Scolopagias, Pediocetes, and Bonasa;
PLATE XX.

A CANADIAN FOREST, WITH CHARACTERISTIC MAMMALIA.
together with many northern birds common to both continents. Yet a few Palaearctic forms, not known in other parts of the sub-region, appear here. These are *Budytes flava*, *Phylloscopus kennicottii*, and *Pyrhrula coccinea*, all belonging to genera not occurring elsewhere in North America. Considering the proximity of the district to North-east Asia, and the high probability that there was an actual land connection at, and south of, Behring's Straits, in late Tertiary times, it is somewhat remarkable that the admixture of Palaearctic and Nearctic groups is not greater than it is. The Palaearctic element, however, forms so small a portion of the whole fauna, that it may be satisfactorily accounted for by the establishment of immigrants since the Glacial period. The great interest felt by ornithologists in the discovery of the three genera above-named, with a wren allied to a European species, is an indication that the faunas even of the northern parts of the Nearctic and Palaearctic regions are, as regards birds, radically distinct. It may be mentioned that the birds of the Aleutian Isles are also, so far as known, almost wholly Nearctic. The number of land-birds known from Alaska is 77; and from the Aleutian Isles 16 species, all of which, except one, are North American.

**Reptiles.**—These are comparatively few and unimportant. There are however five snakes and three tortoises which are limited to Canada proper; while further north there are only Amphibia, represented by frogs and toads, and a salamander of the genus *Plethodon*.

**Fishes.**—Most of the groups of fresh-water fish of the Nearctic region are represented here, especially those of the perch, salmon, and pike families; but there seem to be few or no peculiar genera.

**Insects.**—These are far less numerous than in the more temperate districts, but are still tolerably abundant. In Canada there are 53 species of butterflies, viz., Papilionidæ, 4; Pieridæ, 2; Nymphalidæ, 21; Satyridæ, 3; Lycænidæ 16, and Hesperidæ 7. Most of these are, no doubt, found chiefly in the southern parts of Canada. That Coleoptera are pretty numerous is shown, by more than 800 species having been collected on the
shores of Lake Superior; 177 being Geodephaga and 39 Longicornis.

Greenland.—This great arctic island must be considered as belonging to the Nearctic region, since of its six land mammals, three are exclusively American (*Myodes torquatus*, *Lepus glacialis*, and *Ovibos moschatus*), while the other three (*Vulpes lagopus*, *Ursus maritimus*, and *Rangifer tarandus*) are circumpolar. Only fourteen land-birds are either resident in, or regular migrants to the country; and of these two are European (*Haliactus albicilla*, and *Falco peregrinus*), while three are American (*Anthus ludovicianus*, *Zonotrichia leucophrys*, and *Lagopus rupestris*), the rest being arctic species common to both continents. The waders and aquatics (49 in number) are nearly equally divided between both continents; but the land-birds which visit Greenland as stragglers are mostly American. Yet although the Nearctic element somewhat preponderates, Greenland really belongs to that circumpolar debateable land, which is common to the two North Temperate regions.

Concluding remarks.—We have already discussed pretty fully, though somewhat incidentally, the status and relations of the Nearctic region; first in our chapter on Zoological regions, then in our review of extinct faunas, and lastly in the earlier part of this chapter. It will not therefore be necessary to go further into the question here; but we shall, in our next chapter, give a brief summary of the general conclusions we have reached as to the past history and mutual zoological relations of all the great divisions of the earth.
TABLES OF DISTRIBUTION.

In drawing up these tables, showing the distribution of various classes of animals in the Nearctic region, the following sources of information have been chiefly relied on, in addition to the general treatises, monographs, and catalogues used in the compilation of the 4th Part of this work.

*Mammalia.*—Professor Baird's Catalogue; Allen's List of the Bats; Mr. Lord's List for British Columbia; Brown, for Greenland; Packard for Labrador.

*Birds.*—Baird, Cassin, and Allen's Lists for United States; Richardson's Fauna Boreali Americana; Jones, for Bermudas; and papers by Brown, Coues, Lord, Packard, Dall, and Professor Newton.
### TABLE I.

**FAMILIES OF ANIMALS INHABITING THE NEARCTIC REGION.**

**Explanation.**

Names in *italics* show the families which are peculiar to the region.
Names inclosed thus (...) show families which barely enter the region, and are not considered properly to belong to it.
Numbers correspond to the series of numbers to the families in Part IV.

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### THE NEARCTIC REGION.

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**MARSUPIALA.**

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**BIRDS.**

**PASSERES.**

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<td>38. Motacillidae</td>
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**PICARIES.**

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**PSITTACI.**

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<th>Range beyond the Region</th>
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<td>80. Conuridae</td>
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**COLUMBES.**

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<td>84. Columbidae</td>
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**GALLINAE.**

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<td>91. (Cracidae)</td>
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<td>Rocky Mountains</td>
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<td>100. Scolopacidae</td>
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<td>121. Pelecanidae</td>
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<td>122. Columbidae</td>
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<td>123. Podicipedae</td>
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<td>124. Alcaidae</td>
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<tr>
<td>5. Calamariidae</td>
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<td>6. Oligodontidae</td>
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<tr>
<td>7. Colubridae</td>
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<td>8. Homalopsidae</td>
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<td>17. Pythonidae</td>
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<td><strong>LACERTILIA.</strong></td>
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<td>27. Chirolophidae</td>
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<td>32. Tropidae</td>
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<td>34. Zonuridae</td>
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<td>35. Chelidae</td>
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<td>45. Scincidae</td>
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<td>49. Gekkonidae</td>
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<td>50. Iguanidae</td>
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<tr>
<td><strong>CECILIUM.</strong></td>
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<tr>
<td>56. Alligatorida</td>
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<tr>
<td><strong>CHELONIA.</strong></td>
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<td>57. Testudinidae</td>
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### Chap. XV. \[ \text{THE NEARCTIC REGION.} \]

#### Order and Family.

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<thead>
<tr>
<th>Sub-regions.</th>
<th>Range beyond the Region.</th>
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<td>AMPHIBIA.</td>
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<td>URODELA.</td>
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</tr>
<tr>
<td>2. Sirenidae</td>
<td>...</td>
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<tr>
<td>3. Proteidae</td>
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</tr>
<tr>
<td>4. Anura.</td>
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</tr>
<tr>
<td>5. Menopomidae</td>
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<tr>
<td>6. Salamandridae</td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sirenidae</td>
<td>...</td>
</tr>
<tr>
<td>3. Proteidae</td>
<td></td>
</tr>
<tr>
<td>4. Amphiumidae</td>
<td></td>
</tr>
<tr>
<td>5. Menopomidae</td>
<td></td>
</tr>
<tr>
<td>6. Salamandridae</td>
<td></td>
</tr>
</tbody>
</table>

#### FISHES (FRESH-WATER).

| Acantopterygii. |            |                |             |        |        |
| 1. Gasterosteidae |            |                |             |        |        |
| 3. Percidae ... | ...        |                |             |        |        |
| 4. Aphredoderidae|            |                |             |        |        |
| 12. Scienidae ... |            |                |             |        |        |
| 37. Atherinidae ... |            |                |             |        |        |

#### Physostomi.

| 59. Siluridae ... |            |                |             |        |        |
| 65. Salmonidae ... |            |                |             |        |        |
| 66. Percopsidae ... |            |                |             |        |        |
| 70. Esocidae ... |            |                |             |        |        |
| 71. Umbridae ... |            |                |             |        |        |
| 73. Cyprinodontidae |            |                |             |        |        |
| 74. Heteropogon ... |            |                |             |        |        |
| 75. Cyprinidae ... |            |                |             |        |        |
| 77. Hyodontidae ... |            |                |             |        |        |

#### Ganoidei.

| 93. Amiidae ... |            |                |             |        |        |
| 95. Lepidosteidae |            |                |             |        |        |
| 96. Acipenseridae |            |                |             |        |        |
| 97. Polydontidae ... |            |                |             |        |        |

#### INSECTS. LEPIDOPTERA (PART).

| Diurni (Butterflies). |            |                |             |        |        |
| 1. Danaidae ... |            |                |             |        |        |
| 2. Satyridae ... |            |                |             |        |        |
| 7. (Heliconidae)... |            |                |             |        |        |

**Note:**
- Palearctic
- Cosmopolitan
- Neotropical
- Almost cosmopolitan
- All continents but Australia
- All regions but Nearctic
- All regions but Oriental
- All regions but Ethiopian
- All the regions
- Almost cosmopolitan
- All warm regions
- Palearctic, New Zealand
- Palearctic
- Palearctic
- All regions but Australian
- Not in S. America or Australia
<table>
<thead>
<tr>
<th>Order and Family</th>
<th>Sub-regions</th>
<th>Range beyond the Region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>California</td>
<td>Baja Mexico</td>
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<tr>
<td>8. Nymphalidae</td>
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<td></td>
</tr>
<tr>
<td>9. Libytheidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Erycinidae</td>
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<td></td>
</tr>
<tr>
<td>13. Lycaenidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Pieridae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Papilionidae</td>
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<td></td>
</tr>
<tr>
<td>16. Hesperidae</td>
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<td></td>
</tr>
<tr>
<td>Sphingidea</td>
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<td></td>
</tr>
<tr>
<td>17. Zygenidae</td>
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<td></td>
</tr>
<tr>
<td>18. Castniidae</td>
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<td></td>
</tr>
<tr>
<td>22. Heteriidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Sphingidae</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Cosmopolite
- Not in Australia
- Neotropical
- Neotropical, Australian
- Not in Australia
- Cosmopolite
TABLE II.

**LIST OF GENERA OF TERRESTRIAL MAMMALIA AND BIRDS INHABITING THE NEARCTIC REGION.**

**Explanation.**

Names in *italics* show genera peculiar to the region.
Names enclosed thus (...) indicate genera which barely enter the region, and are not considered properly to belong to it.
Genera properly belonging to the region are numbered consecutively.

**MAMMALIA.**

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<td><strong>CHIROPTERA.</strong></td>
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<tr>
<td>Phyllostomidae.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Macrotus ...</td>
<td>1</td>
<td>California</td>
<td>Mexico, Antilles</td>
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<tr>
<td><strong>Vespertilionidae.</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Scotophilus ...</td>
<td>5</td>
<td>Universal, to Hudson’s Bay</td>
<td>Neot., Orient., Austral.</td>
</tr>
<tr>
<td>3. Vesperilio ...</td>
<td>6</td>
<td>Universal, to Hudson’s Bay</td>
<td>Cosmopolite</td>
</tr>
<tr>
<td>4. Nycticejus ...</td>
<td>1</td>
<td>South and East</td>
<td>India, Tropical Africa, temperate S. America</td>
</tr>
<tr>
<td>5. Lasius ...</td>
<td>3</td>
<td>Temp. N. Amer. to Nova Scotia</td>
<td>Tropical America</td>
</tr>
<tr>
<td>6. Syntos ...</td>
<td>2</td>
<td>S. E. and Central States</td>
<td></td>
</tr>
<tr>
<td>7. Aubrastos ...</td>
<td>1</td>
<td>W. Coast</td>
<td></td>
</tr>
<tr>
<td><strong>Noctilionidae.</strong></td>
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<tr>
<td>8. Nyctinomus ...</td>
<td>1</td>
<td>Cal. and S. Central Sub-region</td>
<td>Neotropical, Oriental. S. Palæarctic</td>
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<td><strong>INSECTIVORA.</strong></td>
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<td>TALPIDAE.</td>
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<td>9. Condylura ...</td>
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<td>Eastern N. America</td>
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<tr>
<td>10. Scapanus ...</td>
<td>2</td>
<td>New York to San Francisco</td>
<td>Japan</td>
</tr>
<tr>
<td>12. Urotrichus ...</td>
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<td>Palæarct., Ethiop., Orin</td>
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<td>14. Neosorex ...</td>
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<td>Vancouver’s Island (a sub-genus)</td>
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<td>15. Blarina ...</td>
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<td>Canada to Mexico (a sub-genus)</td>
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<td><strong>CARNIVORA.</strong></td>
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<td>FELIDÆ.</td>
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<td>16. Felis ...</td>
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<td>All regs. but Australian</td>
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<td>17. Lynx ...</td>
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**VOL. II.**
<table>
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<th>Order, Family, and Genus</th>
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<th>Range beyond the Region</th>
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<td>Palearctic, Oriental</td>
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<td>Palearct., Ethiop., Orient.</td>
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<td>21. Mustela ... ...</td>
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<td>All N. America</td>
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<td>22. Gulo ... ...</td>
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<td>Palearctic, Oriental</td>
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<tr>
<td>23. Latax ... ...</td>
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<td>N. Palearctic</td>
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<td>W. coast of S. America</td>
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<td>26. Mephitis ... ...</td>
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<td>Neotropical</td>
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<tr>
<td>28. Bassaris ... ...</td>
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<td>Guatemala and Mexico</td>
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<td>Palearctic, Oriental</td>
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<td>Behring’s Straits</td>
<td>Kamschatka</td>
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<td>31. Zalophus ... ...</td>
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<td>S. California to N. Pacific</td>
<td>Japan</td>
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<td>California to Behring’s Straits</td>
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<td>33. Callocephalins ...</td>
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<td>Palearctic</td>
</tr>
<tr>
<td>34. Pagomys ...</td>
<td>1</td>
<td>N. Atlantic and N. Pacific</td>
<td>Japan</td>
</tr>
<tr>
<td>35. Pagophilus ...</td>
<td>1</td>
<td>N. Atlantic and N. Pacific</td>
<td>Palearctic</td>
</tr>
<tr>
<td>36. Halicyon ...</td>
<td>1</td>
<td>N. W. coast of America</td>
<td>Palearctic</td>
</tr>
<tr>
<td>37. Phoca ...</td>
<td>1</td>
<td>Northern Coast</td>
<td>Palearctic</td>
</tr>
<tr>
<td>38. Halichaerus ...</td>
<td>1</td>
<td>Greenland</td>
<td>S. temperate shores</td>
</tr>
<tr>
<td>39. Morurga ...</td>
<td>1</td>
<td>California</td>
<td>N. Atlantic</td>
</tr>
<tr>
<td>40. Cystophora ...</td>
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<td>California</td>
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<td><strong>Suidae.</strong></td>
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<td>41. Dieotyles ...</td>
<td>1</td>
<td>Texas to Red River, Arkansas</td>
<td>Neotropical</td>
</tr>
<tr>
<td><strong>Cervidae.</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>42. Alces ...</td>
<td>1</td>
<td>N. E. United States &amp; Canada</td>
<td>N. Palearctic</td>
</tr>
<tr>
<td>43. Rangifer ...</td>
<td>2</td>
<td>Maine to Arctic Ocean &amp; Greenland</td>
<td>Arctic zone</td>
</tr>
<tr>
<td>44. Cervus ...</td>
<td>6</td>
<td>N. America to 57° N. Lat.</td>
<td>Neot., Palearct., Orien.</td>
</tr>
<tr>
<td><strong>Bovidae.</strong></td>
<td></td>
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</tr>
<tr>
<td>45. Bison ...</td>
<td>1</td>
<td>Between Missouri &amp; Rocky Mtns.</td>
<td>E. Europe</td>
</tr>
<tr>
<td>46. <em>Antilocapra</em> ...</td>
<td>1</td>
<td>Central plains from Rio Grande to British Columbia</td>
<td></td>
</tr>
</tbody>
</table>
### THE NEARCTIC REGION.

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>47. <em>Aplacurus</em> ...</td>
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<td>Northern Rocky Mountains</td>
<td>Paleartic</td>
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<tr>
<td>48. <em>Capra</em> ...</td>
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<td>Upper Missouri and Rocky Mountains northwards</td>
<td>Neotropical</td>
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<tr>
<td>49. <em>Ovibus</em> ...</td>
<td>1</td>
<td>Arctic America and Greenland</td>
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#### RODENTIA.

#### Muridae.

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<tr>
<td>50.</td>
<td><em>Reithrodon</em> ... N. America to Lat. 39° N.</td>
<td>Neotropical</td>
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<td>51.</td>
<td><em>Hesperomyys</em> ... Temperate N. America</td>
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<td>52.</td>
<td><em>Neotoma</em> ... 7 Temperate N. America</td>
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<tr>
<td>53.</td>
<td><em>Sigmodon</em> ... 2 S. and S. E. States</td>
<td>Paleartic</td>
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<tr>
<td>54.</td>
<td><em>Arvicola</em> ... 27 Texas and California to Hudson's Bay</td>
<td>N. Paleartic</td>
</tr>
<tr>
<td>55.</td>
<td><em>Myodes</em> ... 3 N. United States to Arctic Reg. and Greenland</td>
<td>Mexico</td>
</tr>
<tr>
<td>56.</td>
<td><em>Fiber</em> ... 1 All N. America</td>
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#### Dipodidae.

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<tr>
<td>57.</td>
<td><em>Jaculus</em> ... Pennsylvania to Canada and California</td>
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#### Soricomyidae.

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<tr>
<td>58.</td>
<td><em>Dipodomys</em> ... New Mexico to Columbia River and Carolina</td>
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<td>59.</td>
<td><em>Petrochilus</em> ... New Mexico to British Columbia</td>
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<tr>
<td>60.</td>
<td><em>Tomomys</em> ... 2 Upper Missouri to Hudson's Bay</td>
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<tr>
<td>61.</td>
<td><em>Geomys</em> ... 5 New Mexico to Alabama and Nebraska</td>
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<tr>
<td>62.</td>
<td><em>Saxomys</em> ... 1 N. America</td>
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#### Castoridae.

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<tr>
<td>63.</td>
<td><em>Castor</em> ... 1 N. Mexico to Labrador</td>
<td>Paleartic</td>
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#### Sciuridae.

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<tr>
<td>64.</td>
<td><em>Sciurus</em> ... 18 N. America to Labrador</td>
<td>All regs., but Australian Paleartic, Oriental Mexican, N. Asia Paleartic N. Paleartic</td>
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<tr>
<td>65.</td>
<td><em>Sciuropterus</em> ... California &amp; E. States northwards</td>
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<tr>
<td>66.</td>
<td><em>Tamias</em> ... 4 Mexico and Virginia to Canada</td>
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<tr>
<td>67.</td>
<td><em>Spermophilus</em> ... 15 N., W., &amp; Central N. America</td>
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<tr>
<td>68.</td>
<td><em>Cynomys</em> ... 2 Rio Grande to Missouri (Central)</td>
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<tr>
<td>69.</td>
<td><em>Aretomys</em> ... 4 Virginia and Nebraska, northw.</td>
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#### Haploodontidae.

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<tr>
<td>70.</td>
<td><em>Haploodon</em> ... 2 California and British Columbia</td>
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#### Cercolabidae.

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<th>Range beyond the Region</th>
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</thead>
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<tr>
<td>71.</td>
<td><em>Erethizon</em> ... 2 Pennsylvania to Canada, &amp; Pacific coast</td>
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#### Lagomysidae.

<table>
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<tr>
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<tr>
<td>72.</td>
<td><em>Lagomys</em> ... 1 Rocky Mountains, 42° to 60° N. Lat.</td>
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#### Leporidae.

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<tr>
<td>73.</td>
<td><em>Lepus</em> ... 15 All N. America to Greenland</td>
<td>All regs., but Australian Paleartic</td>
</tr>
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</table>
### Order, Family, and Genus

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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</thead>
<tbody>
<tr>
<td>MARSUPIALIA. Didelphidae.</td>
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<tr>
<td>74. Didelphys</td>
<td>2</td>
<td>From Hudson's River &amp; Lower California, southward</td>
<td>Neotropical</td>
</tr>
</tbody>
</table>

### BIRDS

#### Turdidae

1. Turdus

2. Minus

3. Galacoglos

4. Orsosipes

5. Harporkynchos

#### Sylviiide

6. Myiadestes

7. Stiata

8. Regulus

9. Poliopilla

#### Cinclidæ

10. Circinus

#### Troglodytidae

11. Troglodytes

12. Thyrophilus

13. Thyrothorax

14. Cistothes \( \text{Camplor-} \) lynchoyn

15. Salpinetes

16. Catherpes

#### Chameleonæ.

17. Chamaea

#### Certhidae.

18. Certhia

#### Sittidae.

19. Sitta

#### Paridae.

20. Parus

21. Lophophanes

22. Isaltiriparus

23. Aurijaros

Almost cosmopolite
Neotropical
To Panama
Mexico
Mexico.

Neotropical
Mexico and Guatemala
Palearct., Cent. America
Neotropical

Andes, Paleartic

Neotropical, Paleartic
Neotropical
Neotropical
Neotropical genus

California

Paleartic, Guatemala

Paleartic, Mexico

Palearct., Orien., Mexico
Paleartic, Mexico

Mexico and Guatemala
<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td><strong>Laniidae</strong></td>
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<tr>
<td>24. Lanius ... ...</td>
<td>4 All N. America</td>
<td>Palearctic, Ethio., Orient.</td>
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<tr>
<td><strong>Corvidae</strong></td>
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<tr>
<td>25. Perisoreus ...</td>
<td>1 Canada and Rocky Mountains</td>
<td>Palearctic</td>
</tr>
<tr>
<td>26. Cyanocitta ...</td>
<td>9 All United States and to Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>27. Gypaetus ...</td>
<td>1 Central and N. W. States</td>
<td></td>
</tr>
<tr>
<td>28. Picoides ...</td>
<td>1 Central and Western States to Sitka</td>
<td></td>
</tr>
<tr>
<td>29. Pica ... ...</td>
<td>2 Central and Western States to Arctic Ocean</td>
<td>Palearctic</td>
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<tr>
<td>30. Corvus ... ...</td>
<td>7 All N. America</td>
<td>Cosmop., excl. S. Amer.</td>
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<tr>
<td><strong>Ceradbidae</strong> (Certhiola ...</td>
<td>1 Florida ; summer migrant</td>
<td>Neotropical genus</td>
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<tr>
<td><strong>Mniotilidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Mniotilus ...</td>
<td>1 Eastern States</td>
<td>Antilles, Andes of Colombia (migrant)</td>
</tr>
<tr>
<td>32. Parula ... ...</td>
<td>1 Eastern States and Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>33. Protonotaria ...</td>
<td>1 Ohio and southwards</td>
<td>Neotrop. to Venezuela</td>
</tr>
<tr>
<td>34. Helminthophaga ...</td>
<td>8 All N. America</td>
<td>Mexico to Columbia</td>
</tr>
<tr>
<td>35. Helmintherus ...</td>
<td>2 S. and E. States to Canada</td>
<td>Mexico to Veragua</td>
</tr>
<tr>
<td>36. Perissoglossa ...</td>
<td>1 Eastern United States</td>
<td>Antilles</td>
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<tr>
<td>37. Dendrocis ...</td>
<td>22 All N. America</td>
<td>Mex. to Ecuador &amp; Chili</td>
</tr>
<tr>
<td>38. Oporornis ...</td>
<td>2 Eastern States</td>
<td>Guatemala and Panama</td>
</tr>
<tr>
<td>39. Geothlypis ...</td>
<td>4 All N. America</td>
<td>Neotropical</td>
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<tr>
<td>40. Setophaga ...</td>
<td>2 E. States &amp; Canadian sub-region</td>
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<tr>
<td>41. Myiobatis ...</td>
<td>5 United States and Canada</td>
<td>Mexico to Columb. (migr.)</td>
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<tr>
<td>42. Sturnus ...</td>
<td>3 S. and E. States to Canada</td>
<td>Mexico to Columbia</td>
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<tr>
<td>43. Icteria ...</td>
<td>2 E. and Central States to Canada</td>
<td>Mexico to Costa Rica</td>
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<td><strong>Vireonideae</strong></td>
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<td>44. Vireosylvia ...</td>
<td>7 All N. America</td>
<td>Antilles and Venezuela</td>
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<tr>
<td>45. Vireo ... ...</td>
<td>6 All United States</td>
<td>Antilles and Costa Rica</td>
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<td><strong>Ampelideae</strong></td>
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<td>46. Ampelis ...</td>
<td>2 All N. America</td>
<td>Palearctic, Guatemala</td>
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<td>47. Phaenopepla ...</td>
<td>1 Gila and Lower Colorado</td>
<td>Mexico</td>
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<td><strong>Hirundinideae</strong></td>
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<tr>
<td>48. Hirundo ...</td>
<td>3 All N. America</td>
<td>Almost cosmopolite</td>
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<tr>
<td>49. Petrochelidon ...</td>
<td>1 All N. America</td>
<td>Neotropical</td>
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<td>50. Cotyle ...</td>
<td>1 All N. America</td>
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<tr>
<td>51. Stelgidopteryx ...</td>
<td>1 Southern States</td>
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<td>52. Progne ...</td>
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<td><strong>Icterideae</strong></td>
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<td>54. Dolichonyx ...</td>
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<td>55. Molothrus ...</td>
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<tr>
<td>56. Ageleus ...</td>
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<tr>
<td>Order, Family, and Genus</td>
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<td>Range within the Region</td>
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<td>58. Sturnella</td>
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<td><strong>FRINGILLIDÆ</strong></td>
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<td>62. Chrysomitis</td>
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<td>(Spermophila)</td>
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<td>** MOTACILLIDÆ**</td>
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<td>95. Sayornis</td>
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<td>E. States to Cañada, California</td>
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<td>(Pyrocephalus)</td>
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<td></td>
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<tr>
<td>96. Empidonax</td>
<td>7</td>
<td>The whole region</td>
</tr>
</tbody>
</table>

* * *
### THE NEARCTIC REGION.

<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>97. Contopus</td>
<td>3</td>
<td>N. and E. of Rocky Mountains</td>
<td>Mexico to Amazonia</td>
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<td>98. Myiarchus</td>
<td>2</td>
<td>E. and W. coasts and Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>99. Empidias</td>
<td>1</td>
<td>Eastern States</td>
<td>Mexico</td>
</tr>
<tr>
<td>100. Tyrannus (Milvulus)</td>
<td>4</td>
<td>All United States to Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Texas</td>
<td>Neotropical genus</td>
</tr>
<tr>
<td>101. Picoides</td>
<td>3</td>
<td>Arctic zone and Rocky Mounts</td>
<td>Palearctic</td>
</tr>
<tr>
<td>102. Picus</td>
<td>6</td>
<td>All United States and Canada</td>
<td>All regs. but Eth. &amp; Aus.</td>
</tr>
<tr>
<td>103. Sphyropicus</td>
<td>6</td>
<td>Brit. Columbia and Pennsylvania southwards</td>
<td>Mexico and Guatemala</td>
</tr>
<tr>
<td>104. Campephilus</td>
<td>2</td>
<td>United States and Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>105. Hylatomus</td>
<td>1</td>
<td>E. and W. States and Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>106. Centurias</td>
<td>3</td>
<td>The whole region</td>
<td>Mexico to Venezuela</td>
</tr>
<tr>
<td>107. Melanerpes</td>
<td>3</td>
<td>United States and S. Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>108. Colaptes</td>
<td>3</td>
<td>United States and Canada</td>
<td>Neotropical</td>
</tr>
<tr>
<td>109. Crotophaga</td>
<td>2</td>
<td>E. States from Pennsylvania S.</td>
<td>Neotropical</td>
</tr>
<tr>
<td>110. Coccyzus</td>
<td>3</td>
<td>S. E. and Cen. States to Canada</td>
<td>Neotropical</td>
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<tr>
<td>111. Geococcyx</td>
<td>1</td>
<td>California to New Mex. &amp; Texas</td>
<td>Guatemala</td>
</tr>
<tr>
<td>112. Ceryle</td>
<td>2</td>
<td>The whole region</td>
<td>Neotropical, S. Palearctic, Oriental</td>
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<td>113. Chordeiles</td>
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<td>114. Antrostomus</td>
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<tr>
<td>115. Nepheneetes</td>
<td>1</td>
<td>N. W. America</td>
<td>Jamaica</td>
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<tr>
<td>116. Chaeura</td>
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<td>All U. States &amp; British Columbia</td>
<td>Almost cosmopolite</td>
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<td>117. Trochilus</td>
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<td>Mexico to Veragua (♀ ♀)</td>
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<td>118. Selasphorus</td>
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<td>W. coast and Centre</td>
<td>Mexico to Veragua</td>
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<td>119. Atthis</td>
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<td>California and Colorado Valley</td>
<td>Mexico to Guatemala</td>
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<td>120. Conurus</td>
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<td>S. and S. E. States</td>
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<td>121. Columba</td>
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<td>All regs. but Australian</td>
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<td>122. Ectopistes</td>
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<td>E. coast to Cen. plains, Canada and British Columbia</td>
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</tr>
<tr>
<td>123. Melopelia</td>
<td>1</td>
<td>W. and S. Central States</td>
<td>Neotropical</td>
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<tr>
<td>124. Zenaida</td>
<td>1</td>
<td>All United States to Canada</td>
<td>Mexico to Veragua</td>
</tr>
<tr>
<td>125. Chapepelia</td>
<td>1</td>
<td>California and S. E. States</td>
<td>Neotropical</td>
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**VOL. II.—11**
<table>
<thead>
<tr>
<th>Order, Family, and Genus</th>
<th>No. of Species</th>
<th>Range within the Region</th>
<th>Range beyond the Region</th>
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<tbody>
<tr>
<td><strong>GALLINÆ.</strong></td>
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<tr>
<td><strong>Tetraonideæ.</strong></td>
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<td></td>
<td></td>
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<td>126. Cyrotoryx</td>
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<td>S. Central States</td>
<td>Mexico and Guatemala</td>
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<td>127. Ortyx</td>
<td>5</td>
<td>All United States and to Canada</td>
<td>Mexico to Honduras and Costa Rica</td>
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<td>128. Callipepla</td>
<td>1</td>
<td>California</td>
<td>Mexico</td>
</tr>
<tr>
<td>129. Lophortyx</td>
<td>2</td>
<td>Arizona and California</td>
<td></td>
</tr>
<tr>
<td>130. Oreortyx</td>
<td>1</td>
<td>California and Oregon</td>
<td></td>
</tr>
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<td>131. Tetrao</td>
<td>3</td>
<td>N. and N. W. America</td>
<td>Paleartic</td>
</tr>
<tr>
<td>132. Centrocereus</td>
<td>1</td>
<td>Rocky Mountains</td>
<td></td>
</tr>
<tr>
<td>133. Pediocates</td>
<td>2</td>
<td>N. and N. W. America</td>
<td>Paleartic</td>
</tr>
<tr>
<td>134. Cupidonia</td>
<td>1</td>
<td>E. &amp; N. Cen. States and Canada</td>
<td>Paleartic</td>
</tr>
<tr>
<td>135. Bonasa</td>
<td>1</td>
<td>N. United States and Canada</td>
<td>Paleartic</td>
</tr>
<tr>
<td>136. Lagopus</td>
<td>4</td>
<td>Arctic zone and to 39° N. Lat. in Rocky Mountains</td>
<td>Paleartic</td>
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<tr>
<td><strong>Pfiasianideæ.</strong></td>
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<td>137. Meleagris</td>
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<td>E. and Central States to Canada</td>
<td>Mexico, Honduras</td>
</tr>
<tr>
<td>(Ortalida)</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Cracideæ.</strong></td>
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<tr>
<td><strong>Accipitrés.</strong></td>
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<td><strong>Vulturideæ.</strong></td>
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<td>Sub-Family (Cathartineæ.)</td>
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<td>138. Catharista</td>
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<td>139. Pseudogryphius</td>
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<td>United States to 40° N. Lat.</td>
<td>Neotropical</td>
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<td><strong>Falconideæ.</strong></td>
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<td>140. Polyborus</td>
<td>1</td>
<td>S. States to Florida &amp; California</td>
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<td>141. Circus</td>
<td>1</td>
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<td>142. Antenor</td>
<td>2</td>
<td>California and Texas</td>
<td>Neotropical</td>
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<tr>
<td>143. Astur</td>
<td>1</td>
<td>All N. America</td>
<td>Almost cosmopolite</td>
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<td>144. Accipiter</td>
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<td>145. Tachytriorchis</td>
<td>1</td>
<td>New Mexico to California</td>
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<td>146. Buteo</td>
<td>12</td>
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<td>147. Archibuteo</td>
<td>3</td>
<td>All N. America</td>
<td>N. Palaearctic</td>
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<td>148. Asturina</td>
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<td>Neotropical</td>
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<td>149. Aquila</td>
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<td>The whole region</td>
<td>Paleare, Ethiop., Indian</td>
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<td>150. Haliaeetus</td>
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<td>151. Naucerus</td>
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<tr>
<td>(Rostrhamus)</td>
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<td>Florida</td>
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<td><strong>Pandionideæ.</strong></td>
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<td>152. Elanus</td>
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<td>153. Ictinia</td>
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<td>Southern States</td>
<td>Tropical regions</td>
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<td>154. Falco</td>
<td>7</td>
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<td>Neotropical</td>
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<td>155. Hierofalco</td>
<td>2</td>
<td>N. of N. America</td>
<td>Almost cosmopolite</td>
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<td>156. Cerchneis</td>
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<td>All N. America</td>
<td>N. Palaearctic</td>
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<td><strong>Pandionideæ.</strong></td>
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<td>Temperate N. America</td>
<td>Cosmopolite</td>
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<tr>
<td>157. Pandion</td>
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### Order, Family, and Genus.

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<thead>
<tr>
<th>Genus</th>
<th>No. of Species</th>
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<tbody>
<tr>
<td>Strigidae</td>
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<tr>
<td>158. Surnia</td>
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<td>1 Arctic &amp; N. Temperate America</td>
<td>N. Palearctic</td>
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<tr>
<td>159. Nyctea</td>
<td>...</td>
<td>1 S. Carolina to Greenland</td>
<td>N. Palearctic</td>
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<td>160. Glaucomys</td>
<td>...</td>
<td>1 Oregon and California</td>
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<td>161. Mierarche</td>
<td>...</td>
<td>1 Arizona and New Mexico</td>
<td>Mexico</td>
</tr>
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<td>162. Phoebetria</td>
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<td>163. Bubo</td>
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<td>164. Scops</td>
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<td>166. Asio</td>
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<td>167. Nyctale</td>
<td>...</td>
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<td>Paleartec</td>
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<td>168. Strix</td>
<td>...</td>
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<td>Almost cosmopolete</td>
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### Peculiar or very Characteristic Genera of Wading and Swimming Birds.

#### Grallae.

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>No. of Species</th>
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<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>Scolopacidae</td>
<td>Microcelus</td>
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<td>1 N. America</td>
<td>Andes to Chili</td>
</tr>
<tr>
<td></td>
<td>Philocephala</td>
<td>...</td>
<td>1 Eastern States to Canada</td>
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#### Charadriidae.

<table>
<thead>
<tr>
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<th>No. of Species</th>
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<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>Aphriza</td>
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<td>West of S. America</td>
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#### Anseres.

#### Anatidae.

<table>
<thead>
<tr>
<th>Genus</th>
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<th>Range beyond the Region</th>
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<tbody>
<tr>
<td>Aix</td>
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<td>China</td>
</tr>
<tr>
<td>Bucephala</td>
<td>...</td>
<td>4 N. America</td>
<td>Europe</td>
</tr>
<tr>
<td>Edemis</td>
<td>...</td>
<td>3 N. America</td>
<td>Europe</td>
</tr>
<tr>
<td>Harelda</td>
<td>...</td>
<td>1 Arctic</td>
<td>Arctic Seas</td>
</tr>
<tr>
<td>Somateria</td>
<td>...</td>
<td>5 Arctic</td>
<td>North Palearctic</td>
</tr>
<tr>
<td>Camptolomus</td>
<td>...</td>
<td>1 N. E. America (? extinct)</td>
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#### Laridae.

<table>
<thead>
<tr>
<th>Genus</th>
<th>No. of Species</th>
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</thead>
<tbody>
<tr>
<td>Creagrus</td>
<td>...</td>
<td>1 California and N. Pacific coasts</td>
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CHAPTER XVI.

SUMMARY OF THE PAST CHANGES AND GENERAL RELATIONS OF THE SEVERAL REGIONS.

Having now closed our survey of the animal life of the whole earth—a survey which has necessarily been encumbered with a multiplicity of detail—we proceed to summarize the general conclusions at which we have arrived, with regard to the past history and mutual relations of the great regions into which we have divided the land surface of the globe.

All the palæontological, no less than the geological and physical evidence, at present available, points to the great land masses of the Northern Hemisphere as being of immense antiquity, and as the area in which the higher forms of life were developed. In going back through the long series of the Tertiary formations, in Europe, Asia, and North America, we find a continuous succession of vertebrate forms, including all the highest types now existing or that have existed on the earth. These extinct animals comprise ancestors or forerunners of all the chief forms now living in the Northern Hemisphere; and as we go back farther and farther into the past, we meet with ancestral forms of those types also, which are now either confined to, or specially characteristic of, the land masses of the Southern Hemisphere. Not only do we find that elephants, and rhinoceroses, and hippopotami, were once far more abundant in Europe than they are now in the tropics, but we also find that the apes of West Africa and Malaya, the lemurs of Madagascar, the Edentata of Africa and South America, and the
Marsupials of America and Australia, were all represented in Europe (and probably also in North America) during the earlier part of the Tertiary epoch. These facts, taken in their entirety, lead us to conclude that, during the whole of the Tertiary and perhaps during much of the Secondary periods, the great land masses of the earth were, as now, situated in the Northern Hemisphere; and that here alone were developed the successive types of vertebrata from the lowest to the highest. In the Southern Hemisphere there appear to have been three considerable and very ancient land masses, varying in extent from time to time, but always keeping distinct from each other, and represented, more or less completely, by Australia, South Africa, and South America of our time. Into these flowed successive waves of life, as they each in turn became temporarily united with some part of the northern land. Australia appears to have had but one such union, perhaps during the middle or latter part of the Secondary epoch, when it received the ancestors of its Monotremata and Marsupials, which it has since developed into a great variety of forms. The South African and South American lands, on the other hand, appear each to have had several successive unions and separations, allowing first of the influx of low forms only (Edentata, Insectivora and Lemurs); subsequently of Rodents and small Carnivora, and, latest of all, of the higher types of Primates, Carnivora and Ungulata.

During the whole of the Tertiary period, at least, the Northern Hemisphere appears to have been divided, as now, into an Eastern and a Western continent; always approximating and sometimes united towards the north, and then admitting of much interchange of their respective faunas; but on the whole keeping distinct, and each developing its own special family and generic types, of equally high grade, and generally belonging to the same Orders. During the Eocene and Miocene periods, the distinction of the Palæarctic and Nearctic regions was better marked than it is now; as is shown by the floras no less than by the faunas of those epochs. Dr. Newberry, in his Report on the Cretaceous and Tertiary floras of the Yellowstone and Missouri Rivers, states, that although the Miocene flora of Central North
America corresponds generally with that of the European Miocene, yet many of the tropical, and especially the Australian types, such as *Hakea* and *Dryandra*, are absent. Owing to the recent discovery of a rich Cretaceous flora in North America, probably of the same age as that of Aix-la-Chapelle in Europe, we are able to continue the comparison; and it appears, that at this early period the difference was still more marked. The predominant feature of the European Cretaceous flora seems to have been the abundance of Proteaceae, of which seven genera now living in Australia or the Cape of Good Hope have been recognised, besides others which are extinct. There are also several species of *Pandanus*, or screw-pine, now confined to the tropics of the Eastern Hemisphere, and along with these, oaks, pines, and other more temperate forms. The North American Cretaceous flora, although far richer than that of Europe, contains no Proteaceae or *Pandani*, but immense numbers of forest trees of living and extinct genera. Among the former we have oaks, beeches, willows, planes, alders, dog-wood, and cypress; together with such American forms as magnolias, sassafras, and liriodendrons. There are also a few not now found in America, as *Araucaria* and *Cinnamomum*, the latter still living in Japan. This remarkable flora has been found over a wide extent of country—New Jersey, Alabama, Kansas, and near the sources of the Missouri in the latitude of Quebec—so that we can hardly impute its peculiarly temperate character to the great elevation of so large an area. The intervening Eocene flora approximates closely, in North America, to that of the Miocene period; while in Europe it seems to have been fully as tropical in character as that of the preceding Cretaceous period; fruits of *Nipa*, *Pandanus*, *Anona*, *Acacia*, and many Proteaceae, occurring in the London clay at the mouth of the Thames.

These facts appear, at first sight, to be inconsistent, unless we suppose the climates of Europe and North America to have been widely different in these early times; but they may perhaps be harmonised, on the supposition of a more uniform and a somewhat milder climate than prevailing over the whole Northern Hemisphere; the contrast in the vegetation of these countries...
being due to a radical difference of type, and therefore not indicative of climate. The early European flora seems to have been a portion of that which now exists only in the tropical and sub-tropical lands of the Eastern Hemisphere; and, as much of this flora still survives in Australia, Tasmania, Japan, and the Cape of Good Hope, it does not necessarily imply more than a warm and equable temperate climate. The early North American flora, on the other hand, seems to have been essentially the same in type as that which now exists there, and which, in the Miocene period, was well represented in Europe; and it is such as now flourishes best in the warmer parts of the United States. But whatever conclusion we may arrive at on the question of climate, there can be no doubt as to the distinctness of the floras of the ancient Nearctic and Palaearctic regions; and the view derived from our study of their existing and extinct faunas—that these two regions have, in past times, been more clearly separated than they are now—receives strong support from the unexpected evidence now obtained as to the character and mutations of their vegetable forms, during so vast an epoch as is comprised in the whole duration of the Tertiary period.

The general phenomena of the distribution of living animals, combined with the evidence of extinct forms, lead us to conclude that the Palaearctic region of early Tertiary times was, for the most part, situated beyond the tropics, although it probably had a greater southward extension than at the present time. It certainly included much of North Africa, and perhaps reached far into what is now the Sahara; while a southward extension of its central mass may have included the Abyssinian highlands, where some truly Palaearctic forms are still found. This is rendered probable by the fossils of Perim Island a little further east, which show that the characteristic Miocene fauna of South Europe and North India prevailed so far within the tropics. There existed, however, at the extreme eastern and western limits of the region, two extensive equatorial land-areas, our Indo-Malayan and West African sub-regions—both of which must have been united for more or less considerable periods with the northern continent. They would then have received
from it such of the higher vertebrates as were best adapted for the peculiar climatal and organic conditions which everywhere prevail near the equator; and these would be preserved, under variously modified forms, when they had ceased to exist in the less favourable and constantly deteriorating climate of the north. At later epochs, both these equatorial lands became united to some part of the great South African continent (then including Madagascar), and we thus have explained many of the similarities presented by the faunas of these distant, and generally very different countries.

During the Miocene period, when a subtropical climate prevailed over much of Europe and Central Asia, there would be no such marked contrast as now prevails between temperate and tropical zones; and at this time much of our Oriental region, perhaps, formed a hardly separable portion of the great Palaearctic land. But when, from unknown causes, the climate of Europe became less genial, and when the elevation of the Himalayan chain and the Mongolian plateau caused an abrupt difference of climate on the northern and southern sides of that great mountain barrier, a tropical and a temperate region were necessarily formed; and many of the animals which once roamed over the greater part of the older and more extensive region, now became restricted to its southern or northern divisions respectively. Then came the great change we have already described (vol. i. p. 288), opening the newly-formed plains of Central Africa to the incursions of the higher forms of Europe; and following on this, a still further deterioration of climate, resulting in that marked contrast between temperate and tropical faunas, which is now one of the most prominent features in the distribution of animal as well as of vegetable forms.

It is not necessary to go into any further details here, as we have already, in our discussion of the origin of the fauna of the several regions, pointed out what changes most probably occurred in each case. These details are, however, to a great extent speculative; and they must remain so till we obtain as much knowledge of the extinct faunas and past geological history of the southern lands, as we have of those of Europe and North
America. But the broad conclusions at which we have now arrived seem to rest on a sufficiently extensive basis of facts; and they lead us to a clearer conception of the mutual relations and comparative importance of the several regions than could be obtained at an earlier stage of our inquiries.

If our views of the origin of the several regions are correct, it is clear that no mere binary division—into north and south, or into east and west—can be altogether satisfactory, since at the dawn of the Tertiary period we still find our six regions, or what may be termed the rudiments of them, already established. The north and south division truly represents the fact, that the great northern continents are the seat and birth-place of all the higher forms of life, while the southern continents have derived the greater part, if not the whole, of their vertebrate fauna from the north; but it implies the erroneous conclusion, that the chief southern lands—Australia and South America—are more closely related to each other than to the northern continent. The fact, however, is that the fauna of each has been derived, independently, and perhaps at very different times, from the north, with which they therefore have a true genetic relation; while any intercommunion between themselves has been comparatively recent and superficial, and has in no way modified the great features of animal life in each. The east and west division, represents—according to our views—a more fundamental diversity; since we find the northern continent itself so divided in the earliest Eocene, and even in Cretaceous times; while we have the strongest proof that South America was peopled from the Nearctic, and Australia and Africa from the Palæarctic region: hence, the Eastern and Western Hemispheres are the two great branches of the tree of life of our globe. But this division, taken by itself, would obscure the facts—firstly, of the close relation and parallelism of the Nearctic and Palæarctic regions, not only now but as far back as we can clearly trace them in the past; and, secondly, of the existing radical diversity of the Australian region from the rest of the Eastern Hemisphere.

Owing to the much greater extent of the old Palæarctic region (including our Oriental), and the greater diversity of
Mammalia it appears to have produced, we can have little doubt that here was the earliest seat of the development of the vertebrate type; and probably of the higher forms of insects and land-molluses. Whether the Nearctic region ever formed one mass with it, or only received successive immigrations from it by northern land-connections both in an easterly and westerly direction, we cannot decide; but the latter seems the most probable supposition. In any case, we must concede the first rank to the Palaearctic and Oriental regions, as representing the most important part of what seems always to have been the Great Continent of the earth, and the source from which all the other regions were supplied with the higher forms of life. These once formed a single great region, which has been since divided into a temperate and a tropical portion, now sufficiently distinct; while the Nearctic region has, by deterioration of climate, suffered a considerable diminution of productive area, and has in consequence lost a number of its more remarkable forms. The two temperate regions have thus come to resemble each other more than they once did, while the Oriental retains more of the zoological aspect of the great northern regions of Miocene times. The Ethiopian, from having been once an insular region, where lower types of vertebrates alone prevailed, has been so overrun with higher types from the old Palaearctic and Oriental lands that it now rivals, or even surpasses, the Oriental region in its representation of the ancient fauna of the great northern continent. Both of our tropical regions of the Eastern Hemisphere possess faunas which are, to some extent, composite, being made up in different proportions of the productions of the northern and southern continents,—the former prevailing largely in the Oriental, while the latter constitutes an important feature in the Ethiopian fauna. The Neotropical region has probably undergone great fluctuations in early times; but it was, undoubtedly, for long periods completely isolated, and then developed the Edentate type of Mammals and the Formicaroid type of Passerine birds into a variety of forms, comparable with the diversified Marsupials of Australia, and typical Passeres of the Eastern Hemisphere.
It has, however, received successive infusions of higher types from the north, which now mingle in various degrees with its lower forms. At an early period it must have received a low form of Primates, which has been developed into the two peculiar families of American monkeys; while its llamas, tapirs, deer, and peccaries, came in at a later date, and its opossums and extinct horses probably among the latest. The Australian region alone, after having been united with the great northern continent at a very early date (probably during the Secondary period) has ever since remained more or less completely isolated; and thus exhibits the development of a primeval type of mammal, almost wholly uninfluenced by any incursions of a later and higher type. In this respect it is unique among all the great regions of the earth.

We see, then, that each of our six regions has had a history of its own, the main outlines of which we have been able to trace with tolerable certainty. Each of them is now characterised—as it seems to have been in all past time of which we have any tolerably full record—by well-marked zoological features; while all are connected and related in the complex modes we have endeavoured to unravel. To combine any two or more of these regions, on account of existing similarities which are, for the most part, of recent origin, would obscure some of the most important and interesting features of their past history and present condition. And it seems no less impracticable to combine the whole into groups of higher rank; since it has been shown that there are two opposing modes of doing this, and that each of them represents but one aspect of a problem, which can only be solved by giving equal attention to all its aspects.

For reasons which have been already stated, and which are sufficiently obvious, we have relied almost exclusively on the distribution of living and extinct mammalia, in arriving at these conclusions. But we believe they will apply equally to elucidate the phenomena presented by the distribution of all terrestrial organisms, when combined with a careful consideration of the
various means of dispersal of the different groups, and the comparative longevity of their species and genera. Even insects, which are perhaps of all animals the farthest removed from mammalia in this respect, agree, in the great outlines of their distribution, with the vertebrate orders. The Regions are admittedly the same, or nearly the same for both; and the discrepancies that occur are of a nature which can be explained by two undoubted facts—the greater antiquity, and the greater facilities for dispersal, of insects.

But this principle, if sound, must be carried farther, and be applied to plants also. There are not wanting indications that this may be successfully done; and it seems not improbable, that the reason why botanists have hitherto failed to determine, with any unanimity, which are the most natural phytological regions, and to work out any connected theory of the migrations of plants, is, because they have not been furnished with the clue to the past changes of the great land masses, which could only be arrived at by such an examination of the past and present distribution of the higher animals as has been here attempted. The difficulties in the way of the study of the distribution of plants, from this point of view, will be undoubtedly very great; owing to the unusual facilities for distribution many of them possess, and the absence of any group which might take the place of the mammalia among animals, and serve as a guide and standard for the rest. We cannot expect the regions to be so well defined in the case of plants as in that of animals; and there are sure to be many anomalies and discrepancies, which will require long study to unravel. The Six Great Regions here adopted, are however, as a whole, very well characterised by their vegetable forms. The floras of tropical America, of Australia, of South Africa, and of Indo-Malaya, stand out with as much individuality as do the faunas; while the plants of the Palæarctic and Nearectic regions, exhibit resemblances and diversities, of a character not unlike those found among the animals.

This is not a mere question of applying to the vegetable kingdom a series of arbitrary divisions of the earth which have been
SUMMARY AND CONCLUSION.

found useful to zoologists; for it really involves a fundamental problem in the theory of evolution. The question we have to answer, is, firstly—whether the distribution of plants is, like that of animals, mainly and primarily dependent on the past revolutions of the earth's surface; or, whether other, and altogether distinct causes, have had a preponderating influence in determining the range and limits of vegetable forms; and, secondly—whether those revolutions have been, in their general outlines, correctly interpreted by means of a study of the distribution and affinities of the higher animals. The first question is one for botanists alone to answer; but, on the second point, the author ventures to hope for an affirmative reply, from such of his readers as will weigh carefully the facts and arguments he has adduced.

The remaining part of this volume, will consist, of a systematic review of the distribution of each family of animals, and an application of the principles already established to elucidate the chief phenomena they present. The present chapter must, therefore, be considered as the conclusion of the argumentative and theoretical part of the present work; but it must be read in connection with the various discussions in Parts II. and III., in which the conclusions to be drawn from the several groups of facts have been successively given;—and especially in connection with the general observations at the end of each of the six chapters on the Zoological Regions.

The hypothetical view, as to the more recent of the great Geographical changes of the Earth's surface, here set forth, is not the result of any preconceived theory, but has grown out of a careful study of the facts accumulated, and has led to a considerable modification of the author's previous views. It may be described, as an application of the general theory of Evolution, to solve the problem of the distribution of animals; but it also furnishes some independent support to that theory, both by showing what a great variety of curious facts are explained by its means, and by answering some of the objections,
which have been founded on supposed difficulties in the distribution of animals in space and time.

It also illustrates and supports the geological doctrine, of the general permanence of our great continents and oceans, by showing how many facts in the distribution of animals can only be explained and understood on such a supposition; and it exhibits, in a striking manner, the enormous influence of the Glacial epoch, in determining the existing zoological features of the various continents.

And, lastly, it furnishes a more consistent and intelligible idea than has yet been reached by any other mode of investigation, of all the more important changes of the earth's surface that have probably occurred during the entire Tertiary period; and of the influence of these changes, in bringing about the general features, as well as many of the more interesting details and puzzling anomalies, of the Geographical Distribution of Animals.
PART IV.

GEOGRAPHICAL ZOOLOGY:

A SYSTEMATIC SKETCH OF THE CHIEF FAMILIES OF LAND ANIMALS IN THEIR GEOGRAPHICAL RELATIONS.
INTRODUCTION.

In the preceding part of our work, we have discussed the geographical distribution of animals from the point of view of the geographer; taking the different regions of the earth in succession, and giving as full an account as our space would permit of their chief forms of animal life. Now, we proceed from the standpoint of the systematic zoologist; taking in succession each of the families with which we deal, and giving an account of the distribution, both of the entire family and, as far as practicable, of each of the genera of which it is composed. As in the former part, our mode of treatment led us to speculate on the past changes of the earth's surface; so here we shall endeavour to elucidate the past migrations of animals, and thus, to some extent, account for their actual distribution.

The tabular headings, showing the range of the family in each region, will enable the reader to determine at a glance the general distribution of the group, as soon as he has familiarised himself, by a study of our general and regional maps, with the limits of the regions and sub-regions, and the figures (1 to 4) by which the latter are indicated. Much pains have been taken, to give the number of the known genera and species in each family, correctly; but these numbers must, in most cases, only be looked upon as approximations; because, owing to constant accessions of fresh material on the one hand, and the discovery that many supposed species are only varieties, on the other, such statistics are in a continual state of fluctuation. In the number of genera there is the greatest uncertainty; as will be seen by the two sets of numbers sometimes given, which denote the genera according to different modern authorities.

Vol. II.—12
There is also a considerable difference in the dependence to be placed on the details given in the different classes of animals. In Mammalia and Birds some degree of accuracy has, it is hoped, been attained; the classification of these groups being much advanced, and the materials for their study ample. In Reptiles this is not the case, as there is no recently published work dealing with the whole subject, or with either of the larger orders. An immense number of new species and new genera of snakes and lizards, have been described in the last twenty years; and Dr. Günther—our greatest authority on reptiles in this country—has kindly assisted me in incorporating such of these as are most trustworthy, in a general system; but until entire Orders have been described or catalogued on a uniform plan, nothing more than a general approximation to the truth can be arrived at. Still, so many of the groups are well defined, and have a clearly limited distribution, that some interesting and valuable comparisons may be made.

For Fishes, the valuable "Catalogue" of Dr. Günther was available, and it has rarely been attempted to go beyond it. A large number of new species have since been described, in all parts of the world; but it is impossible to say how many of these are really new, or what genera they actually belong to. The part devoted to this Class is, therefore, practically a summary, of Dr. Günther's Catalogue; and it is believed that the discoveries since made will not materially invalidate the conclusions to be drawn from such a large number of species, which have been critically examined and classified on a uniform system by one of our most able naturalists. When a supplement to this catalogue is issued, it will be easier to make the necessary alterations in distribution, than if a mass of untrustworthy materials had been mixed up with it.

For Insects, excellent materials are furnished, in the Catalogue of Mr. Kirby for Butterflies and in that of Drs. Gemminger and Harold for Coleoptera. I have also made use of some recently published memoirs on the Insects of Japan and St. Helena, and a few other recent works; and have, I believe, elaborated a more extensive series of facts to illustrate the distribution of insects,
than has been made use of by any previous writer. Several discussions on the bearing of the facts of insect distribution, will also be found under the several Regions, in the preceding part of this work.

Terrestrial Mollusca form a group, as to the treatment of which I have most misgivings; owing to my almost entire ignorance of Malacology, and the great changes recently made in the classification of shells. There is also much uncertainty as to genera and sub-genera, which is very puzzling to one who merely wishes to get at general results. Finding it impossible to incorporate the new matter with the old, or to harmonise the different classifications of modern conchologists, I thought it better to confine myself to the standard works of Martens and Pfeiffer, with such additions of new species as I could make without fear of going far wrong. In some cases I have made use of recent monographs—especially on the shells of Europe, North America, the West Indian Islands, and the Sandwich Islands; and have, I venture to hope, not fallen into much error in the general conclusions at which I have arrived.
CHAPTER XVII.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF MAMMALIA.

Order I.—PRIMATES.

Family 1.—SIMIIDÆ. (4 Genera, 12 Species).

General Distribution.

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The Simiidae, or Anthropoid Apes, comprehend those forms of the monkey-tribe which, in general organization, approach nearest to man. They inhabit the tropics of the Old World, and are most abundant near the equator; but they are limited to certain districts, being quite unknown in eastern and southern Africa, and the whole peninsula of Hindostan.

The genus Troglodytes (or Mimetes, as it is sometimes named) comprehends the chimpanzee and gorilla. It is confined to the West African sub-region, being found on the coast about 12° North and South of the equator, from the Gambia to Benguela, and as far inland as the great equatorial forests extend. There are perhaps other species of chimpanzee; since Livingstone met with what he supposed to be a new species in the forest region west of Lake Tanganyika, while Dr. Schweinfurth found one in the country beyond the western watershed of the Nile. The gorilla is confined within narrower limits on and near the equator.
We have to pass over more than 70° of longitude before we again meet with Anthropoid Apes, in the northern part of Sumatra—where a specimen of the orang-utan (Simia satyrus) now in the Calcutta Museum, was obtained by Dr. Abel, and described by him in the Asiatic Researches, vol. xv.—and in Borneo, from which latter island almost all the specimens in European museums have been derived. There are supposed to be two species of Simia in Borneo, a larger and a smaller; but their distinctness is not admitted by all naturalists. Both appear to be confined to the swampy forests near the north, west, and south coasts.

The Gibbons, or long-armed apes, forming the genus Hylobates, (7 species) are found in all the large islands of the Indo-Malayan sub-region, except the Philippines; and also in Sylhet and Assam south of the Brahmaputra river, eastward to Cambodja and South China to the west of Canton, and in the island of Hainan.

The Siamang (Siamanga syndactyla) presents some anatomical peculiarities, and has the second and third toes united to the last joint, but in general form and structure it does not differ from Hylobates. It is the largest of the long-armed apes, and inhabits Sumatra and the Malay peninsula.

Family 2.—Semnopithecidae. (2 Genera, 30 Species.)

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The Semnopithecidae, are long-tailed monkeys without cheek-pouches, and with rather rounded faces, the muzzle not being prominent. They have nearly the same distribution as the last family, but are more widely dispersed in both Africa and Asia, one species just entering the Palæartic region.

The Eastern genus Presbytes or Semnopithecus (29 species), is spread over almost the whole of the Oriental region wherever the forests are extensive. They extend along the Himalayas to beyond Simla, where a species has been observed at an altitude of 11,000
feet, playing among fir-trees laden with snow wreaths. On the west side of India they are not found to the north of 14° N. latitude. On the east they extend into Arakan, and to Borneo and Java, but not apparently into Siam or Cambodja. Along the eastern extension of the Himalayas they again occur in East Thibet; a remarkable species with a large upturned nose (\textit{S. roxellana}) having been discovered by Père David at Moupin (about Lat. 32° N.) in the highest forests, where the winters are severe and last for several months, and where the vegetation, and the other forms of animal life, are wholly those of the Palæarctic region. It is very curious that this species should somewhat resemble the young state of the proboscis monkey (\textit{S. nasalis}), which inhabits one of the most uniform, damp, and hot climates on the globe—the river-swamps of Borneo.

\textit{Colobus}, the African genus (11 species), is very closely allied to the preceding, differing chiefly in the thumb being absent or rudimentary. They are confined to the tropical regions—Abysinia on the east, and from the Gambia to Angola and the island of Fernando Po, on the west.

**Family 3.—Cynopithecidae.** (7 Genera, 67 Species).

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This family comprehends all the monkeys with cheek pouches, and the baboons. Some of these have very long tails, some none; some are dog-faced, others tolerably round-faced; but there are so many transitions from one to the other, and such a general agreement in structure, that they are now considered to form a very natural family. Their range is more extensive than any other family of Quadrumana, since they not only occur in every part of the Ethiopian and Oriental regions, but enter the Palearctic region in the east and west, and the Australian region as far as the islands of Timor and Bataclan. The African genera
are *Myiopithecus*, *Cercopithecus*, *Cercocebus*, *Theropithecus*, and *Cynocephalus*; the Oriental genera, *Macacus*, and *Cynopithecus*.

*Myiopithecus* (1 species), consisting of the talapoin monkey of West Africa, differs from the other African monkeys in the structure of the last molar tooth; in the large ears, short face, and wide internasal septum; in this respect, as well as in its grace and gentleness, resembling some of the American monkeys.

*Cercopithecus* (24 species), contains all the more graceful and prettily coloured monkeys of tropical Africa, and comprises the guenons, the white-nosed, and the green monkeys. They range from the Gambia to the Congo, and from Abyssinia to the Zambesi.

*Cercocebus* (5 species), the mangabeys, of West Africa, are very closely allied to the eastern genus *Macacus*.

*Theropithecus* (2 species), including the gelada of Abyssinia and an allied species, resemble in form the baboons, but have the nostrils placed as in the last genus.

*Cynocephalus* (10 species), the baboons, are found in all parts of Africa. They consist of animals which vary much in appearance, but which agree in having an elongated dog-like muzzle with terminal nostrils, and being of terrestrial habits. Some of the baboons are of very large size, the mandrill (*C. maimon*) being only inferior to the orang and gorilla.

*Macacus* (25 species), is the commonest form of eastern monkey, and is found in every part of the Oriental region, as well as in North Africa, Gibraltar, Thibet, North China, and Japan; and one of the commonest species, *M. cynomolgus*, has extended its range from Java eastward to the extremity of Timor. The tail varies greatly in length, and in the Gibraltar monkey (*M. innus*) is quite absent. A remarkable species clothed with very thick fur, has lately been discovered in the snowy mountains of eastern Thibet.

*Cynopithecus* (?2 sp.).—This genus consists of a black baboon-like Ape, inhabiting Celebes, Batchian, and the Philippine Islands; but perhaps introduced by man into the latter islands and into Batchian. It is doubtful if there is more than one species. The tail of this animal is a fleshy tubercle, the nostrils as in *Macacus*, but the muzzle is very prominent; and the
development of the maxillary bones into strong lateral ridges corresponds to the structure of the most typical baboons. This species extends further east than any other quadrumanous animal.

**Family 4.—Cebidæ.** (10 Genera, 78 Species.)

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The Cebidæ, which comprehend all the larger American Monkeys, differ from those of the Old World by having an additional molar tooth in each jaw, and a broad nasal septum; while they have neither cheek-pouches nor ischial callosities, and the thumb is never completely opposable. Some have prehensile tails, especially adapting them for an arboreal life. They are divided into four sub-families,—Cebinae, Mycetinæ, Pitheciinæ, and Nyctipithecinæ. The Cebidæ are strictly confined to the forest regions of tropical America, from the southern part of Mexico to about the parallel of 30° South Latitude. The distribution of the genera is as follows:—

**Sub-family, Cebinae.**—*Cebus* (18 sp.), is the largest genus of American monkeys, and ranges from Costa Rica to Paraguay. They are commonly called sapajous. *Lagothrix* (5 sp.), the woolly monkeys, are rather larger and less active than the preceding; they are confined to the forests of the Upper Amazon Valley, and along the slopes of the Andes to Venezuela and Bolivia. *Ateles* (14 sp.), the spider monkeys, have very long limbs and tail. They range over the whole area of the family, and occur on the west side of the Equatorial Andes and on the Pacific coast of Guatemala. *Eriodes* (3 sp.), are somewhat intermediate between the last two genera, and are confined to the eastern parts of Brazil south of the equator. The three last mentioned genera have very powerful prehensile tails, the end being bare beneath; whereas the species of *Cebus* have the tail
completely covered with hair, although prehensile, and therefore not so perfect a grasping organ.

Sub-family, Mycetinae, consists of but a single genus, *Mycetes* (10 sp.), the howling monkeys, characterized by having a hollow bony vessel in the throat formed by an enlargement of the hyoid bone, which enables them to produce a wonderful howling noise. They are large, heavy animals, with a powerful and perfect prehensile tail. They range from East Guatemala to Paraguay. (Plate XIV., vol. ii., p. 24.)

Sub-family, Pitheciinae, the sakis, have a non-prehensile bushy tail. *Pithecia* (7 sp.), has the tail of moderate length; while *Brachyurus* (5 sp.) has it very short. Both appear to be restricted to the great equatorial forests of South America.

Sub-family, Nyctipithecinae, are small and elegant monkeys, with long, hairy, non-prehensile tails. *Nyctipithecus* (5 sp.), the night-monkeys or douroucoulis, have large eyes, nocturnal habits, and are somewhat lemurine in their appearance. They range from Nicaragua to the Amazon and eastern Peru. *Saimiris* or *Chrysothrix* (3 sp.), the squirrel-monkeys, are beautiful and active little creatures, found in most of the tropical forests from Costa Rica to Brazil and Bolivia. *Callithrix* (11 sp.), are somewhat intermediate between the last two genera, and are found all over South America from Panama to the southern limits of the great forests.

**Family 5.—HAPALIDÆ. (2 Genera, 32 Species.)**

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The Hapalidæ, or marmosets, are very small monkeys, which differ from the true Cebidæ in the absence of one premolar tooth, while they possess the additional molar tooth; so that while they have the same number of teeth (thirty-two) as the Old World monkeys, they differ from them even more than do the
Cebidæ. The thumb is not at all opposable, and all the fingers are armed with sharp claws. The hallux, or thumb-like great toe, is very small; the tail is long and not prehensile. The two genera Hapale (9 sp.), and Midas (24 sp.), are of doubtful value, though some naturalists have still further sub-divided them. They are confined to the tropical forests of South America, and are most abundant in the districts near the equator.

Sub-order—LEMUROIDEA.

FAMILY 6.—LEMURIDÆ. (11 Genera, 53 Species.)

The Lemuridæ, comprehending all the animals usually termed Lemurs and many of their allies, are divided by Professor Mivart—who has carefully studied the group—into four sub-families and eleven genera, as follows:

Sub-family Indrisinæ, consisting of the genus Indris (5 sp.), is confined to Madagascar.

Sub-family Lemurinæ, contains five genera, viz.:—Lemur, (15 sp.); Hapalemur (2 sp.); Microcebus (4 sp.); Chirogaleus (5 sp.); and Lepilemur (2 sp.);—all confined to Madagascar.

Sub-family Nycticebinae, contains four genera, viz.:—Nycticebus (3 sp.)—small, short-tailed, nocturnal animals, called slow-lemurs, range from East Bengal to South China, and to Borneo and Java; Loris (1 sp.)—a very small, tail-less, nocturnal lemur, which inhabits Madras, Malabar, and Ceylon; Perodicticus (1 sp.)—the potto—a small lemur with almost rudimentary forefinger, found at Sierra Leone (Plate V., vol. i., p. 264); Atecebus (1 sp.)—the angwantibo,—another extraordinary form in which the forefinger is quite absent and the first toe armed with a long claw,—inhabits Old Calabar.
Sub-family Galaginæ, contains only the genus *Galago* (14 sp.), which is confined to the African continent, ranging from Senegal and Fernando Po to Zanzibar and Natal.

**Family 7.—Tarsiidae.** (1 Genus, 1 Species.)

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The curious *Tarsius spectrum*, which constitutes this family, inhabits Sumatra, Borneo, and Celebes, which would bring it into the Australian region; but this island is altogether so anomalous that we can only consider its productions to have somewhat more affinity with the Australian than the Oriental region, but hardly to belong to either. The Tarsier is a small, long-tailed, nocturnal animal, of curious structure and appearance; and it forms the only link of connection with the next family, which it resembles in the extraordinary development of the toes, one of which is much larger and more slender than the rest. (Plate VIII., vol. i. p. 337.)

**Family 8.—Chiromyidae.** (1 Genus, 1 Species.)

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The Aye-aye, (*Chiromys*), the sole representative of this family, is confined to the island of Madagascar. It was for a long time very imperfectly known, and was supposed to belong to the Rodentia; but it has now been ascertained to be an exceedingly specialized form of the Lemuroid type, and must be considered to be one of the most extraordinary of the mammalia now inhabiting the globe. (Plate VI., vol. i., p. 278.)
Fossil Quadruped.

Not much progress has yet been made in tracing back the various forms of Apes and Monkeys to their earliest appearance on the globe; but there have been some interesting recent discoveries, which lead us to hope that the field is not yet exhausted. The following is a summary of what is known as to the early forms of each family:

Simiidae.—Two or three species of this family have been found in the Upper Miocene deposits of France and Switzerland. Pliopithecus, of which a species has been found at each locality, was allied to the gibbons (Hylobates), and perhaps to Semnopithecus. A more remarkable form, named Dryopithecus, as large as a man, and having peculiarities of structure which are thought by Gervais and Lartet to indicate a nearer approach to the human form than any existing Ape, has been found in strata of the same age in France.

Semnopithecidae.—Species of Semnopithecus have been found in the Upper Miocene of Greece, and others in the Siwalik Hills of N. W. India, also of Upper Miocene age. An allied form also occurs in the Miocene of Wurtemburg. Mesopithecus from Greece is somewhat intermediate between Semnopithecus and Macacus.

Remains supposed to be of Semnopithecus, have also occurred in the Pliocene of Montpellier.

Cynopithecidae.—Macacus has occurred in Pliocene deposits at Grays, Essex; and also in the South of France along with Cercopithecus.

Cebidae.—In the caves of Brazil remains of the genera Cebus, Myctes, Callithrix, and Hapale, have been found; as well as an extinct form of larger size—Protopithecus.

Lemuroidea.—A true lemur has recently been discovered in the Eocene of France; and it is supposed to be most nearly allied to the peculiar West African genera, Perodicticus and Arctocebus. Cynopithecus, from the Swiss Jura, is supposed to have affinities both for the Lemuridae and the American Cebidae.

In the lower Eocene of North America remains have been
discovered, which are believed to belong to this sub-order: but they form two distinct families,—Lemuravidae and Limnotheridae. Other remains from the Miocene are believed to be intermediate between these and the Cebidae,—a most interesting and suggestive affinity, if well founded. For the genera of these American Lemuroidea, see vol. i., p. 133.

General Remarks on the Distribution of Primates.

The most striking fact presented by this order, from our present point of view, is the strict limitation of well-marked families to definite areas. The Cebidae and Hapalidae would alone serve to mark out tropical America as the nucleus of one of the great zoological divisions of the earth. In the Eastern Hemisphere, the corresponding fact is the entire absence of the order from the Australian region, with the exception of one or two outlying forms, which have evidently transgressed the normal limits of their group. The separation of the Ethiopian and Oriental regions is, in this order, mainly indicated by the distribution of the genera, no one of which is common to the two regions. The two highest families, the Simiidae and the Semnopithecidae, are pretty equally distributed about two equatorial foci, one situated in West Africa, the other in the Malay archipelago,—in Borneo or the Peninsula of Malacca;—while the third family, Cynopithecidae, ranges over the whole of both regions, and somewhat overpasses their limits. The Lemuroid group, on the other hand, offers us one of the most singular phenomena in geographical distribution. It consists of three families, the species of which are grouped into six sub-families and 13 genera. One of these families and two of the sub-families, comprising 7 genera, and no less than 30 out of the total of 50 species, are confined to the one island of Madagascar. Of the remainder, 3 genera, comprising 15 species, are spread over tropical Africa; while three other genera with 5 species, inhabit certain restricted portions of India and the Malay islands. These curious facts point unmistakably to the former existence of a large tract of land in what is now the Indian Ocean, connecting Madagascar on the one hand with Ceylon, and with the Malay countries on the
other. About this same time (but perhaps not contemporaneously) Madagascar must have been connected with some portion of Southern Africa, and the whole of the country would possess no other Primates but Lemuroidea. After the Madagascar territory (very much larger than the existing island) had been separated, a connection appears to have been long maintained (probably by a northerly route) between the more equatorial portions of Asia and Africa; till those higher forms had become developed, which were afterwards differentiated into Simia, Presbytes, and Cynopithecus, on the one hand, and into Troglodytes, Colobus, and Cynocephalus, on the other. In accordance with the principle of competition so well expounded by Mr. Darwin, we can understand how, in the vast Asiatic and African area north of the Equator, with a great variety of physical conditions and the influence of a host of competing forms of life, higher types were developed than in the less extensive and long-isolated countries south of the Equator. In Madagascar, where these less complex conditions prevailed in a considerable land-area, the lowly organized Lemuroids have diverged into many specialized forms of their own peculiar type; while on the continents they have, to a great extent, become exterminated, or have maintained their existence in a few cases, in islands or in mountain ranges. In Africa the nocturnal and arboreal Galagos are adapted to a special mode of life, in which they probably have few competitors.

How and when the ancestors of the Cebidae and Hapalidae entered the South American continent, it is less easy to conceive. The only rays of light we yet have on the subject are, the supposed affinities of the fossil Cenopithecus of the Swiss, and the Lemuravidae of the North American Eocene, with both Cebidae and Lemuroids, and the fact that in Miocene or Eocene times a mild climate prevailed up to the Arctic circle. The discovery of an undoubted Lemuroid in the Eocene of Europe, indicates that the great Northern Continent was probably the birthplace of this low type of mammal, and the source whence Africa and Southern Asia were peopled with them, as it was, at a later period, with the higher forms of monkeys and apes.
Order II.—CHIROPTERA.

Family 9.—PTEROPIDÆ. (9 Genera, 65 Species.)

GENERAL DISTRIBUTION.

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The Pteropidæ, or fruit-eating Bats, sometimes called flying-foxes, are pretty evenly distributed over the tropical regions of the Old World and Australia. They range over all Africa and the whole of the Oriental Region, and northward, to Amoy in China and to the South of Japan. They are also found in the more fertile parts of Australia and Tasmania, and in the Pacific Islands as far east as the Marianne and Samoa Islands; but not in the Sandwich Islands or New Zealand.

The genera of bats are exceedingly numerous, but they are in a very unsettled state, and the synonymy is exceedingly confused. The details of their distribution cannot therefore be usefully entered into here. The Pteropidæ differ so much from all other bats, that they are considered to form a distinct suborder of Chiroptera, and by some naturalists even a distinct order of Mammalia.

No fossil Pteropidæ have been discovered.

Family 10.—PHYLLOSTOMIDÆ. (31 Genera, 60 Species.)

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The Phyllostomidæ, or simple leaf-nosed Bats, are confined to the Neotropical region, from Mexico and the Antilles to the
The southern limits of the forest region east of the Andes, and to about lat. 33° S. in Chili. None are found in the Nearctic region, with the exception of one species in California (Macrotus Californicus), closely allied to Mexican and West Indian forms. The celebrated blood-sucking vampyre bats of South America belong to this group. Two genera, Desmodus and Diphylla, form Dr. Peters' family Desmodidae. Mr. Dobson, in his recently published arrangement, divides the family into five groups:—Mormopes, Vampyri, Glossophaga, Stenodermata, and Desmodontes.

Numerous remains of extinct species of this family have been found in the bone-caves of Brazil.

**Family 11.—Rhinolophidae.** (7 Genera, 70 Species.)

The Rhinolophidae, or Horse-shoe Bats (so-called from a curiously-shaped membranous appendance to the nose), range over all the Ethiopian and Oriental regions, the southern part of the Palaearctic region, Australia and Tasmania. They are most abundant and varied in the Oriental region, where twelve genera are found; while only five inhabit the Australian and Ethiopian regions respectively. Europe has only one genus and four species, mostly found in the southern parts, and none going further north than the latitude of England, where two species occur. Two others are found in Japan, at the opposite extremity of the Palaearctic region.

The genera Nycteris and Megaderma, which range over the Ethiopian and Oriental regions to the Moluccas, are considered by Dr. Peters to form a distinct family, Megadermidae; and Mr. Dobson in his recent arrangement (published after our first
volume was printed) adopts the same family under the name of Nycteridae. The curious Indian genus *Rhinopoma*, which, following Dr. J. E. Gray, we have classed in this family, is considered by Mr. Dobson to belong to the Noctilionidae.

*Fossil Rhinolophidae.*—Remains of a species of *Rhinolophus* still living in England, have been found in Kent's Cavern, near Torquay.

**Family 12.—VESPERTILIONIDÆ.** (18 Genera, 200 Species.)

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The small bats constituting the family Vespertilionidæ, have no nose-membrane, but an internal earlet or *tragus*, and often very large ears. They range over almost the whole globe, being apparently only limited by the necessity of procuring insect food. In America they are found as far north as Hudson's Bay and the Columbia river; and in Europe they approach, if they do not pass the Arctic circle. Such remote islands as the Azores, Bermudas, Fiji Islands, Sandwich Islands, and New Zealand, all possess species of this group of bats, some of which probably inhabit every island in warm or temperate parts of the globe.

The genus *Taphozous*, which, in our Tables of Distribution in vol. i. we have included in this family, is placed by Mr. Dobson in his family Emballonuridæ, which is equivalent to our next family, Noctilionidæ.

*Fossil Vespertilionidæ.*—Several living European bats of this family—*Scotophilus murinus, Plecotus auritus, Vespertilio noctula*, and *V. pipistrellus*—have been found fossil in bone-caves in various parts of Europe.

Extinct species of *Vespertilio* have occurred in the Lower Miocene at Mayence, in the Upper Miocene of the South of France, and in the Upper Eocene of the Paris basin.

Vol. II.—13
Family 13.—Noctilionidae. (14 Genera, 50 Species.)

General Distribution.

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The Noctilionidae, or short-headed Bats, are found in every region, but are very unequally distributed. Their head-quarters is the Neotropical region, where most of the genera occur, and where they range from Mexico to Buenos Ayres and Chili, while in North America there is only one species in California. They are unknown in Australia; but one species occurs in New Zealand, and another in Norfolk Island. Several species of Dysops (or Molossus) inhabit the Oriental region; one or two species being widely distributed over the continent, while two others inhabit the Indo-Malayan Islands. A species of this same genus occurs in South Africa, and another in Madagascar and in the Island of Bourbon; while one inhabits Southern Europe and North Africa, and another is found at Amoy in China. It will be seen therefore, that these are really South American bats, which have a few allies widely scattered over the various regions of the globe. Their affinities are, according to Mr. Tomes, with the Phyllostomidae, a purely South American family. The species which forms the connecting link is the Mystacina tuberculata, a New Zealand bat, which may, with almost equal propriety be placed in either family, and which affords an interesting illustration of the many points of resemblance between the Australian and Neotropical regions.

Dr. Peters has separated this family into three,—Mormopidae, which is wholly Neotropical, and is especially abundant in the West Indian Islands; Molossidae, chiefly consisting of the genus Molossus; and Noctilionidae, comprising the remainder of the family, and wholly Neotropical. Mr. Dobson, however, classes the Mormopes with the Phyllostomidae, and reduces the
Molossi to the rank of a sub-family. In our first volume we have classed *Rhinopoma* with the Rhinolophidae, and *Taphozous* with the Vespertilionidae; but according to Mr. Dobson both these genera belong to the present family.

*Remarks on the Distribution of the Order Chiroptera.*

Although the bats, from their great powers of flight, are not amenable to the limitations which determine the distribution of other terrestrial mammals, yet certain great facts of distribution come out in a very striking manner. The speciality of the Neotropical region is well shown, not only by its exclusive possession of one large family (Phyllostomidae), but almost equally so by the total absence of two others (Pteropidæ and Rhinolophidæ). The Nearctic region is also unusually well marked, by the total absence of a family (Rhinolophidæ) which is tolerably well represented in the Palæarctic. The Pteropidæ well characterize the tropical regions of the Old World and Australia; while the Vespertilionidæ are more characteristic of the Palæarctic and Nearctic regions, which together possess about 60 species of this family.

The bats are a very difficult study, and it is quite uncertain how many distinct species are really known. Schinz, in his *Synopsis Mammalium* (1844) describes 330, while the list given by Mr. Andrew Murray in his *Geographical Distribution of Mammalia* (1866), contains 400 species. A small number of new species have been since described, but others have been sunk as synonyms, so that we can perhaps hardly obtain a nearer approximation to the truth than the last number. In Europe there are 35 species, and only 17 in North America.

*Fossil Chiroptera.*—The fossil remains of bats that have yet been discovered, being chiefly allied to forms still existing in the same countries, throw no light on the origin or affinities of this remarkable and isolated order of Mammalia; but as species very similar to those now living were in existence so far back as Miocene or even Eocene times, we may be sure the group is one of immense antiquity, and that there has been ample time for the amount of variation and extinction required to bring about
the limitation of types, and the peculiarities of distribution we now find to exist.

Order III.—INSECTIVORA.

Family 14.—GALEOPITHECIDÆ. (1 Genus, 2 Species.)

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The singular and isolated genus *Galeopithecus*, or flying lemur, has been usually placed among the Lemuroidea, but it is now considered to come best at the head of the Insectivora. Its food however, seems to be purely vegetable, and the very small, blind, and naked young, closely attached to the wrinkled skin of the mother's breast, perhaps indicates some affinity with the Marsupials. This animal seems, in fact, to be a lateral offshoot of some low form, which has survived during the process of development of the Insectivora, the Lemuroidea, and the Marsupials, from an ancestral type. Only two species are known, one found in Malacca, Sumatra, and Borneo, but not in Java; the other in the Philippine islands (Plate VIII. vol. i. p. 337).

Family 15.—MACROSCELIDIDÆ. (3 Genera, 10 Species.)

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The Macroscelides, or elephant shrews, are extraordinary little animals, with trunk-like snout and kangaroo-like hind-legs. They are almost confined to South Africa, whence they extend up the east coast as far as the Zambezi and Mozambique. A
single outlying species of *Macroscelides* inhabits Barbary and Algeria; while the two genera *Petrodromus*, and *Rhynoecyon*, each represented by a single species, have only been found at Mozambique.

**Family 16.—Tupaiidae.** (3 Genera, 10 species.)

*General Distribution.*

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The Tupaiidae are squirrel-like shrews, having bushy tails, and often climbing up trees, but also feeding on the ground and among low bushes. The typical *Tupaia* (7 species), are called ground squirrels by the Malays. They are most abundant in the Malay islands and Indo-Chinese countries, but one species is found in the Khasia Mountains, and one in the Eastern Ghauts near Madras. The small shorter-tailed *Hylomys* (2 species) is found from Tenasserim to Java and Borneo; while the elegant little *Ptilocerus* (1 species) with its long pencilled tail, is confined to Borneo; (Plate VIII. vol. i. p. 337). The family is therefore especially Malayan, with outlying species in northern and continental India.

*Extinct Species.—Oxygomphus*, found in the Tertiary deposits of Germany, is believed to belong to this family; as is *Omomys*, from the Pliocene of the United States.

**Family 17.—Erinaceidae.** (2 Genera, 15 Species.)

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The Hedgehogs, comprised in the genus *Erinaceus* (14 species), are widely distributed over the Palæarctic, and a part of the
Oriental regions; but they only occur in the Ethiopian region in South Africa and in the Deserts of the north, which more properly belong to the Palaearctic region. They are absent from the Malayan, and also from the Indo-Chinese sub-regions; except that they extend from the north of China to Amoy and Formosa, and into the temperate highlands of the Western Himalayas. The curious *Gymnura* (1 species) is found in Borneo, Sumatra, and the Malay peninsula.

*Extinct Species.*—The common hedgehog has been found fossil in several Post-tertiary deposits, while extinct species occur in the lower Miocene of Auvergne and in some other parts of Europe. Many of these remains are classed in different genera from the living species;—(*Amphechinus, Tetracus, Galerix*)

**Family 18.—CENTETIDÆ.** (6 Genera, 10 Species.)

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The Centetidæ are small animals, many of them having a spiny covering, whence the species of *Centetes* have been called Madagascar hedgehogs. The genera *Centetes* (2 species), *Hemicentetes* (1 species), *Erienus* (1 species), *Echinops* (3 species), and the recently described *Oryzorictes* (1 species), are all exclusively inhabitants of Madagascar, and are almost or quite tail-less. The remaining genus, *Solenodon*, is a more slender and active animal, with a long, rat-like tail, shrew-like head, and coarse fur; and the two known species are among the very few indigenous mammals of the West Indian islands, one being found in Cuba (Plate XVII., vol. ii., p. 67), the other in Hayti. Although presenting many points of difference in detail, the essential characters of this curious animal are, according to Professors Peters and Mivart, identical with the rest of the Centetidæ. We have thus a most remarkable and well-established case of discontinuous distribution, two portions of the same family
being now separated from each other by an extensive continent, as well as by a deep ocean.

Extinct Species.—Remains found in the Lower Miocene of the South of France are believed to belong to the genus *Echinops*, or one closely allied to it.

**Family 19.—POTAMOGALIDÆ. (1 Genus, 1 Species,)**

**General Distribution.**

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The genus *Potamogale* was founded on a curious, small, otter-like animal from West Africa, first found by M. Du Chaillu at the Gaboon, and afterwards by the Portuguese at Angola. Its affinities are with several groups of Insectivora, but it is sufficiently peculiar to require the establishment of a distinct family for its reception. (Plate V., vol. i., p. 264.)

**Family 20.—CHRYSOCHLORIDÆ. (2 Genera, 3 Species.)**

**General Distribution.**

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The Chrysochloridæ, or golden moles, of the Cape of Good Hope have been separated by Professor Mivart into two genera, *Chrysochloris* and *Chalcochloris*. They are remarkable mole-like animals, having beautiful silky fur, with a metallic lustre and changeable golden tints. They are peculiar to the Cape district, but one species extends as far north as the Mozambique territory. Their dentition is altogether peculiar, so as to completely separate them from the true moles.
Family 21.—Talpidæ. (8 Genera, 19 Species.

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The Moles comprise many extraordinary forms of small mammals especially characteristic of the temperate regions of the northern hemisphere, only sending out a few species of *Talpa* along the Himalayas as far as Assam, and even to Tenasserim, if there is no mistake about this locality; while one species is found in Formosa, the northern part of which is almost as much Palæarctic as Oriental. The genus *Talpa* (7 species), spreads over the whole Palæarctic region from Great Britain to Japan; *Scaptochirus* (1 species) is a recent discovery in North China; *Condylura* (1 species), the star-nosed mole, inhabits Eastern North America from Nova Scotia to Pennsylvania; *Scapanus* (2 species) ranges across from New York to St. Francisco; *Scalops* (3 species), the shrew-moles, range from Mexico to the great lakes on the east side of America, but on the west only to the north of Oregon. An allied genus, *Myogale* (2 species), has a curious discontinuous distribution in Europe, one species being found in South-East Russia, the other in the Pyrenees (Plate II., vol. i., p. 218). Another allied genus, *Nectogale* (1 species), has recently been described by Professor Milne-Edwards from Thibet. *Urotrichus* is a shrew-like mole which inhabits Japan, and a second species has been discovered in the mountains of British Columbia; an allied form, *Uropsilus*, inhabits East Thibet. *Anurosorex* and *Scaptonyx*, are new genera from North China.

**Extinct Species.**—The common mole has been found fossil in bone-caves and diluvial deposits, and several extinct species of mole-like animals occur in the Miocene deposits of the South of France and of Germany. These have been described under the generic names *Dimylus, Geotrypus, Hyporissus, Galeospalax*; while *Palaeospalax* has been found in the Pliocene forest-beds of Norfolk.
and Ostend. Species of *Myogale* also occur from the Miocene downwards.

**Family 22.—SORICIDÆ. (1 Genus, 11 Sub-genera, 65 Species.)**

**General Distribution.**

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The Shrews have a wide distribution, being found throughout every region except the Australian and Neotropical; although, as a species is found in Timor and in some of the Moluccas, they just enter this part of the former region, while one found in Guatemala brings them into the latter. A number of species have recently been described from India and the Malay Islands, so that the Oriental region is now the richest in shrews, having 28 species; the Nearctic comes next with 24; while the Ethiopian has 11, and the Palæartic 10 species. The sub-genera are *Crossopus, Amphisorex, Neosorex, Crocidura, Diplomesodon, Pinulia, Pachyura, Blarina, Feroculus, Anausorex.*

**Extinct Species.**—Several species of *Sorex* have been found fossil in the Miocene of the South of France, as well as the extinct genera *Mysarachne* and *Plesiosorex*; and some existing species have occurred in Bone Caves and Diluvial deposits.

**General Remarks on the Distribution of the Insectivora.**

The most prominent features in the distribution of the Insectivora are,—their complete absence from South America and Australia; the presence of *Solenodon* in two of the West Indian islands while the five allied genera are found only in Madagascar; and the absence of hedgehogs from North America. If we consider that there are only 135 known species of the order, 65 of which belong to the one genus *Sorex*; while the remaining 26 genera contain only 70 species, which have to be classed in 8 distinct families, and present such divergent and highly specialized forms as *Galéopithecus, Erinaceus, Solenodon,* and *Condyhtra,* it becomes evident that we have here the detached fragments of a much more
extensive group of animals, now almost extinct. Many of the forms continue to exist only in islands, removed from the severe competition of a varied mammalian population, as in Madagascar and the Antilles; while others appear to have escaped extermination either by their peculiar habits—as the various forms of Moles; by special protection—as in the Hedgehogs; or by a resemblance in form, coloration, and habits to dominant groups in their own district—as the Tupaias of Malay which resemble squirrels, and the Elephant-shrews of Africa which resemble the jerboas. The numerous cases of isolated and discontinuous distribution among the Insectivora, offer no difficulty from this point of view; since they are the necessary results of an extensive and widely-spread group of animals slowly becoming extinct, and continuing to exist only where special conditions have enabled them to maintain themselves in the struggle with more highly organized forms.

The fossil Insectivora do not throw much light on the early history of the order, since even as far back as the Miocene period they consist almost wholly of forms which can be referred to existing families. In North America they go back to the Eocene period, if certain doubtful remains have been rightly placed. The occurrence of fossil Centetidae in Europe, supports the view we have maintained in preceding chapters, that the existing distribution of this family between Madagascar and the Antilles, proves no direct connection between those islands, but only shows us that the family once had an extensive range.

Order IV.—Carnivora.

Family 23.—FELIDÆ. (3 Genera, 14 Sub-genera, 66 Species.)

The Cats are very widely distributed over the earth—with the exception of the Australian region and the island sub-region
of Madagascar and the Antilles—universally; ranging from the torrid zone to the Arctic regions and the Straits of Magellan. They are so uniform in their organization that many naturalists group them all under one genus, *Felis*; but it is now more usual to class at least the lynxes as a separate genus, while the hunting leopard, or cheetah, forms another. Dr. J. E. Gray divides these again, and makes 17 generic groups; but as this subdivision is not generally adopted, and does not bring out any special features of geographical distribution, I shall not further notice it.

The genus *Felis* (56 species) has the same general range as the whole family, except that it does not go so far north; the Amoor river in Eastern Asia, and 55° N. Lat. in America, marking its limits. *Lynxus* (10 species) is a more northern group, ranging to the polar regions in Europe and Asia, and to Lat. 66° N. in America, but not going further south than Northern Mexico and the European shores of the Mediterranean, except the caracal, which may be another genus, and which extends to Central India, Persia, North Africa and even the Cape of Good Hope. The lynxes are thus almost wholly peculiar to the Nearctic and Palaearctic regions. *Cynelurus* (1 species) the hunting leopard, ranges from Southern and Western India through Persia, Syria, Northern and Central Africa, to the Cape of Good Hope.

*Extinct Felidae.*—More than twenty extinct species of true Felidae have been described, ranging in time from the epoch of prehistoric man back to the Miocene or even the Eocene period. They occur in the south of England, in Central and South Europe, in North-West India, in Nebraska in North America, and in the caves of Brazil. Most of them are referred to the genus *Felis*, and closely resemble the existing lions, tigers, and other large cats. Another group however forms the genus *Machairodus*, a highly specialized form with serrated teeth. Five species have been described from Europe, Northern India, and both North and South America; and it is remarkable that they exhibit at least as wide a range, both in space and time, as the more numerous species referred to *Felis*. One of them undoubtedly coexisted
with man in England, while another, as well as the allied *Dinictis*, has been found in the Mauvais Terres of Nebraska, associated with *Anchitherium* and other extinct and equally remarkable forms, which are certainly Miocene if not, as some geologists think, belonging to the Eocene period. These facts clearly indicate that we have as yet made little approach to discovering the epoch when Felidæ originated, since the oldest forms yet discovered are typical and highly specialized representatives of a group which is itself the most specialized of the Carnivora. Another genus, *Pseudalurus*, is common to the Miocene deposits of Europe and North America.

**Family 24.—Cryptooproctidæ.** (1 Genus, 1 Species.)

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The *Cryptooprocta ferox*, a small and graceful cat-like animal, peculiar to Madagascar, was formerly classed among the Viverridæ, but is now considered by Professor Flower to constitute a distinct family between the Cats and the Civets.

**Family 25.—Viverridæ.** (8-33 Genera, 100 Species.)

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The Viverridæ comprise a number of small and moderate-sized carnivorous animals, popularly known as civets, genets, and ichneumons, highly characteristic of the Ethiopian and Oriental regions, several of the genera being common to both. A species of *Genetta*, and one of *Herpestes*, inhabit South Europe; while *Viverra* extends to the Moluccas, but is doubtfully indigenous. The extreme geographical limits of the family are marked by
Genetta in France and Spain, Viverra in Shanghai and Batchian Island, and Herpestes in Java and the Cape of Good Hope.

The following are the genera with their distribution as given by Dr. J. E. Gray in his latest British Museum Catalogue:

Sub-family Viverrinæ.—Viverra (3 species), North and tropical Africa, the whole Oriental region to the Moluccas; Viverricula (1 species), India to Java; Genetta (5 species), South Europe, Palestine, Arabia, and all Africa; Fossa (1 species), Madagascar; Linsang (2 species), Malacca to Java; Poiana (1 species), West Africa; Galidia (3 species), Madagascar; Hemigalea (1 species), Malacca and Borneo; Arctictis (1 species), Nepal to Sumatra and Java; Nandinia (1 species), West Africa; Faraadoxurus (9 species), the whole Oriental region; Paguma (3 species), Nepal to China, Sumatra, and Borneo; Arctogale (1 species), Ternasserim to Java.

Sub-family Herpestinæ.—Cynogale (1 species), Borneo; Galictis (2 species), Madagascar; Herpestes (22 species), South Palæarctic, Ethiopian, and Oriental regions; Athylax (3 species), Tropical and South Africa; Galogale (13 species), all Africa, North India, to Cambodja; Galerella (1 species), East Africa; Calictis (1 species), Ceylon (?); Ariella (1 species), South Africa; Ichneumia (4 species), Central, East, and South Africa; Bdeogale (3 species), West and East Africa; Urva (1 species), Himalayas to Aracan; Teniogale (1 species), Central India; Onychogale (1 species), Ceylon; Helogale (2 species), East and South Africa; Cynictis (3 species), South Africa.

Sub-family Rhinogalidæ.—Rhinogale (1 species), East Africa; Mungos (3 species), all Africa; Crossarchus (1 species), Tropical Africa; Eupleres (1 species), Madagascar; Suricata (1 species), South Africa.

Fossil Viverridæ.—Several species of Viverra and Genetta have been found in the Upper Miocene of France, and many extinct genera have also been discovered. The most remarkable of these was Ictitherium, from the Upper Miocene of Greece, which has also been found in Hungary, Bessarabia, and France. Some of the species were larger than any living forms of Viverridæ, and approached the hyænas. Other extinct genera are Thalassictis.
and *Soricictis* from the Upper Miocene, the former as large as a panther; *Tylodon*, of small size, from the Upper Eocene; and *Palaeonyctis* from the Lower Eocene, also small and showing a very great antiquity for this family, if really belonging to it.

**Family 26.—Proteidae.** (1 Genus, 1 Species.)

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The curious *Proteles* or Aard-wolf, a highly-modified form of hyæna, approaching the ichneumons, and feeding on white ants and carrion, is peculiar to South Africa.

**Family 27.—Hyænidae.** (1 Genus, 3 Species.)

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The Hyænas are characteristically Ethiopian, to which region two of the species are confined. The third, *Hyæna striata*, ranges over all the open country of India to the foot of the Himalayas, and through Persia, Asia Minor, and North Africa. Its fossil remains have been found in France.

**Extinct Species.**—The cave hyæna (*H. spelœna*) occurs abundantly in the caverns of this country and of Central Europe, and is supposed to be most nearly allied to the *H. crocuta* of South Africa. Another species is found in some parts of France. The earliest known true hyænas occur in the Pliocene formation in France, in the Red Crag (Older Pliocene) of England, and in the Upper Miocene of the Siwalik hills. In the Miocene period in Europe, quite distinct genera are found, such as *Hyænictis* and *Lycaena* from the Upper Miocene of Greece;
Idiatherium, supposed to be intermediate between Viverridae and Hyænidae; and Thalassictis, uniting the weasels and hyænas.

**Family 28.—Canidae.** (3 Genera, 17 Sub-Genera, 54 Species.)

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**General Distribution.**

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The Canidae, comprising the animals commonly known as dogs, wolves, and foxes, have an almost universal range over the earth, being only absent from the island sub-regions of Madagascar, the Antilles, Austro-Malaya, New Zealand, and the Pacific Islands. With the exception of two remarkable forms—the hyæna dog (*Lycaon pictus*), and the great-eared fox (*Megalotis Lalandei*), both from South Africa—all the species are usually placed in the genus *Canis*, the distribution of which will be the same as that of the family. Dr. J. E. Gray, in his arrangement of the family (Proc. Zool. Soc., 1868), subdivides it into fifteen genera, the names and general distribution of which are as follows:—

*Icticyon* (1 species), Brazil; *Cuon* (4 species), Siberia to Java; *Lupus* (5 species), North America, Europe, India to Ceylon; *Dieba* (1 species), North and West Africa; *Simenius* (1 species), Abyssinia; *Chrysocyon* (2 species), North and South America; *Canis* (4 species), India, Australia (indigenous?) *Lycalopex* (2 species), South America; *Pseudalopex* (5 species), South America and Falkland Islands; *Thous* (2 species), South America to Chili; *Vulpes* (17 species), all the great continents, except South America and Australia; *Fennicus* (4 species), all Africa; *Leucocyon* (1 species), Arctic regions; *Urocyon* (2 species), North America; *Nyctereutes* (1 species), Japan, Amoorland to Canton (Plate III., vol. i. p. 226). These are all sub-genera according to Professor Carus, except *Icticyon.* The same author makes *Lycaon* a sub-genus, while Dr. Gray makes it a sub-family!

**Extinct Species.**—The dog, wolf, and fox, are found fossil in
caverns in many parts of Europe, and several extinct species have been found in Tertiary deposits in Europe, North India, and South America. Two species have been found so far back as the Eocene of France, but the fragments discovered are not sufficient to determine the characters with any certainty. In North America, several species of Canis occur in the Pliocene of Nebraska and La Plata. The genus Galecynus, of the Pliocene of Ceninghen, and Paluocyon, of the Brazilian caves, are supposed to belong to the Canidae. Amphicyon abounded in the Miocene period, both in Europe and North America; and some of the species were as large as a tiger. Other extinct genera are, Cynodictis, Cyotherium, and Galethylax, from the Eocene of France; Pseudocyon, Simocyon, and Hemicyon, from the Miocene; but all these show transition characters to Viverridae or Ursidae, and do not perhaps belong to the present family.

**Family 29.—MUSTELIDÆ. (21–28 Genera, 92 Species.)**

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The Mustelidæ constitute one of those groups which range over the whole of the great continental areas. They may be divided into three sub-families—one, the Mustelinae, containing the weasels, gluttons, and allied forms; a second, the Lutrinae, containing the otters; and a third, often considered a distinct family, the Melininae, containing the badgers, ratels, skunks, and their allies.

In the first group (Mustelinae) the genera Martes and Putorius (13 species), range over all the Palearctic region, and a considerable part of the Oriental, extending through India to Ceylon, and to Java and Borneo. Two species of Martes (=Mustela of Baird) occur in the United States. The weasels, forming the genus Mustela (20 species), have a still wider range, extending into tropical Africa and the Cordilleras of Peru, but
not going south of the Himalayas in India. The North American species are placed in the genus *Putorius* by Professor Baird. An allied genus, *Gymnopus* (4 species), is confined to the third and fourth Oriental sub-regions. *Gulo* (1 species), the glutton, is an arctic animal keeping to the cold regions of Europe and Asia, and coming as far south as the great lakes in North America. *Galictis* (2 species), the grisons, are confined to the Neotropical region.

The Otters (Lutrinae) range over the whole area occupied by the family. They have been subdivided into a number of groups, such as *Barangia* (1 species), found only in Sumatra; *Lontra*, containing 3 South American species; *Lutra* (7 species), ranging over the whole of the Paleartctic and Oriental regions; *Nutria* (1 species), a sea-otter confined to the west coast of America from California to Chiloe; *Lutronectes* (1 species), from Japan only; *Aonyx* (5 species), found in West and South Africa, and the third and fourth Oriental sub-regions. *Hydrogale* (1 species), confined to South Africa; *Latax* (2 species), Florida and California to Canada and British Columbia; *Pteronura* (1 species), Brazil and Surinam; and *Enhydris* (1 species), the peculiar sea-otter of California, Kamschatka and Japan. The last two are the only groups of otters, besides *Lutra*, admitted by Professor Carus as genera.

The Badgers and allies (Melininae) have also a wide range, but with one exception are absent from South America. They comprise the following genera: *Arctonyx* (1 species), Nepal to Arakan; *Meles* (4 species), North Europe to Japan, and China as far south as Hongkong (Plate I., vol. i., p. 195); *Taxidea* (2 species), Central and Western North America to 58° N. Lat.; *Mydaus* (1 species), mountains of Java and Sumatra; *Melivora* (3 species), Tropical and South Africa and India to foot of Himalayas; *Mephitis* (12 species), America from Canada and British Columbia to the Straits of Magellan (Plate XX., vol. ii., p. 136). *Idonyx* (2 species), Tropical Africa to the Cape; *Helictis* (4 species), Nepal to Java, Formosa and Shanghai (Plate VII., vol. i. p. 331).

*Fossil Mustelidae.*—Species of otter, weasel, badger, and glutton, occur in European bone caves and other Post-tertiary deposits; and in North America *Galictis*, now found only in the Neotropical region, and, with *Mephitis*, occurring in Brazilian caves.

Vol. II.—14
Species of *Mustela* have been found in the Pliocene of France and of South America; and *Lutra* in the Pliocene of North America.

In the Miocene deposits of Europe several species of *Mustela* and *Lutra* have been found; with the extinct genera *Taxodon*, *Potamotherium*, and *Palaeomephitis*; as well as *Promephitis* in Greece.

In the Upper Miocene of the Siwalik Hills species of *Lutra* and *Mellivora* are found, as well as the extinct genera *Enhydrion* and *Ursitaxus*.

The family appears to have been unknown in North America during the Miocene period.

**FAMILY 30.—PROCYONIDÆ.** (4 Genera, 8 Species.)

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The Procyonidae are a small, but very curious and interesting family of bear-like quadrupeds, ranging from British Columbia and Canada on the north, to Paraguay and the limits of the tropical forests on the south.

The Racoons, forming the genus *Procyon*, are common all over North America; a well-marked variety or distinct species inhabiting the west coast, and another, most parts of South America. The genus *Nasua*, or the coatis (5 species?), extends from Mexico and Guatemala to Paraguay. The curious arboreal prehensile-tailed kinkagou (*Cercoleptes candivelvus*) is also found in Mexico and Guatemala, and in all the great forests of Peru and North Brazil. *Bassaris* (2 species), a small weasel-like animal with a banded tail, has been usually classed with the Viverridae or Mustelidae, but is now found to agree closely in all important points of internal structure with this family. It is found in California, Texas, and the highlands of Mexico, and belongs therefore as much to the Nearctic as to the Neotropical region. A second species has recently been described by Professor Peters.
from Coban in Guatemala, in which country it has also been observed by Mr. Salvin.

*Fossil Procyonidae.*—A species of *Nasua* has been found in the bone caves of Brazil, and a *Procyon* in the Pliocene or Post-pliocene deposits of Illinois and Carolina.

**Family 31.—ÆLURIDÆ.** (2 Genera, 2 Species.)

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The Panda (*Ælurus fulgens*), of the forest regions of the Eastern Himalayas and East Thibet, a small cat-like bear, has peculiarities of organization which render it necessary to place it in a family by itself. (Plate VII. vol. i. p. 331). An allied genus, *Æluroplus*, a remarkable animal of larger size and in colour nearly all white, has recently been described by Professor Milne-Edwards, from the mountains of East Thibet; so that the family may be said to inhabit the border lands of the Oriental and Palearctic regions. These animals have their nearest allies in the coatis and bears.

**Family 32.—URSIDÆ.** (5 Genera, or Sub-genera, 15 Species.)

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The Bears have a tolerably wide distribution, although they are entirely absent from the Australian and Ethiopian, and almost so from the Neotropical region, one species only being found in the Andes of Peru and Chili. They comprise the following groups, some of which are doubtfully ranked as genera.

*Thalassarctos*, the polar bear (1 species) inhabiting the Arctic regions; *Ursus*, the true bears (12 species), which range over
all the Nearctic and Palaearctic regions as far as the Atlas Mountains, the Indo-Chinese sub-region in the mountains, and to Hainan and Formosa; Helarctos, the Malay or sun-bear (1 species) confined to the Indo-Malayan sub-region; Melursus or Prochilus, the honey-bear (1 species), confined to the first and second Oriental sub-regions, over which it ranges from the Ganges to Ceylon; and Tremarctos, the spectacled bear—commonly known as Ursus ornatus—which is isolated in the Andes of Peru and Chili, and forms a distinct group.

Fossil Ursidae.—Two bears (Ursus spelæus and U. priscus) closely allied to living species, abound in the Post-tertiary deposits of Europe; and others of the same age are found in North America, as well as an extinct genus, Arctodus.

Ursus arvernensis is found in the Pliocene formation of France, and the extinct genus Leptarchus in that of North America.

Several species of Amphicyon, which appears to be an ancestral form of this family, are found in the Miocene deposits of Europe and N. India; while Ursus also occurs in the Siwalik Hills and Nerbudda deposits.

Family 33.—OTARIIDÆ. (4 Genera, 8 Species.)

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The Otariidæ, or Eared Seals, comprehending the sea-bears and sea-lions, are confined to the temperate and cold shores of the North Pacific, and to similar climates in the Southern Hemisphere, where the larger proportion of the species are found. They are entirely absent from the North Atlantic shores. Mr. J. A. Allen, in his recent discussion of this family (Bull. Harvard Museum) divides them into the following genera:—

Otaria (1 species), Temperate South America, from Chili to La Plata; Callorhinus (1 species), Behring's Straits and Kamchatka; Arctocephalus (3 species), temperate regions of the
Southern Hemisphere; Zalophus (2 species), North Pacific, from California to Japan, and the shores of Australia and New Zealand; Eumetopias (1 species), Behring’s Straits and California.

Fossil Otariidae.—Remains supposed to belong to this family have been found in the Miocene of France.

**Family 34.—Trichechidae.** (1 Genus, 1 Species.)

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The Morse, or Walrus (Trichecus rosmarus), which alone constitutes this family, is a characteristic animal of the North Polar regions, hardly passing south of the Arctic circle except on the east and west coasts of North America, where it sometimes reaches Lat. 60°. It is most abundant on the shores of Spitsbergen, but is not found on the northern shores of Asia between Long. 80° and 160° E., or on the north shores of America from 100° to 150° west.

Its remains have been found fossil in Europe as far south as France, and in America as far as Virginia; but the small fragments discovered may render the identification uncertain.

**Family 35.—Phocidae.** (13 Genera, 21 Species.)

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The earless or true Seals are pretty equally divided between the Northern and Southern Hemispheres, frequenting almost exclusively the temperate and cold regions, except two species said to occur among the West Indian islands. The genus Phoca and its close allies, as well as Halichærus and Pelagius, are
northern; while *Stenorhynchus* and *Morunga*, with their allies, are mostly southern. The genera admitted by Dr. Gray in his catalogue are as follows:

Callocephalus (3 species), Greenland, North Sea, also the Caspian Sea, and Lakes Aral and Baikal; *Pagomys* (2 species), North Sea, North Pacific, and Japan; *Pagophilus* (2 species), North Pacific and North Atlantic; *Halicyon* (1 species), North West coast of America; *Phoca* (2 species), North Atlantic and North Pacific, Japan; *Halichoerus* (1 species), Greenland, North Sea, and Baltic; *Pelagius* (2 species), Madeira, Mediterranean, Black Sea; *Stenorhynchus* (1 species), Antarctic Ocean, Falkland Islands, New Zealand; *Lobodon* (1 species), Antarctic Ocean; *Leptonyx* (1 species), Antarctic Ocean, South Australia, East Patagonia; *Ommatophoca* (1 species), Antarctic Ocean; *Morunga* (2 species), California, Falkland Islands, Temperate regions of Southern Ocean; *Cystophora* (2 species), North Atlantic, Antilles.

**Fossil Seals.**—Remains of living species of seals have been found in Post-tertiary deposits in many parts of Europe and in Algeria, as well as in New Zealand. *Pristiphoca occitana* is a fossil seal from the Pliocene of Montpellier, while a species of *Phoca* is said to have been found in the Miocene deposits of the United States.

**General Remarks on the Distribution of the Carnivora.**

**Terrestrial Carnivora.**—For the purposes of geographical distribution, the terrestrial and aquatic Carnivora differ too widely to be considered in one view, their areas being limited by barriers of a very different nature. The terrestrial Carnivora form a very extensive and considerably varied group of animals, having, with the doubtful exception of Australia, a world-wide distribution. Yet the range of modification of form is not very great, and the occurrence of three families consisting of but one species each, is an indication of a great amount of recent extinction. One of the most marked features presented by this group is its comparative scarcity in the Neotropical region, only four families being represented there (not counting the Ursidæ, which has only one Andean species), and both genera and species are few in number. Even the Procyonidæ, which are especially South
American, have but two genera and six species in that vast area. We might therefore, from these considerations alone, conclude that Carnivora are a development of the northern hemisphere, and have been introduced into the Neotropical region at a comparatively recent epoch. The claim of the Nearctic region to be kept distinct from the Palæarctic (with which some writers have wished to unite it) is well maintained by its possession of at least six species of *Mephitis*, or skunk, a group having no close allies in any other region,—and the genera *Procyon* and *Bassaris*,—for the latter, ranging from the high lands of Guatemala and Mexico to Texas and California, may be considered a Nearctic rather than a Neotropical form. In the other families, the most marked feature is the total absence of Ursidæ from the Ethiopian region. The great mass of the generic forms of Carnivora, however, are found in the Oriental and Ethiopian regions, which possess all the extensive group of Viverridæ (except a few species in the fourth Palæarctic sub-region) and a large number of Felidæ and Mustelidæ.

*Aquatic Carnivora.*—The aquatic Carnivora present no very marked features of distribution, except their preference for cold and temperate rather than tropical seas. Their nearest approximation to the terrestrial group, is supposed to be that of the Otariidæ to the Ursidæ; but this must be very remote, and the occurrence of both seals and bears in the Miocene period, shows, that until we find some late Secondary or early Tertiary formation rich in Mammalian remains, we are not likely to get at the transition forms indicating the steps by which the aquatic Carnivora were developed. The most interesting special fact of distribution to be noticed, is the occurrence of seals, closely allied to those inhabiting the northern seas, in the Caspian, Lake Aral, and Lake Baikal. In the case of the two first-named localities there is little difficulty, as they are connected with the North Sea by extensive plains of low elevation, so that a depression of less than 500 feet would open a free communication with the ocean. At a comparatively recent epoch, a great gulf of the Arctic ocean must have occupied the valley of the Irtish, and extended to the Caspian Sea; till the elevation of the Kirghiz Steppes cut off the
communication with the ocean, leaving an inland sea with its seals. Lake Baikal, however, offers much greater difficulties; since it is not only a fresh-water lake, but is situated in a mountain district nearly 2,000 feet above the sea level, and entirely separated from the plains by several hundred miles of high land. It is true that such an amount of submergence and elevation is known to have occurred in Europe so recently as during the Glacial period; but Lake Baikal is so surrounded by mountains, that it must at that time have been filled with ice, if at anything like its present elevation. Its emergence from the sea must therefore have taken place since the cold epoch, and this would imply that an enormous extent of Northern Asia has been very recently under water.

We are accustomed to look on Seals as animals which exclusively inhabit salt water; but it is probably from other causes than its saltiness that they usually keep to the open sea, and there seems no reason why fresh-water should not suit them quite as well, provided they find in it a sufficiency of food, facilities for rearing their young, and freedom from the attacks of enemies. As already remarked in vol. i. p. 218, Mr. Belt's ingenious hypothesis (founded on personal examination of the Siberian Steppes), that during the Glacial period the northern ice-cap dammed up the waters of the northward flowing Asiatic rivers, and thus formed a vast fresh-water lake which might have risen as high as Lake Baikal, seems to offer the best solution of this curious problem of distribution.

Range of Carnivora in Time.—Carnivora have been found in all the Tertiary deposits, and comprise a number of extinct genera and even families. Several genera of Canidae occur in the Upper Eocene of Europe; but the most remarkable fact is, that even in the Lower Eocene are found two well-marked forms, Palaeonyetis, one of the Viverridae, and Arctocyon, forming a distinct family type of very generalized characters, but unmistakably a carnivore. This last has been found at La Fère, in the north-east of France, in a deposit which, according to M. Gaudry, is the very lowest of the Lower Eocene formation in Europe. Arctocyon is therefore one of the oldest, if not the very oldest, of the higher forms of mammal yet discovered.
Order V.—CETACEA.

FAMILY 36.—BALÆNIDÆ. (6 Genera, 14 Species.)

General Distribution.—Temperate and Cold Seas of both Northern and Southern Hemispheres.

This family comprises the whalebone or "right" whales, the best known species being the Greenland whale (Balæna mystictetus). Allied species are found in all parts of the southern seas, as far north as the Cape of Good Hope; while some of the northern species are found off the coast of Spain, and even enter the Mediterranean. As most of the species indicated are imperfectly known, and their classification by no means well settled, no useful purpose will be served by enumerating the genera or sub-genera.

FAMILY 37.—BALÆNOPTERIDÆ. (9 Genera, 22 Species.)

General Distribution.—Cold and Temperate Seas of both Hemispheres.

This family comprises the finner whales and rorquals, and are characterised by possessing a dorsal fin and having the baleen or whalebone less developed. They are abundant in all northern seas, less so in the southern hemisphere, but they seem occasionally to enter the tropical seas. The best known genera are Megaptera (7 species); Physalus (4 species); and Balænoptera (2 species); all of which have species in the North Sea.

FAMILY 38.—CATODONTIDÆ. (4 Genera, or Sub-Genera, 6 Species.)

General Distribution.—All the Tropical Oceans, extending north and south into Temperate waters.

This family, comprising the cachalots or sperm whales, and black-fish, are separated from the true whales by having teeth in the lower jaw and no whalebone. They are pre-eminently a tropical, as distinguished from the two preceding which are
arctic and antarctic families. The spermaceti whale (*Catodon macrocephalus*) abounds in the Pacific Ocean and in the deep Moluccan Sea, and also in the Indian Ocean and the Mozambique Channel. In the Atlantic it is scarce, although it occasionally comes north as far as our shores.

The genera of Catodontidae as given by Dr. Gray are, *Catodon* (2 species?), Warm Eastern Oceans; *Physeter* (1 species), "the black fish," North Sea; *Cogia* (2 species), South Temperate Oceans; *Euphysetes* (1 species), Coast of Australia.

**Family 39.—HYPEROODONTIDÆ.** (9 Genera or Sub-Genera, 12 Species.)

*General Distribution.*—Atlantic, Mediterranean, Indian Ocean, and Southern Ocean.

This family consists of the beaked whales, which have no permanent teeth in the upper jaw. The genera, according to Dr. Gray, are, *Hyperoodon* (2 species) "bottle-nosed whales," North Sea; *Lagenocetus* (1 species), North Sea; *Epidon* (2 species), North and South Atlantic; *Petrohychus* (2 species), Mediterranean Sea and Southern Ocean; *Berardius* (1 species), New Zealand; *Xiphias* (1 species) North Atlantic; *Dolichodon* (1 species), Cape of Good Hope; *Neoziphius* (1 species) Mediterranean; *Diophodon* (1 species), Indian Ocean.

**Family 40.—MONODONTIDÆ.** (1 Genus, 1 Species.)

The "Narwhal" (*Monodon monoceros*) which constitutes this family, is placed by Dr. Gray along with the "white whales," in his family Belugidæ. It inhabits the North Sea.

**Family 41.—DELPHINIDÆ.** (24 Genera or Sub-Genera, 100 Species.)

*General Distribution.*—All Oceans, Seas, and Great Rivers of the globe.

This family, including the Porpoises, Dolphins, White Whales, &c., may be described as small, fish-shaped whales, having teeth
in both jaws. According to Dr. Gray they form seven families and 24 genera; according to Professor Carus, four sub-families and 8 genera, but as these groups appear to be established on quite different principles, and often differ widely from each other, I shall simply enumerate Dr. Gray’s genera with their distribution as given in his British Museum Catalogue.

Platanista (2 species), long-snouted porpoises, inhabiting the Ganges and Indus; *Inia* (1 species), a somewhat similar form, inhabiting the upper waters of the Amazonian rivers; *Steno* (8 species), Indian Ocean, Cape of Good Hope, and West Pacific; *Sotalia* (1 species), Guiana; *Delphinus* (10 species), all the oceans; *Clymenia* (14 species), all the oceans; *Delphinapterus* (1 species), South Atlantic; *Tursio* (7 species), Atlantic and Indian Oceans; *Eutropia* (2 species), Chili, and Cape of Good Hope; *Electra* (8 species), all the oceans; *Leucopleurus* (1 species), North Sea; *Lagenorhynchus* (1 species), North Sea; *Pseudorca* (2 species), North Sea, Tasmania; *Orcella* (2 species), Ganges; *Acanthodelphis* (1 species), Brazil; *Phocoena* (2 species), North Sea; *Neomeris* (1 species), India; *Grampus* (3 species), North Sea, Mediterranean, Cape of Good Hope; *Globiocephalus* (14 species), all the oceans; *Spherocephalus* (1 species), North Atlantic; *Orca* (9 species), Northern and Southern Oceans; *Ophisia* (1 species), North Pacific; *Beluga* (6 species), Arctic Seas, Australia; *Pontoporia* (1 species), Monte Video.

**Fossil Cetacea.**

Remains of Cetacea are tolerably abundant in Tertiary deposits, both in Europe and North America. In the Lower Pliocene of England, France, and Germany, extinct species of five or six living genera of whales and dolphins have been found; and most of these occur also in the Upper Miocene, along with many others, referred to about a dozen extinct genera.

In the Post-pliocene deposits of Vermont and South Carolina, several extinct species have been found belonging to living genera; but in the Miocene deposits of the Eastern United States cetacean remains are much more abundant, more than 30 species of
extinct whales and dolphins having been described, most of them belonging to extinct genera.

The Zeuglodontidae, an extinct family of carnivorous whales, with double-fanged serrated molar teeth, whose affinities are somewhat doubtful, are found in the older Pliocene of Europe, and in the Miocene and Eocene of the Eastern United States. Zeuglodon abounds in the United States, and one species reached a length of seventy feet. A species of this genus is said to have been found in Malta. Squalodon occurs in Europe and North America; and in the latter country four or five other genera have been described, of which one, Sauroctetes, has been found also at Buenos Ayres.

Order VI.—SIRENIA.

Family 42.—MANATIDÆ. (3 Genera, 5 Species ?)

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The Sea-cows are herbivorous aquatic animals living on the coasts or in the great rivers of several parts of the globe. Manatus (2 species) inhabits both shores of the Atlantic, one species ranging from the Gulf of Mexico to North Brazil, and ascending the Amazon far into the interior of the continent; while the other is found on the west coast of Africa. Halicore (2 species ?), the Dugong, is peculiar to the Indian Ocean, extending from Mozambique to the Red Sea, thence to Western India and Ceylon, the Malay Archipelago and the north coast of Australia. Rytina (1 species), supposed to be now extinct, inhabited recently the North Pacific, between Kamschatka and Behring's Straits.

Fossil Sirenia.—Extinct species of Manatus have been found in the Post-pliocene deposits of Eastern North America from
Maryland to Florida; and an extinct genus, *Prorastomus*, in some Tertiary deposits in the Island of Jamaica.

In Post-pliocene deposits in Siberia, remains of *Rytina* have been found; while several species of the extinct genus *Hali-therium*, perhaps intermediate between *Manatus* and *Halicore*, have been found in the older Pliocene and Upper Miocene of France and Germany.

*Order VII.—UNGULATA.*

**Family 43.—EQUIDÆ.** (1 Genus, 8 Species.)

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<th>General Distribution.</th>
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<td>Neotropical Sub-regions</td>
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The Horses, Asses, and Zebras form a highly specialized group now confined to the Ethiopian and Palæarctic regions, but during the middle and later teriaries having a very extensive range. The zebras (3 species) inhabit the greater part of the Ethiopian region, while the asses (4 species) are characteristic of the deserts of the Palæarctic region from North Africa and Syria to Western India, Mongolia, and Manchuria. The domestic horse is not known in a wild state, but its remains are found in recent deposits from Britain to the Altai Mountains, so that its disappearance is probably due to human agency.

*Extinct Equidæ.*—Extinct forms of this family are very numerous. The genus *Equus* occurs in Post-pliocene and Pliocene deposits in Europe, North America, and South America. In North America the species are most numerous. An allied genus *Hipparion*, having rudimentary lateral toes, is represented
by several species in the Pliocene of North America, while in Europe it occurs both in the Older Pliocene and Upper Miocene. Various other allied forms, in which the lateral toes are more and more developed, and most of which are now classed in a distinct family, Anchitheridæ, range back through the Miocene to the Eocene period. A sufficient account of these has already been given in vol. i. chap. vi. p. 135, to which the reader is referred for the supposed origin and migrations of the horse.

Family 44.—TAPIRIDÆ. (2 Genera? 6 Species.)

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The Tapirs form a small group of animals whose discontinuous distribution plainly indicates their approaching extinction. For a long time only two species were known, the black American, and the white-banded Malay tapir, the former confined to the equatorial forests of South America, the latter to the Malay peninsula, Sumatra, and Borneo (Plate VIII. vol. i. p. 337). Lately however another, or perhaps two distinct species (or according to Dr. J. E. Gray, four?) have been discovered in the Andes of New Granada and Ecuador, at an elevation of from 8,000 to 12,000 feet; while one or perhaps two more, forming the allied genus Elasmognathus, have been found to inhabit Central America from Panama to Guatemala.

Extinct Tapirs.—True tapirs inhabited Western Europe, from the latest Pliocene back to the earliest Miocene times; while they only occur in either North or South America in the Post-pliocene deposits and caves. The singular distribution of the living species is thus explained, since we see that they are an Old World group which only entered the American continent at a comparatively recent epoch. An ancestral form of this group—Lophiodon—is found in Miocene and Eocene deposits of
Europe and North America; while a still more ancient form of large size is found in the Lower Eocene of France and England, indicating an immense antiquity for this group of Mammalia. There are many other extinct forms connecting these with the Palæotheriidae, already noticed in chapter vi. (vol. i. pp. 119-125).

**Family 45.—**RHINOCEROTIDÆ. (1 Genus, 9 Species.)

**General Distribution.**

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Living Rhinoceroses are especially characteristic of Africa, with Northern and Malayan India. Four or perhaps five species, all two-horned, are found in Africa, where they range over the whole country south of the desert to the Cape of Good Hope. In the Oriental region there are also four or five species, which range from the forests at the foot of the Himalayas eastwards through Assam, Chittagong, and Siam, to Sumatra, Borneo and Java. Three of these are one-horned, the others found in Sumatra, and northwards to Pegu and Chittagong, two-horned. The Asiatic differ from the African species in some dental characters, but they are in other respects so much alike that they are not generally considered to form distinct genera. In his latest catalogue however (1873), Dr. Gray has four genera, *Rhinoceros* (4 species), and *Ceratotherium* (2 species), Asiatic; *Rhinaster* (2 species), and *Ceratotherium* (2 species), African.

*Extinct Rhinocerotidae.*—Numerous species of *Rhinoceros* ranged over Europe and Asia from the Post-pliocene back to the Upper Miocene period, and in North America during the Pliocene period.
only. The hornless *Acerotherium* is Miocene only, in both countries. Other genera are, *Leptodon* from Greece, and *Hyracodon* from Nebraska, both of Miocene age. More than 20 species of extinct rhinoceroses are known, and one has even been found at an altitude of 16,000 feet in Thibet.

**Family 46.—HIPPOPOTAMIDÆ.** (1 Genus, 2 Species.)

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The Hippopotamus inhabits all the great rivers of Africa; a distinct species of a smaller size being found on the west coast, and on some of the rivers flowing into Lake Tchad.

**Fossil Hippopotami.**—Eight extinct species of *Hippopotamus* are known from Europe and India, the former Post-pliocene or Pliocene, the latter of Upper Miocene age. They ranged as far north as the Thames valley. An extinct genus from the Siwalik Hills, *Merycopotamus*, according to Dr. Falconer connects *Hippopotamus* with *Anthracotherium*, an extinct form from the Miocene of Europe, allied to the swine.

**Family 47.—SUIDÆ.** (5 Genera, 22 Species.)

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The Swine may be divided into three well-marked groups, from peculiarities in their dentition. 1. The Dicotylinae, or
peccaries (1 genus, *Dicotyles*). These offer so many structural differences that they are often classed as a separate family. 2. The true swine (3 genera, *Sus*, *Potamochoerus*, and *Babirusa*); and, 3. The Phacochoerinae, or wart hogs (1 genus, *Phacochoerus*). These last are also sometimes made into a separate family, but they are hardly so distinct as the Dicotylinae.

The Peccaries (2 species), are peculiar to the Neotropical region, extending from Mexico to Paraguay. They also spread northwards into Texas, and as far as the Red River of Arkansas, thus just entering the Nearctic region; but with this exception swine are wholly absent from this region, forming an excellent feature by which to differentiate it from the Palaearctic.

*Sus* (14 species), ranges over the Palaearctic and Oriental regions and into the first Australian sub-region as far as New Guinea; but it is absent from the Ethiopian region, or barely enters it on the north-east. *Potamochoerus* (3 species?), is wholly Ethiopian (Plate V. vol. i. p. 278). *Babirusa* (1 species), is confined to two islands, Celebes and Bourn, in the first Australian sub-region.

*Phacochoerus* (2 species), ranges over tropical Africa from Abyssinia to Caffraria.

Dr. J. E. Gray divides true swine (*Sus*) into 7 genera, but it seems far better to keep them as one.

**Fossil Suidae.**—These are very numerous. Many extinct species of wild hog (*Sus*), are found in Europe and North India, ranging back from the Post-pliocene to the Upper Miocene formations. In the Miocene of Europe are numerous extinct genera, *Bothriodon*, *Anthracotherium*, *Palcochærus*, *Hyotherium*, and some others; while in the Upper Eocene occur *Cebochærus*, *Choæropotamus*, and *Acotherium*—these early forms having more resemblance to the peccaries.

None of these genera are found in America, where we have the living genus *Dicotyles* in the Post-pliocene and Pliocene deposits, both of North and South America; with a number of extinct genera in the Miocene. The chief of these are, *Elotherium*, *Perchoerus*, *Leptochoerus*, and *Nanohyus*, all from Dakota, and *Thinohyus*, from Oregon. One extinct genus, *Platygonus*, closely allied to *Dicotyles*, is found in the Post-pliocene of Nebraska.
Oregon, and Arkansas. *Elotherium* is said to be allied to the peccary and hippopotamus. *Hyopotamus*, from the Miocene of Dakota, is allied to *Anthracotherium*, and forms with it (according to Dr. Leidy) a distinct family of ancestral swine.

It thus appears, that the swine were almost equally well represented in North America and Europe, during Miocene and Pliocene times, but by entirely distinct forms; and it is a remarkable fact that these hardy omnivorous animals, should, like the horses, have entirely died out in North America, except a few peccaries which have preserved themselves in the sub-tropical parts and in the southern continent, to which they are comparatively recent emigrants. We can hardly have a more convincing proof of the vast physical changes that have occurred in the North American continent during the Pliocene and Post-pliocene epochs, than the complete extinction of these, along with so many other remarkable types of Mammalia.

According to M. Gaudry, the ancestors of all the swine, with the hippopotami and extinct *Anthracotherium, Merycopotamus*, and many allied forms,—are the *Hyracotherium* and *Pliolophus*, both found only in the London clay belonging to the Lower Eocene formation.

**FAMILY 48.—CAMELIDÆ.** (2 Genera, 6 Species).—

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<th>Neotropical Sub-regions</th>
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The Camels are an exceedingly restricted group, the majority of the species now existing only in a state of domestication. The genus *Camelus* (2 species), is a highly characteristic desert form
of the Palaearctic region, from the Sahara to Mongolia as far as Lake Baikal. *Auchenia* (4 species), comprehending the Llamas and Alpacas, is equally characteristic of the mountains and deserts of the southern part of South America. Two species entirely domesticated inhabit the Peruvian and Bolivian Andes; and two others are found in a wild state, the vicuna in the Andes of Peru and Chili (Plate XVI. vol. ii. p. 40), and the guanaco over the plains of Patagonia and Tierra del Fuego.

**Extinct Camelidae.**—No fossil remains of camels have been found in Europe, but one occurs in the deposits of the Siwalik Hills, usually classed as Upper Miocene, but which some naturalists think are more likely of Older Pliocene age. *Merycetherium*, teeth of which have been found in the Siberian drift, is supposed to belong to this family.

In North America, where no representative of the family now exists, the camel-tribe were once abundant. In the Post-pliocene deposits of California an *Auchenia* has been found, and in those of Kansas one of the extinct genus *Procamelus*. In the Pliocene period, this genus, which was closely allied to the living camels, abounded, six or seven species having been described from Nebraska and Texas, together with an allied form *Homocamelus*. In the Miocene period different genera appear,—*Pebrotherium*, and *Protomeryx*,—while a *Procamelus* has been found in deposits of this age in Virginia.

In South America a species of *Auchenia* has been found in the caves of Brazil, and others in the Pliocene deposits of the pampas, together with two extinct genera, *Palavolama* and *Camelotherium*.

We thus find the ancestors of the Camelidae in a region where they do not now exist, but which is situated so that the now widely separated living forms could easily have been derived from it. This case offers a remarkable example of the light thrown by paleontology on the distribution of living animals; and it is a warning against the too common practice of assuming the direct land connection of remote continents, in order to explain similar instances of discontinuous distribution to that of the present family.
Family 49.—Tragulidæ. (2 Genera, 6 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Paleartic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
<th>Oriental Sub-regions</th>
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The Tragulidæ are a group of small, hornless, deer-like animals, with tusks in the upper jaw, and having some structural affinities with the camels. The musk-deer was formerly classed in this family, which it resembles externally; but a minute examination of its structure by M. Milne-Edwards, has shown it to be more nearly allied to the true deer. The Chevrotains, or mouse-deer, Tragulus (5 species), range over all India to the foot of the Himalayas and Ceylon, and through Assam, Malacca, and Cambodia, to Sumatra, Borneo, and Java (Plate VIII., vol. i. p. 337). Hyomoschus (1 species), is found in West Africa.

Extinct Tragulidæ.—A species of Hyomoschus is said to have been found in the Miocene of the South of France, as well as three extinct genera, Dremotherium (also found in Greece), with Lophiomeryx from the Upper Miocene, said to be allied to Tragulus; and Amphitragulus from the Lower Miocene, of more remote affinities, and sometimes placed among the Deer. There seems to be no doubt, however, that this family existed in Europe in Miocene times; and thus another case of discontinuous distribution is satisfactorily accounted for.

Family 50.—Cervidæ. (8 Genera, 52 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Paleartic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Cervidæ, or deer tribe, are an extensive group of animals equally adapted for inhabiting forests or open plains, the Arctic
regions or the Tropics. They range in fact over the whole of the
great continents of the globe, with the one striking exception of
Africa, where they are only found on the shores of the Mediterrane-
ian which form part of the Palaearctic region. The following
is the distribution of the genera.

Akes (1 species), the elk or moose, ranges all over Northern
Europe and Asia, as far south as East Prussia, the Caucasus, and
North China; and over Arctic America to Maine on the East, and
British Columbia on the west. The American species may
however be distinct, although very closely allied to that of
Europe. Tarandus (1 species), the reindeer, has a similar range
to the last, but keeps farther north in Europe, inhabiting Green-
land and Spitzbergen; and in America extends farther south, to
New Brunswick and the north shore of Lake Superior. There
are several varieties or species of this animal confined to special
districts, but they are not yet well determined. Cervus (40
species), the true deer, have been sub-divided into numerous sub-
genera characteristic of separate districts. They range over the
whole area of the family, except that they do not go beyond
57° N. in America and a little farther in Europe and Asia. In
South America they extend over Patagonia and even to Tierra
del Fuego. They are found in the north of Africa, and over the
whole of the Oriental region, and beyond it as far as the Mo-
luccas and Timor, where however they have probably been intro-
duced by man at an early period. Dama (1 species), the fallow
deer, is a native of the shores of the Mediterranean, from Spain
and Barbary to Syria. Capreolus (2 species), the roe-deer, inhabits
all Temperate and South Europe to Syria, with a distinct species
in N. China. Cervulus (4 species), the muntjacs, are found in
all the forest districts of the Oriental region, from India and
Ceylon to China as far north as Ningpo and Formosa, also south-
ward to the Philippines, Borneo, and Java. Moschus (1 species)
the musk-deer, inhabits Central Asia from the Amoor and
Pekin, to the Himalayas and the Siamese mountains above
8000 ft. elevation. This is usually classed as a distinct family,
but M. Milne-Edwards remarks, that it differs in no important
points of organisation from the rest of the Cervidae. Hydropotes
(1 species) inhabits China from the Yang-tse Kiang northwards. This new genus has recently been discovered by Mr. Swinhoe, who says its nearest affinities are with Moschus. Other new forms are Lophotragus, and Elaphodus, both inhabiting North China; the former is hornless, the latter has very small horns about an inch long.

Extinct Deer.—Numerous extinct species of the genus Cervus are found fossil in many parts of Europe, and in all formations between the Post-pliocene and the Upper Miocene. The Elk and Reindeer are also found in caves and Post-pliocene deposits, the latter as far south as the South of France. Extinct genera only, occur in the Upper Miocene in various parts of Europe:—Micromeryx, Palaeomeryx, and Dicrocerus have been described; with others referred doubtfully to Moschus, and an allied genus Amphimoschus.

In N. America, remains of this family are very scarce, a Cervus allied to the existing wapiti deer, being found in Post-pliocene deposits, and an extinct genus, Leptomeryx, in the Upper Miocene of Dakota and Oregon. Another extinct genus, Merycodus, from the Pliocene of Oregon, is said to be allied to camels and deer.

In South America, several species of Cervus have been found in the Brazilian caves, and in the Pliocene deposits of La Plata.

It thus appears, that there are not yet sufficient materials for determining the origin and migrations of the Cervidae. There can be little doubt that they are an Old World group, and a comparatively recent development; and that some time during the Miocene period they passed to North America, and subsequently to the Southern continent. They do not however appear to have developed much in North America, owing perhaps to their finding the country already amply stocked with numerous forms of indigenous Ungulates.
FAMILY 51.—CAMELOPARDALIDÆ. (1 Genus, 1 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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Living Species.

Exinct Species.

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The Camelopardalidæ, or giraffes, now consist of but a single species which ranges over all the open country of the Ethiopian region, and is therefore almost absent from West Africa, which is more especially a forest district. During the Middle Tertiary period, however, these animals had a wider range, over Southern Europe and Western India as far as the slopes of the Himalayas.

Extinct Species.—Species of Camelopardalis have been found in Greece, the Siwalik Hills, and Perim Island at the entrance to the Red Sea; and an extinct genus, Helladotherium, more bulky but not so tall as the giraffe, ranged from the south of France to Greece and North-west India.

FAMILY 52.—BOVIDÆ. (34 Genera, 149 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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<th>Palearctic Sub-regions</th>
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This large and important family, includes all the animals commonly known as oxen, buffaloes, antelopes, sheep, and goats, which have been classed by many naturalists in at least three, and sometimes four or five, distinct families. Zoologically, they
are briefly and accurately defined as, "hollow-horned ruminants;" and, although they present wide differences in external form, they grade so insensibly into each other, that no satisfactory definition of the smaller family groups can be found. As a whole they are almost confined to the great Old World continent, only a few forms extending along the highlands and prairies of the Nearctic region; while one peculiar type is found in Celebes, an island which is almost intermediate between the Oriental and Australian regions. In each of the Old World regions there are found a characteristic set of types. Antelopes prevail in the Ethiopian region; sheep and goats in the Palaearctic; while the oxen are perhaps best developed in the Oriental region.

Sir Victor Brooke, who has paid special attention to this family, divides them into 13 sub-families, and I here adopt the arrangement of the genera and species which he has been so good as to communicate to me in MSS.

Sub-family I. Bovinæ (6 genera, 13 species). This group is one of the best marked in the family. It comprises the Oxen and Buffaloes with their allies, and has a distribution very nearly the same as that of the entire family. The genera are as follows: *Bos* (1 sp.), now represented by our domestic cattle, the descendants of the *Bos primigenius*, which ranged over a large part of Central Europe in the time of the Romans. The Chillingham wild cattle are supposed to be the nearest approach to the original species. *Bison* (2 sp.), one still wild in Poland and the Caucasus; the other in North America, ranging over the prairies west of the Mississippi, and on the eastern slopes of the Rocky Mountains (Plate XIX., vol. ii., p. 129). *Bibos* (3 sp.), the Indian wild cattle, ranging over a large part of the Oriental region, from Southern India to Assam, Burmah, the Malay Peninsula, Bornco, and Java. *Poephagus* (1 sp.), the yak, confined to the high plains of Western Thibet. *Bubalus* (5 sp.), the buffaloes, of which three species are African, ranging over all the continental parts of the Ethiopian region; one Northern and Central Indian; and the domesticated animal in South Europe and North Africa. *Anoa* (1 sp.), the small wild cow of Celebes,
a very peculiar form more nearly allied to the buffaloes than to any other type of oxen.

Sub-family II. TRAGELAPHINÆ (3 genera, 11 species). The Bovine Antelopes are large and handsome animals, mostly Ethiopian, but extending into the adjacent parts of the Palaearctic and Oriental regions. The genera are: Orcas (2 sp.), elands, inhabiting all Tropical and South Africa. Tragelaphus (8 sp.), including the bosch-bok, kudu, and other large antelopes, ranges over all Tropical and South Africa (Plate IV., vol. ii., p. 261). Portax (1 sp.) India, but rare in Madras and north of the Ganges.

Sub-family III. ORYGINÆ (2 genera, 5 species). Oryx (4 sp.) is a desert genus, ranging over all the African deserts to South Arabia and Syria; Addax (1 sp.) inhabits North Africa, North Arabia, and Syria.

Sub-family IV. HIPPOTRAGINÆ (1 genus, 3 species). The Sable Antelopes, Hippotragus, form an isolated group inhabiting the open country of Tropical Africa and south to the Cape.

Sub-family V. GAZELLINÆ (6 genera, 23 species). This is a group of small or moderate-sized animals, most abundant in the deserts on the borders of the Palaearctic, Oriental, and Ethiopian regions. Gazella (17 sp.) is typically a Palaearctic desert group, ranging over the great desert plateaus of North Africa, from Senegal and Abyssinia to Syria, Persia, Beloochistan, and the plains of India, with one outlying species in South Africa. Procavia (2 sp.), Western Thibet and Mongolia to about 110° east longitude. Antelope (1 sp.) inhabits all the plains of India. Epyceros (1 sp.) the palla, inhabits the open country of South and South-east Africa. Saiga (1 sp.) a singular sheep-faced antelope, which inhabits the steppes of Eastern Europe and Western Asia from Poland to the Irtish River, south of 55° north latitude. (Plate II., vol. i., p. 218.) Panthalops (1 sp.) confined to the highlands of Western Thibet and perhaps Turkestan.

Sub-family VI. ANTILOCAPRINÆ (1 genus, 1 species), Antilocapra, the prong-horned antelope, inhabit both sides of the Rocky Mountains, extending north to the Saskatchewan and
Columbia River, west to the coast range of California, and east to the Missouri. Its remarkable deciduous horns seem to indicate a transition to the Cervidae. (Plate XIX., vol. ii., p. 129.)

Sub-family VII. Cervicaprinae (5 genera, 21 species). This group of Antelopes is wholly confined to the continental portion of the Ethiopian region. The genera are: Cervicapra (4 sp.), Africa, south of the equator and Abyssinia; Kobus (6 sp.), grassy plains and marshes of Tropical Africa; Pellea (1 sp.), South Africa; Nanotragus (9 species), Africa, south of the Sahara; Neotragus (1 sp.) Abyssinia and East Africa.

Sub-family VIII. Cephalophineae (2 genera, 24 species), Africa and India; Cephalophus (22 sp.), continental Ethiopian region; Tetraceros (2 sp.) hilly part of all India, but rare north of the Ganges.

Sub-family IX. Alcephalinae (2 genera, 11 species), large African Antelopes, one species just entering the Palaearctic region. The genera are: Alcephalus (9 sp.) all Africa and north-east to Syria; Catoblepas (2 sp.), gnus, Africa, south of the Equator.

Sub-region X. Budorcinæ (1 genus, 2 species) Budorcas inhabits the high Himalayas from Nepal to East Thibet.

Sub-family XI. Rupicaprinae (1 genus, 2 species) the Chamois, Rupicapra, inhabit the high European Alps from the Pyrenees to the Caucasus. (Plate I., vol. i., p. 195.)

Sub-family XII. Nemorhedinae (2 genera, 10 species). These goat-like Antelopes inhabit portions of the Palaearctic and Oriental regions, as well as the Rocky Mountains in the Nearctic region. Nemorhedus (9 sp.) ranges from the Eastern Himalayas to N. China and Japan, and south to Formosa, the Malay Peninsula and Sumatra. Aploceerus (1 sp.), the mountain goat of the trappers, inhabits the northern parts of California and the Rocky Mountains.

Sub-family XIII. Caprinae (2 genera, 23 species). The Goats and Sheep form an extensive series, highly characteristic of the Palaearctic region, but with an outlying species on the Neilgherries in Southern India, and one in the Rocky Mountains and California. The genera are Capra (22 sp.) and Ovis (1 sp.).
The genus *Capra* consists of several sub-groups which have been named as genera, but it is unnecessary here to do more than divide them into "Goats and Ibexes" on the one hand and "Sheep" on the other—each comprising 11 species. The former range over all the South European Alps from Spain to the Caucasus; to Abyssinia, Persia, and Scinde; over the high Himalayas to E. Thibet and N. China; with an outlying species in the Neighgherries. The latter are only found in the mountains of Corsica, Sardinia, and Crete, in Europe; in Asia Minor, Persia, and in Central and North-Eastern Asia, with one somewhat isolated species in the Atlas mountains; while in America a species is found in the Rocky Mountains and the coast range of California. *Ovibos* (1 sp.), the musk-sheep, inhabits Arctic America north of lat. 60; but it occurs fossil in Post-glacial gravels on the Yena and Obi in Siberia, in Germany and France along with the Mammoth and with flint implements, and in caves of the Reindeer period; also in the brick earth in the south of England, associated with *Rhinoceros megacrinus* and *Elephas antiquus*.

**Extinct Bovidae.**—In the caverns and diluviums of Europe, of the Post-Pliocene period, the remains are found of extinct species of *Bos, Bison, and Capra*; and in the caverns of the south of France *Rupicapra*, and an antelope near *Hippotragus*. *Bos* and *Bison* also occur in Pliocene deposits. In the Miocene of Europe, the only remains are antelopes closely allied to existing species, and these are especially numerous in Greece, where remains referred to two living and four extinct genera have been discovered. In the Miocene of India numerous extinct species of *Bos*, and two extinct genera, *Hemibos* and *Amphibos*, have been found, one of them at a great elevation in Thibet. Antelopes, allied to living Indian species, are chiefly found in the Nerbudda deposits.

In North America, the only bovine remains are those of a *Bison*, and a sheep or goat, in the Post-pliocene deposits; and of two species of musk-sheep, sometimes classed in a distinct genus *Bootherium*, from beds of the same age in Arkansas and Ohio. *Casoryx*, from the Pliocene of Nebraska, is supposed to be allied to the antelopes and to deer.
In the caves of Brazil remains of two animals said to be ante-lopes, have been discovered. They are classed by Gervais in the genera *Antilope* and *Leptothorium*, but the presence of true ante-lopes in S. America at this period is so improbable, that there is probably some error of identification.

The extinct family Sivatheridæ, containing the extraordinary and gigantic four-horned *Sivatherium* and *Bramatherium*, of the Siwalik deposits, are most nearly allied to the antelopes.

From the preceding facts we may conclude, that the great existing development of the Bovidae is comparatively recent. The type may have originated early in the Miocene period, the oxen being at first most tropical, while the antelopes inhabited the desert zone a little further north. The sheep and goats seem to be the most recent development of the bovine type, which was probably long confined to the Eastern Hemisphere.

*General Remarks on the Distribution of the Ungulata.*

With the exception of the Australian region, from which this order of mammalia is almost entirely wanting, the Ungulata are almost universally distributed over the continental parts of all the other regions. Of the ten families, 7 are Ethiopian, 6 Oriental, 5 Palearctic, 4 Neotropical, and 3 Nearctic. The Ethiopian region owes its superiority to the exclusive possession of the hippopotamus and giraffe, both of which inhabited the Palearctic and Oriental regions in Miocene times. The excessive poverty of the Nearctic region in this order is remarkable; the swine being represented only by *Dicotylæ* in its extreme southern portion, while the Bovidae are restricted to four isolated species. Deer alone are fairly well represented. But, during the Eocene and Miocene periods, North America was wonderfully rich in varied forms of Ungulates, of which there were at least 8 or 9 families; while we have reason to believe that during the same periods the Ethiopian region was excessively poor, and that it probably received the ancestors of all its existing families from Europe or Western Asia in later Miocene or Pliocene times. Many types that once abounded in both Europe and North America are now preserved only in South America and Central or Tropical Asia,—as
the tapirs and camels; while others once confined to Europe and Asia have found a refuge in Africa,—as the hippopotamus and giraffe; so that in no other order do we find such striking examples of those radical changes in the distribution of the higher animals which were effected during the latter part of the Tertiary period. The present distribution of this order is, in fact, utterly unintelligible without reference to the numerous extinct forms of existing and allied families; but as this subject has been sufficiently discussed in the Second Part of this work (Chapters VI. and VII.) it is unnecessary to give further details here.

Order VIII.—PROBOSCIDEA.

Family 53.—ELEPHANTIDÆ. (1 Genus, 2 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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<td>Living Species.</td>
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<td>Extinct Species.</td>
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The elephants are now represented by two species, the African, which ranges all over that continent south of the Sahara, and the Indian, which is found over all the wooded parts of the Oriental region, from the slopes of the Himalayas to Ceylon, and eastward, to the frontiers of China and to Sumatra and Borneo. These, however, are but the feeble remnants of a host of gigantic creatures, which roamed over all the great continents except Australia during the Tertiary period, and several of which were contemporary with man.

Extinct Elephants.—At least 14 extinct species of Elephas, and a rather greater number of the allied genus Mastodon (distinguished by their less complex grinding teeth) have now been
discovered. Elephants ranged over all the Palaeartic and Nearctic regions in Post-Pliocene times; in Europe and Central India they go back to the Pliocene; and only in India to the Upper Miocene period; the number of species increasing as we go back to the older formations.

In North America two or three species of *Mastodon* are Post-pliocene and Pliocene; and a species is found in the caves of Brazil, and in the Pliocene deposits of the pampas of La Plata, of the Bolivian Andes, and of Honduras and the Bahamas. In Europe the genus is Upper Miocene and Pliocene, but is especially abundant in the former period. In the East, it extends from Perim island to Burmah and over all India, and is mostly Miocene, but with perhaps one species Pliocene in Central India.

An account of the range of such animals as belong to extinct families of Proboscidea, will be found in Chapters VI. and VII.; from which it will be seen that, although the family Elephantidae undoubtedly originated in the Eastern Hemisphere, it is not improbable that the first traces of the order Proboscidea are to be found in N. America.

*Order IX.—Hyracoidae.*

**Family 54.—Hyraclidæ.** (1 Genus. 10–12 Species.)

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The genus *Hyrax*, which alone constitutes this family, consists of small animals having the appearance of hares or marmots, but which more resemble the genus *Rhinoceros* in their teeth and skeleton. They range all over the Ethiopian region, except Madagascar; a peculiar species is found in Fernando Po, and they just enter the Palaeartic as far as Syria. They may therefore be considered as an exclusively Ethiopian group. In Dr. Gray's
last Catalogue (1873) he divides the genus into three—\textit{Hyrax}, \textit{Euhyrax} and \textit{Dendrohyrax}—the latter consisting of two species confined apparently to West and South Africa.

No extinct forms of this family have yet been discovered; the \textit{Hyracotherium} of the London clay (Lower Eocene) which was supposed to resemble \textit{Hyrax}, is now believed to be an ancestral type of the Suidæ or swine.

\textit{Order X.—RODENTIA.}

\textbf{Family 55.—MURIDÆ. (37 Genera, 330 Species.)}

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The Muridæ, comprising the rats and mice with their allies, are almost universally distributed over the globe (even not reckoning the domestic species which have been introduced almost everywhere by man), the exceptions being the three insular groups belonging to the Australian region, from none of which have any species yet been obtained. Before enumerating the genera it will be as well to say a few words on the peculiarities of distribution they present. The true mice, forming the genus \textit{Mus}, is distributed over the whole of the world except N. and S. America where not a single indigenous species occurs, being replaced by the genus \textit{Hesperomys}; five other genera, comprehending all the remaining species found in South America are peculiar to the Neotropical region. Three genera are confined to the Palaearctic region, and three others to the Nearctic. No less than twelve genera are exclusively Ethiopian, while only three are exclusively Oriental and three Australian.

\textit{Mus} (100-120 sp.) the Eastern Hemisphere, but absent from the Pacific and Austro-Malayan Islands, except Celebes and Papua; \textit{Lasiomys} (1 sp.) Guinea; \textit{Acanthomys} (5-6 sp.) Africa, India and
N. Australia; *Cricetomys* (1 sp.) Tropical Africa; *Saccostomus* (2 sp.) Mozambique; *Cricetus* (9 sp.) Palaearctic region and Egypt; *Cricetus* (1 sp., Milne-Edwards, 1870) Pekin; *Pseudomys* (1 sp.) Australia; *Hapalotis* (13 sp.) Australia; *Phlomys* (1 sp.) Philippines; *Platacanthomys* (1 sp., Blyth, 1865) Malabar; *Dendromys* (2 sp.) S. Africa; *Nesomyys* (1 sp. Peters, 1870) Madagascar; *Steatomys* (2 sp.) N. and S. Africa; *Pelomys* (1 sp.) Mozambique; *Reithrodon* (9 sp.) N. America, Lat. 29° to Mexico, and south to Tierra del Fuego; *Acodon* (1 sp.) Peru; *Myxomys* (1 sp.) Guatemala; *Hesperomys* (90 sp.) North and South America; *Holochilus* (4 sp.) South America; *Ocymycterus* (4 sp.) Brazil and La Plata; *Neotoma* (6 sp.) U.S., East coast to California; *Sigmodon* (2 sp.) Southern United States; *Dryomys* (1 sp.) Peru; *Neotomys* (2 sp.) S. America; *Otomyx* (6 sp.) S. and E. Africa; *Meriones = Gerbillus* (20-30 sp.) Egypt, Central Asia, India, Africa; *Rhombomys* (6 sp.) S. E. Europe, N. Africa, Central Asia; *Malacothrix* (2 sp.) South Africa; *Mystromys* (1 sp.) South Africa; *Psammomys* (1 sp.) Egypt; *Spalacomyx* (1 sp.) India; *Sminthys* (1-3 sp.) East Europe, Tartary, Siberia; *Hydromys* (5 sp.) Australia and Tasmania; *Hypogeomys* (1 sp., Grandidier, 1870) Madagascar; *Brachytarsomys* (1 sp., Günther, 1874) Madagascar; *Fiber* (2 sp.) N. America to Mexico; *Arvicola* (50 sp.) Europe to Asia Minor, North Asia, Himalayas, Temp. N. America; *Cuniculus* (1 sp.) N. E. Europe, Siberia, Greenland, Arctic America; *Myodes* (4 sp.) Europe, Siberia, Arctic America, and Northern United States; *Myospalax = Siphneus* (2 sp.) Altai Mountains and N. China; *Lophiomys* (1 sp.) S. Arabia, and N. E. Africa; *Echiothrix* (1 sp.) Australia.

Extinct Muridae.—Species of *Mus*, *Cricetus*, *Arvicola*, and *Myodes*, occur in the Post-Pliocene deposits of Europe; *Arvicola*, *Meriones*, and the extinct genus *Cricetodon*, with some others, in the Miocene.

In North America, *Fiber*, *Arvicola*, and *Neotoma*, occur in caves;

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1 Myospalax has hitherto formed part of the next family, Spalacidae; but a recent examination of its anatomy by M. Milne-Edwards shows that it belongs to the Muridae, and comes near Arvicola.

In South America *Mus*, or more probably *Hesperomys*, is abundant in Brazilian caverns, and *Oxymycterus* in the Pliocene of La Plata; while *Arvicola* is said to have occurred both in the Pliocene and Eocene deposits of the same country.

**Family 56.—SPALACIDÆ.** (7 Genera, 17 Species.)

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The Spalacidae, or mole-rats, have a straggling distribution over the Old World continents. They are found over nearly the whole of Africa, but only in the South-east of Europe, and West of Temperate Asia, but appearing again in North India, Malacca, and South China. *Ellobius* (1 sp.), is found in South Russia and South-west Siberia; *Spalax* (1 sp.), Southern Russia, West Asia, Hungary, Moldavia, and Greece (Plate II., vol. i. p. 218); *Rhizomys* (6 sp.), Abyssinia, North India, Malacca, South China; *Heterocepalus* (1 sp.), Abyssinia; *Bathyerges* (= *Orycterus* 1 sp.), South Africa; *Georychus* (6 sp.), South, Central, and East Africa; *Heliophobus* (1 sp.), Mozambique.

**Family 57.—DIPODIDÆ.** (3 Genera, 22 Species.)

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The Jerboas, or jumping mice, are especially characteristic of the regions about the eastern extremity of the Mediterranean, being found in South Russia, the Caspian district, Arabia, Egypt, Vol. II.—16
and Abyssinia; but they also extend over a large part of Africa, and eastward to India; while isolated forms occur in North America, and the Cape of Good Hope. *Dipus* = *Gerbillus* (20 sp.); inhabits North and Central Africa, South-East Europe, and across Temperate Asia to North China, also Afghanistan, India, and Ceylon; *Pedetes* (1 sp.), South Africa to Mozambique and Angola; *Jaculus* = *Meriones* (1 sp.), North America, from Nova Scotia and Canada, south to Pennsylvania and west to California and British Columbia (Plate XX., vol. ii. p. 135).

*Extinct Dipotidae.*—*Dipus* occurs fossil in the Miocene of the Alps; and an extinct genus, *Issiodromys*, said to be allied to *Pedetes* of the Cape of Good Hope, is from the Pliocene formations of Auvergne in France.

Family 58.—**MYOXIDÆ.** (1 Genus, 12 Species.)

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The Dormice (*Myoxus*), are small rodents found over all the temperate parts of the Palæartic region, from Britain to Japan; and also over most parts of Africa to the Cape, but wanting in India. Some of the African species have been separated under the name of *Graphidurus*, while those of Europe and Asia form the sub-genera *Glis*, *Muscardinus*, and *Eliomys*.

*Extinct Myoxidae.*—*Myoxus* ranges from the Post-pliocene of the Maltese caverns to the Miocene of Switzerland and the Upper Eocene of France; and an extinct genus *Brachymys* is found in the Miocene of Central Europe.
**Family 59.—SACCOMYIDÆ.** (6 Genera, 33 Species.)

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The Saccomyidae, or pouch rats, are almost wholly confined to our second Nearctic sub-region, comprising the Rocky Mountains and the elevated plains of Central North America. A few species range from this district as far as Hudson's Bay on the north, to South Carolina on the east, and to California on the west, while one genus, doubtfully placed here, goes south as far as Honduras and Trinidad. The group must therefore be considered to be pre-eminently characteristic of the Nearctic region.

The genera are,—*Dipodomys* (5 sp.), North Mexico, California, the east slope of the Rocky Mountains to the Columbia River, and one species in South Carolina; *Perognathus* (6 sp.), North Mexico, California, east slope of the Rocky Mountains to British Columbia; *Thomomys* (2 sp.), Upper Missouri, and Upper Columbia Rivers to Hudson's Bay; *Geomys* (5 sp.), North Mexico, and east slope of Rocky Mountains to Nebraska (Plate XIX., vol. ii. p. 129); *Saccomys* (1 sp.), North America, locality unknown; *Heteromys* (6 sp.), Mexico, Honduras, and Trinidad. *Geomys* and *Thomomys* constitute a separate family Geomyidae, of Professor Carus; but I follow Professor Lilljeborg, who has made a special study of the Order, in keeping them with this family.

In the Post-Pliocene deposits of Illinois and Nebraska, remains of an existing species of *Geomys* have been found.
Family 60.—Castoridae. (1 Genus, 2 Species.)

General Distribution.

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The Beavers, forming the genus Castor, consist of two species, the American (Castor canadensis) ranging over the whole of North America from Labrador to North Mexico; while the European (Castor fiber) appears to be confined to the temperate regions of Europe and Asia, from France to the River Amoor, over which extensive region it doubtless roamed in prehistoric times, although now becoming rare in many districts.

Extinct Castoridae.—Extinct species of Castor range back from the Post-pliocene to the Upper Miocene in Europe, and to the Newer Pliocene in North America. Extinct genera in Europe are, Trogontherium, Post-Pliocene and Pliocene; Chalicomys, Older Pliocene; and Stegocastor, Upper Miocene. In North America Castoroides is Post-Pliocene, and Paleocastor, Upper Miocene. The family thus first appears on the same geological horizon in both Europe and North America.

Family 61.—Sciuridae.—(8 Genera, 180-200 Species.)

General Distribution.

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The Squirrel family, comprehending also the marmots and prairie-dogs, are very widely spread over the earth. They are especially abundant in the Nearctic, Palearctic, and Oriental regions, and rather less frequent in the Ethiopian and Neotropical, in which last region they do not extend south of Paraguay. They are absent from the West Indian islands, Madagascar, and Australia, only occurring in Celebes which doubtfully belongs to the Australian region. The genera are as follows:—
Sciurus (100—120 sp., including the sub-genera Spermosciurus, Xerus, Macroxus, Rheithrosciurus, and Rhinosciurus), comprises the true squirrels, and occupies the area of the whole family wherever woods and forests occur. The approximate number of species in each region is as follows: Nearctic 18, Palæarctic 6, Ethiopian 18, Oriental 50, Australian (Celebes) 5, Neotropical 30. Sciuropterus (16—19 sp.), comprises the flat-tailed flying squirrels, which range from Lapland and Finland to North China and Japan, and southward through India and Ceylon, to Malacca and Java, with a species in Formosa; while in North America they occur from Labrador to British Columbia, and south to Minnesota and Southern California. Pteromys (12 sp.), comprising the round-tailed flying squirrels, is a more southern form, being confined to the wooded regions of India from the Western Himalayas to Java and Borneo, with species in Formosa and Japan. Tamias (5 sp.), the ground squirrels, are chiefly North American, ranging from Mexico to Puget's Sound on the west coast, and from Virginia to Montreal on the Atlantic coast; while one species is found over all northern Asia. Spermophilus (26 sp.), the pouched marmots, are confined to the Nearctic and Palæarctic regions; in the former extending from the Arctic Ocean to Mexico and the west coast, but not passing east of Lake Michigan and the lower Mississippi; in the latter from Silesia through South Russia to the Amoor and Kamschatka, most abundant in the desert plains of Tartary and Mongolia. Arctomys (8 sp.), the marmots, are found in the northern parts of North America as far down as Virginia and Nebraska to the Rocky Mountains and British Columbia, but not in California; and from the Swiss Alps eastward to Lake Baikal and Kamschatka, and south as far as the Himalayas, above 8,000 feet elevation. Cynomys (2 sp.), the prairie-dogs, inhabit the plains east of the Rocky Mountains from the Upper Missouri to the Red River and Rio Grande (Plate XIX., vol. ii. p. 129). Anomalurus (5 sp.), consists of animals which resemble flying-squirrels, but differ from all other members of the family in some points of internal structure. They form a very aberrant portion of the Sciuridae, and, according to some naturalists, a distinct family. They inhabit West Africa and the island of Fernando Po.
Extinct Sciuridae.—These are tolerably abundant. The genus *Sciurus* appears to be a remarkably ancient form, extinct species being found in the Miocene, and even in the Upper Eocene formations of Europe. *Spermophilus* goes back to the Upper Miocene; *Arctomys* to the Newer Pliocene. Extinct genera are, *Brachymys*, *Lithomys* and *Plesiarchomys*, from the European Miocene, the latter said to be intermediate between marmots and squirrels.

In North America, *Sciurus*, *Tamias*, and *Arctomys* occur in the Post-pliocene deposits only. The extinct genera are *Ischyromys*, from the Upper Miocene of Nebraska; *Paramys*, allied to the marmots, and *Sciuravus*, near the squirrels, from the Eocene of Wyoming.

Here we have unmistakable evidence that the true squirrels (*Sciurus*) are an Old World type, which has only recently entered North America; and this is in accordance with the comparative scarcity of this group in South America, a country so well adapted to them, and their great abundance in the Oriental region, which, with the Palæarctic, was probably the country of their origin and early development. The family, however, has been traced equally far back in Europe and North America, so that we have as yet no means of determining where it originated.

Family 62.—Haploodontidae.—(1 Genus, 2 Species.)

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The genus *Haploodon* or *Aplodontia*, consists of two curious rat-like animals, inhabiting the west coast of America, from the southern part of British Columbia to the mountains of California. They seem to have affinities both with the beavers and marmots, and Professor Lilljeborg constitutes a separate family to receive them.
**Family 63.—CHINCHILLIDÆ.** (3 Genera, 6 Species.)

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The Chinchillidæ, including the chinchillas and viscachas, are confined to the alpine zones of the Andes, from the boundary of Ecuador and Peru to the southern parts of Chili; and over the Pampas, to the Rio Negro on the south, and the River Uruguay on the east. *Chinchilla* (2 sp.), the true chinchillas, are found in the Andes of Chili and Peru, south of 9° S. lat., and from 8,000 to 12,000 feet elevation (Plate XVI. vol. ii. p. 40); *Lagidium* (3 sp.), the alpine viscachas, inhabit the loftiest plateaus and mountains from 11,000 to 16,000 feet, and extend furthest north of any of the family; while *Lagostomus* (1 sp.), the visscacha of the Pampas, has the range above indicated. The family is thus confined within the limits of a single sub-region.

*Extinct Chinchillidæ.—Lagostomus* has been found fossil in the caves of Brazil, and in the Pliocene deposits of La Plata. The only known extinct forms of this family are *Amblyrhiza* and *Locomys*, found in cavern-deposits in the island of Anguilla, of Post-Pliocene age. These are very interesting, as showing the greater range of this family so recently; though its absence from North America and Europe indicates that it is a peculiar development of the Neotropical region.

**Family 64.—OCTODONTIDÆ.** (8 Genera, 19 Species.)

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The Octodontidae include a number of curious and obscure rat-like animals, mostly confined to the mountains and open plains of South America, but having a few stragglers in other parts of the world, as will be seen by our notes on the genera. The most remarkable point in their distribution is, that two genera are peculiar to the West Indian islands, while no species of the family inhabits the northern half of South America. The distribution of the genera is as follows:—*Habrocomus* (2 sp.), Chili; *Capromys* (3 sp.), two of which inhabit Cuba, the third Jamaica (Plate XVII. vol. ii. p. 67); *Plagiodontia* (1 sp.), only known from Hayti; *Spalacopus*, including *Schizodon* (2 sp.), Chili, and east side of Southern Andes; *Octodon* (3 sp.), Peru, Bolivia, and Chili; *Ctenomys* (6 sp.), the tuco-tuco of the Pampas, the Campos of Brazil to Bolivia and Tierra del Fuego; *Ctenodactylus* (1 sp.), Tripoli, North Africa; *Pectinator* (1 sp.), East Africa, Abyssinia, 4,000 to 5,000 feet.

*Capromys* and *Plagiodontia*, the two West Indian genera, were classed among the Echimyidae by Mr. Waterhouse, but Professor Lilljeborg removes them to this family.

*Extinct Octodontidae.*—Species of *Ctenomys* have been found in the Pliocene of La Plata, and an extinct genus *Megamys*, said to be allied to *Capromys*, in the Eocene of the same country. In Europe, *Palaeomys* and *Archaecomys* from the lower Miocene of Germany and France, are also said to be allied to *Capromys*.

**Family 65.—ECHIMYIDÆ.** (10 Genera, 30 Species.)

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The Echimyidae, or spiny rats, are a family, chiefly South American, of which the Coypu, a large beaver-like water-rat from Peru and Chili is the best known. Two of the genera are found in South Africa, but all the rest inhabit the continent of South America, East of the Andes, none being yet known north
of Panama. The genera are as follows:—Dactylomys (2 sp.), Guiana and Brazil; Cercomys (1 sp.), Central Brazil; Lasioromys (1 sp.), San Paulo, Brazil; Petromys (1 sp.), South Africa; Myoptamus (1 sp.), the coypu, on the East side of the Andes from Peru to 42° S. lat., on the West side from 33° to 48° S. lat.; Carterodon (1 sp.), Minaes Geraes, Brazil; Aulacodes (1 sp.), West and South Africa; Mesomys (1 sp.), Borba on the Amazon; Echimys (11 sp.), from Guiana and the Ecuadorian Andes to Paraguay; Loncheres (10 sp.), New Granada to Brazil.

Fossil and Extinct Echimyidae.—The genus Carterodon was established on bones found in the Brazilian caves, and it was several years afterwards that specimens were obtained showing the animal to be a living species. Extinct species of Myoptamus and Loncheres have also been found in these caves, with the extinct genera Lonchophorus and Phyllomys.

No remains of this family have been discovered in North America; but in the Miocene and Upper Eocene deposits of France there are many species of an extinct genus Theridomys, which is said to be allied to this group or to the next (Cercolabidae). Aulacodon, from the Upper Miocene of Germany, is allied to the West African Aulacodes; and some other remains from the lower Miocene of Auvergne, are supposed to belong to Echimys.

Family 66.—Cercolabidae. (3 Genera, 13–15 Species.)

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The Cercolabidae, or arboreal porcupines, are a group of rodents entirely confined to America, where they range from the northern limit of trees on the Mackenzie River, to the southern limit of forests in Paraguay. There is however an intervening district, the Southern United States, from which they are absent. Erethizon (3 sp.), the Canadian porcupine, is found throughout
Canada and as far south as Northern Pennsylvania, and west to the Mississippi (Plate XX., vol. ii. p. 135); an allied species inhabiting the west coast from California to Alaska, and inland to the head of the Missouri River; while a third is found in the north-western part of South America; Cercolabes (12 sp.), ranges from Mexico and Guatemala to Paraguay, on the eastern side of the Andes; Chaetomys (1 sp.), North Brazil.

Extinct Cercolabidae.—A large species of Cercolabes has been found in the Brazilian caves, but none have been discovered in North America or Europe. We may conclude therefore that this is probably a South American type, which has thence spread into North America at a comparatively recent epoch. The peculiar distribution of Cercolabes may be explained by supposing it to have migrated northwards along the west coast by means of the wooded slopes of the Rocky Mountains. It could then only reach the Eastern States by way of the forest region of the great lakes, and then move southward. This it may be now doing, but it has not yet reached the Southern States of Eastern North America.

Family 67.—HYSTRICIDÆ. (3 Genera, 12 Species.)

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The true Porcupines have a very compact and well-marked distribution, over the whole of the Oriental and Ethiopian regions (except Madagascar), and the second Palearctic sub-region. There is some confusion as to their sub-division into genera, but the following are those most usually admitted:—Hystrix' (5 sp.), South Europe to the Cape of Good Hope, all India, Ceylon, and South China; Atherura (5 sp.), "brush-tailed porcupines," inhabit West Africa, India, to Siam, Sumatra, and Borneo; Acanthion (2 sp.), Nepal and Malacca, to Sumatra, Borneo, and Java.

Extinct Hystricidae.—Several extinct species of Hystrix have
been found in the Pliocene and Miocene deposits of Europe, and one in the Pliocene of Nebraska in North America.

**Family 68.—CAVIIDÆ.** (6 Genera, 28 Species.)

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The Cavies and Agoutis were placed in distinct families by Mr. Waterhouse, in which he is followed by Professor Carus, but they have been united by Professor Lilljeborg, and without pretending to decide which classification is the more correct I follow the latter, because there is a striking external resemblance between the two groups, and they have an identical distribution in the Neotropical region, and with one exception are all found east of the Andes. *Dasyprocta* (9 sp.), the agouti, ranges from Mexico to Paraguay, one species inhabiting the small West Indian islands of St. Vincent, Lucia, and Grenada; *Callogenys* (2 sp.), the paca, is found from Guatemala to Paraguay, and a second species (somewhat doubtful) in Eastern Peru; *Hydrochoerus* (1 sp.), the capybara, inhabits the banks of rivers from Guayana to La Plata; *Cavia* (9 sp.), the guinea-pigs, Brazil to the Straits of Magellan, and one species west of the Andes at Yça in Peru; *Kerodon* (6 sp.), Brazil and Peru to Magellan; *Dolichotis* (1 sp.), the Patagonian cavy, from Mendoza to 48° 30' south latitude, on sterile plains.

**Extinct Caviidæ.**—*Hydrochoerus, Callogenys, Dasyprocta,* and *Kerodon,* have occurred abundantly in the caves of Brazil, and the last-named genus in the Pliocene of La Plata. *Hydrochoerus* has been found in the Post-Pliocene deposits of South Carolina. *Cavia* and *Dasyprocta* are said to have been found in the Miocene of Switzerland and France. No well-marked extinct genera of this family have been recorded.

If the determination of the above-mentioned fossil species of *Cavia* and *Dasyprocta* are correct, it would show that this now
exclusively South American family is really derived from Europe, where it has long been extinct.

Family 69.—LAGOMYIDÆ. (1 Genus, 11 Species.)

**General Distribution.**

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The Lagomyidæ, or pikas, are small alpine and desert animals which range from the south of the Ural Mountains to Cashmere and the Himalayas, at heights of 11,000 to 14,000 feet, and northward to the Polar regions and the north-eastern extremity of Siberia. They just enter the eastern extremity of Europe as far as the Volga, but with this exception, seem strictly limited to the third Palæarctic sub-region. In America they are confined to the Rocky Mountains from about 42° to 60° north latitude.

*Extinct Lagomyidae.*—Extinct species of *Lagomys* have occurred in the southern parts of Europe, from the Post-Pliocene to the Miocene formations. *Titanomys*, an extinct genus, is found in the Miocene of France and Germany.

Family 70.—LEPORIDÆ. (1 Genus, 35–40 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Hares and Rabbits are especially characteristic of the Nearctic and Palæarctic, but are also thinly scattered over the Ethiopian and Oriental regions. In the Neotropical region they are very scarce, only one species being found in South America, in the mountains of Brazil and various parts of the Andes, while one or two of the North American species extend into Mexico.
and Guatemala. In the Nearctic region, they are most abundant in the central and western parts of the continent, and they extend to the Arctic Ocean and to Greenland. They are found in every part of the Palaearctic region, from Ireland to Japan; three species range over all India to Ceylon, and others occur in Hainan, Formosa, South China, and the mountains of Pegu; the Ethiopian region has only four or five species, mostly in the southern extremity and along the East coast. An Indian species is now wild in some parts of Java, but it has probably been introduced.

**Extinct Leporidae.**—Species of Lepus occur in the Post-Pliocene and Newer Pliocene of France; but only in the Post-Pliocene of North America, and the caves of Brazil.

**General Remarks on the Distribution of the Rodentia.**

With the exception of the Australian region and Madagascar, where Muridae alone have been found, this order is one of the most universally and evenly distributed over the entire globe. Of the sixteen families which compose it, the Palaearctic region has 10; the Ethiopian, Nearctic, and Neotropical, each 9; and the Oriental only 5. These figures are very curious and suggestive. We know that the rodentia are exceedingly ancient, since some of the living genera date back to the Eocene period; and some ancestral types might thus have reached the remote South American and South African lands at the time of one of their earliest unions with the northern continents. In both these countries the rodents diverged into many special forms, and being small animals easily able to conceal themselves, have largely survived the introduction of higher Mammalia. In the Palaearctic and Nearctic regions, their small size and faculty of hibernation may have enabled them to maintain themselves during those great physical changes which resulted in the extermination or banishment of so many of the larger and more highly organised Mammalia, to which, in these regions, they now bear a somewhat inordinate proportion. The reasons why they are now less numerous and varied in the Oriental region, may be of two kinds. The comparatively small area of that region and its
uniformity of climate, would naturally lead to less development of such a group as this, than in the vastly more extensive and varied and almost equally luxuriant Palaearctic region of Eocene and Miocene times; while on the other hand the greater number of the smaller Carnivora in the tropics during the Pliocene and Post-Pliocene epochs, would be a constant check upon the increase of these defenceless animals, and no doubt exterminate a number of them.

The Rodents thus offer a striking contrast to the Ungulates; and these two great orders afford an admirable illustration of the different way in which physical and organic changes may affect large and small herbivorous Mammalia; often leading to the extinction of the former, while favouring the comparative development of the latter.

Order XI.—EDENTATA.

Family 71.—BRADYPODIDÆ. (3 Genera, 12 Species.)

General Distribution.

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The Sloths are a remarkable group of arboreal mammals, strictly confined to the great forests of the Neotropical region, from Guatemala to Brazil and Eastern Bolivia. None are found west of the Andes, nor do they appear to extend into Paraguay, or beyond the Tropic of Capricorn on the east coast. The genera as defined by Dr. Gray in 1871 are:—*Choloepus* (2 sp.), "Sloths with two toes on fore limbs, sexes alike," Costa Rica to Brazil; *Bradypus* (2 sp.), "Sloths with three toes on fore limbs, sexes alike," Central Brazil, Amazon to Rio de Janeiro; *Aretopitheus* (8 sp.), "Sloths with three toes on fore limbs, males with a coloured patch on the back," Costa Rica to Brazil and Eastern Bolivia (Plate XIV., vol. ii. p. 24).
Extinct Bradypodidae.—In the caves of Brazil are found three extinct genera of Sloths—Caelodon, Sphenodon, and Ochotherium. More distantly allied, and probably forming distinct families, are Scelidotherium and Megatherium, from the caves of Brazil and the Pliocene deposits of La Plata and Patagonia.

Family 72.—MANIDIDÆ. (1 Genus, 8 Species.)

General Distribution.

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The Manididae, or scaly ant-eaters, are the only Edentate Mammalia found out of America. They are spread over the Ethiopian and Oriental regions; in the former from Sennaar to West Africa and the Cape; in the latter from the Himalayas to Ceylon, and Eastward to Borneo and Java, as well as to South China, as far as Amoy, Hainan, and Formosa. They have been sub-divided, according to differences in the scaly covering, into five groups, Manis, Phatagin, Smutsia, Pholidotus and Pangolin, the three former being confined to Africa, the last common to Africa and the East, while Pholidotus seems confined to Java. It is doubtful if these divisions are more than sub-genera, and as such they are treated here.

No extinct species referable to this family are yet known.

Family 72.—DASYPODIDÆ. (6 Genera, 17 Species.)

General Distribution.

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The Dasypodidae, or armadillos, are a highly characteristic Neotropical family, ranging from the northern extremity of the region
in south Texas, to 50° south latitude on the plains of Patagonia. The distribution of the genera is as follows:—Tatusia (5 sp.), has the range of the whole family from the lower Rio Grande of Texas to Patagonia; Prionodontes (1 sp.), the giant armadillo, Surinam to Paraguay; Dasypus (4 sp.), Brazil to Bolivia, Chili, and La Plata; Xenurus (3 sp.), Guiana to Paraguay; Tolypeutes (2 sp.), the three-banded armadillos, Bolivia and La Plata; Chlamydophorus (2 sp.), near Mendoza in La Plata, and Santa Cruz de la Sierra in Bolivia.

Extinct Armadillos.—Many species of Dasypus and Xenurus have been found in the caves of Brazil, together with many extinct genera—Hoplophorus, Euryodon, Heterodon, Pachytherium, and Chlamydothrichus, the latter as large as a rhinoceros. Eutatus, allied to Tolypeutes, is from the Pliocene deposits of La Plata.

Family 74.—Orycteropodidae. (1 Genus, 2 Species.)

General Distribution.

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The Aard-vark, or Cape ant-eater (Orycteropus capensis) is a curious form of Edentate animal, with the general form of an ant-eater, but with the bristly skin and long obtuse snout of a pig. A second species inhabits the interior of North-East Africa and Senegal, that of the latter country perhaps forming a third species (Plate IV. vol. i. p. 261).

Extinct Orycteropodidae.—The genus Macrotherium, remains of which occur in the Miocene deposits of France, Germany, and Greece, is allied to this group, though perhaps forming a separate family. The same may be said of the Ancylotherium, a huge animal found only in the Miocene deposits of Greece.
Family 75.—Myrmecophagidae. (3 Genera, 5 Species.)

General Distribution.

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The true ant-eaters are strictly confined to the wooded portions of the Neotropical region, ranging from Honduras to Paraguay on the East side of the Andes. The three genera now generally admitted are: Myrmecophaga (1 sp.), the great ant-eater, Northern Brazil to Paraguay; Tamandua (2 sp.), 4-toed ant-eaters, Guatemala, Ecuador to Paraguay (Plate XIV. vol. ii. p. 24); Cyclothorus (2 sp.), 2-toed ant-eaters, Honduras and Costa Rica to Brazil.

Extinct Ant-eaters.—The only extinct form of this family seems to be the Glossotherium, found in the caves of Brazil, and the Tertiary deposits of Uruguay. It is said to be allied to Myrmecophaga and Manis.

General Remarks on the Distribution of the Edentata.

These singular animals are almost confined to South America, where they constitute an important part of the fauna. In Africa, two family types are scantly represented, and one of these extends over all the Oriental region. In Pliocene and Post-Pliocene times the Edentata were wonderfully developed in South America, many of them being huge animals, rivalling in bulk, the rhinoceros and hippopotamus. As none of these forms resemble those of Africa, while the only European fossil Edentata are of African type, it seems probable that South Africa, like South America, was a centre of development for this group of mammals; and it is in the highest degree probable that, should extensive fluvial deposits of Pliocene or Miocene age be discovered in the former country, an extinct fauna, not less strange and grotesque than that of South America, will be brought to Vol. II.—17
light. From the fact that so few remains of this order occur in Europe, and those of one family type, and in Miocene deposits only, it seems a fair conclusion, that this represents an incursion of an ancient Ethiopian form into Europe analogous to that which invaded North America from the south during the Post-Pliocene epoch. The extension of the Manididae, or scaly ant-eaters, over tropical Asia may have occurred at the same, or a somewhat later epoch.

For a summary of the Numerous Edentata of North and South America which belong to extinct families, see vol. i. p. 147.

*Order XII.—MARSUPIALIA.*

**Family 76.—DIDELPHYIDÆ.** (3 Genera, 22 Species.)

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The Didelphyidae, or true opossums, range throughout all the wooded districts of the Neotropical region from the southern boundary of Texas to the River La Plata, and on the west coast to 42° S. Lat., where a species of Didelphys was obtained by Professor Cunningham. One species only is found in the Nearctic region, extending from Florida to the Hudson River, and west to the Missouri. The species named Didelphys californica inhabits Mexico, and only extends into the southern extremity of California. The species are most numerous in the great forest region of Brazil, and they have been recently found to the west of the Andes near Guayaquil, as well as in Chili. The exact number of species is very doubtful, owing to the difficulty of determining them from dried skins. All but two belong to the genus Didelphys, which has the range above given for the family (Plate XIV., vol. ii. p. 24); Chironectes (1 sp.), the yapock or water opossum, inhabits Guiana and Brazil; Hyracodon (1 sp.), is a small
rat-like animal discovered by Mr. Fraser in Ecuador, and which may perhaps belong to another family.

*Extinct Didelphyidae.*—No less than seven species of *Didelphys* have been found in the caves of Brazil, but none in the older formations. In North America the living species only, has been found in Post-Pliocene deposits. In Europe, however, many species of small opossums, now classed as a distinct genus, *Peratherium*, have been found in various Tertiary deposits from the Upper Miocene to the Upper Eocene.

We have here a sufficient proof that the American Marsupials have nothing to do with those of Australia, but were derived from Europe, where their ancestors lived during a long series of ages.

**Family 77.—DASYURIDÆ. (10 Genera, 30 Species.)**

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The Dasyuridæ, or native cats, are a group of carnivorous or insectivorous marsupials, ranging from the size of a wolf to that of a mouse. They are found all over Australia and Tasmania, as well as in New Guinea and the adjacent Papuan islands. Several new genera and species have recently been described by Mr. G. Krefft, of the Sydney Museum, and are included in the following enumeration. *Phasgale* (3 sp.), New Guinea, West, East, and South Australia; *Antechinomys* (1 sp.), Interior of South Australia; *Antechinus* (12 sp.), Aru Islands, all Australia, and Tasmania; *Chactocerus* (1 sp.), South Australia; *Dactylopsila* (1 sp.), Aru Islands and North Australia; *Podabrus* (5 sp.), West, East, and South Australia, and Tasmania; *Myoictis* (1 sp.), Aru Islands; *Sarcophilus* (1 sp.), Tasmania; *Dasyurus* (4 sp.), North, East, and South, Australia, and Tasmania; *Thylacinus* (1 sp.), Tasmania (Plate XL, vol. i. p. 439).

Extinct species of *Dasyurus* and *Thylacinus* have been found in the Post-Pliocene deposits of Australia.
**Family 78.—Myrmecobiidae.** (1 Genus, 1 Species.)

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The only representative of this family is the *Myrmecobius fasciatus*, or native ant-eater, a small bushy-tailed squirrel-like animal, found in the South and West of Australia.

**Family 79.—Peramelidae.** (3 Genera, 10 Species.)

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The Peramelidae, or bandicoots, are small insectivorous Marsupials, having something of the form of the kangaroos. They range over the whole of Australia and Tasmania, as well as the Papuan Islands. The genus *Perameles* (8 sp.), has the range of the family, one species being found in New Guinea and the Aru Islands (Plate XI., vol. i. p. 440); *Peragalea* (1 sp.), inhabits West Australia only; and *Chaeopus* (1 sp.), a beautiful little animal with something of the appearance of a mouse-deer, is found in both South, East, and West Australia.

**Family 80.—Macropodidae.** (10 Genera, 56 Species.)

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The well-known Kangaroos are the most largely developed family of Marsupials, and they appear to be the form best adapted for the present conditions of life in Australia, over every part of which they range. One genus of true terrestrial kangaroos (*Dorcopsis*), inhabits the Papuan Islands, as do also the curious tree kangaroos (*Dendrolagus*) which, without much apparent modification of form, are able to climb trees and feed upon the foliage. The genera, as established by Mr. Waterhouse, are as follows: *Macropus* (4 sp.), West, South, and East Australia, and Tasmania (Plate XII., vol. i. p. 441); *Oosphranter* (5 sp.), all Australia; *Halmaturus* (18 sp.), all Australia and Tasmania; *Petrogale* (7 sp.), all Australia; *Dendrolagus* (2 sp.), New Guinea (Plate X., vol. i. p. 414); *Dorcopsis* (2 sp.) Aru and Mysol Islands, and New Guinea; *Onychogalea* (3 sp.), Central Australia; *Lagorchestes* (5 sp.), North, West, and South Australia; *Bettongia* (6 sp.), West, South, and East, Australia, and Tasmania; *Hypsiprymnus* (4 sp.), West and East Australia, and Tasmania.

**Extinct Macropodidae.**—Many species of the genera *Macropus* and *Hypsiprymnus* have been found in the cave-deposits and other Post-Tertiary strata of Australia. Among the extinct genera are *Protemnodon* and *Sthenurus*, which are more allied to the tree-kangaroos of New Guinea than to living Australian species; the gigantic *Diprotodon*, a kangaroo nearly as large as an elephant; and *Nototherium*, of smaller size.

**Family 81.—Phalangistidae.** (8 Genera, 27 Species.)

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The Phalangistidae, or phalangers, are one of the most varied and interesting groups of Marsupials, being modified in a variety of ways for an arboreal life. We have the clumsy-looking tail-less koala, or native sloth; the prehensile-tailed opossum-like phalangers; the beautiful flying oppossums, so closely resembling
in form the flying squirrels of North America and India, but
often no larger than a mouse; the beautiful dormouse-like
*Dromicius*, one species of which is only $2\frac{1}{2}$ inches long or less
than the harvest-mouse; and the little *Tarsipes*, a true honey-
sucker with an extensile tongue, and of the size of a mouse.
These extreme modifications and specializations within the range
of a single family, are sufficient to indicate the great antiquity
of the Australian fauna; and they render it almost certain that
the region it occupied was once much more extensive, so as
to supply the variety of conditions and the struggle between
competing forms of life, which would be required to develop so
many curiously modified forms, of which we now probably see
only a remnant.

The Phalangistidae not only range over all Australia and
Tasmania, but over the whole of the Austro-Malayan sub-region
from New Guinea to the Moluccas and Celebes. The distribu-
tion of the genera is as follows:—*Phascolaretos* (1 sp.), the
koala, East Australia; *Phalangista* (5 sp.), East, South, and West
Australia, and Tasmania; *Cuscus* (8 sp.), woolly phalangers,
New Guinea, North Australia, Timor, Moluccas and Celebes;
*Petaurista* (1 sp.) large flying phalanger, East Australia;
*Belideus* (5 sp.), flying opossums, South, East, and North Aus-
tralia, New Guiana and Moluccas; *Acrobata* (1 sp.), pigmy
flying opossum, South and East Australia; *Dromicia* (5 sp.),
dormouse-phalangers, West and East Australia, and Tasmania;
*Tarsipes* (1 sp.), West Australia.

_Thylacoleo_, a large extinct marsupial of doubtful affinities,
seems to be somewhat intermediate between this family and the
kangaroos. Professor Owen considered it to be carnivorous, and
able to prey upon the huge *Diprotodon*, while Professor Flower
and Mr. Gerard Krefft, believe that it was herbivorous.

**Family 82.—Phascolomyidae.** (1 Genus, 3 Species.)

**General Distribution.**

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The Wombats are tail-less, terrestrial, burrowing animals, about the size of a badger, but feeding on roots and grass. They inhabit South Australia and Tasmania (Plate XI. vol. i. p. 439).

An extinct wombat, as large as a tapir, has been found in the Australian Pliocene deposits.

_General Remarks on the Distribution of Marsupialia._

We have here the most remarkable case, of an extensive and highly varied order being confined to one very limited area on the earth's surface, the only exception being the opossums in America. It has been already shown that these are comparatively recent immigrants, which have survived in that country long after they disappeared in Europe. As, however, no other form but that of the Didelphyidae occurs there during the Tertiary period, we must suppose that it was at a far more remote epoch that the ancestral forms of all the other Marsupials entered Australia; and the curious little mammals of the Oolite and Trias, offer valuable indications as to the time when this really took place.

A notice of these extinct marsupials of the secondary period will be found at vol. i. p. 159.

_{Order XIII.—Monotremata._

_Family 83.—Ornithorhynchidae._ (1 Genus, 1 Species.)

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The _Ornithorhynchus_, or duck-billed Platypus, one of the most remarkable and isolated of existing mammalia, is found in East and South Australia, and Tasmania.
FAMILY 84.—ECHIDNIDÆ. (1 Genus, 2 Species.)

**General Distribution.**

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palæarctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Echidna, or Australian Hedgehog, although quite as remarkable in internal structure as the Ornithorhynchus, is not so peculiar in external appearance, having very much the aspect of a hedgehog or spiny armadillo. The two species of this genus are very closely allied; one inhabits East and South Australia, the other Tasmania.

*Extinct Echidnidae.*—Remains of a very large fossil species of *Echidna* have lately (1868) been discovered at Darling Downs in Australia.

**Remark on the Distribution of the Monotremata.**

This order is the lowest and most anomalous of the mammalia, and nothing resembling it has been found among the very numerous extinct animals discovered in any other part of the world than Australia.
CHAPTER XVIII.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF BIRDS.

Order I.—PASSERES.

Family 1.—TURDIDÆ. (21 Genera, 205 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
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The extensive and familiar group of Thrushes ranges over every region and sub-region, except New Zealand. It abounds most in the North Temperate regions, and has its least development in the Australian region. Thrushes are among the most perfectly organized of birds, and it is to this cause, perhaps, as well as to their omnivorous diet, that they have been enabled to establish themselves on a number of remote islands. Peculiar species of true thrush are found in Norfolk Island, and in the small Lord Howes' Island nearer Australia; the Island of St. Thomas in the Gulf of Guinea has a peculiar species; while the Mid-Atlantic island Tristan d'Acunha,—one of the most remote and isolated spots on the globe,—has a peculiarly modified form of thrush. Several of the smaller West Indian Islands have also peculiar species or genera of thrushes.

The family is of somewhat uncertain extent, blending insensibly with the warblers (Sylviidæ) as well as with the Indian bulbuls
(Pycnonotidæ), while one genus, usually placed in it (Myiophonous) seems to agree better with Enicurus among the Cincliidæ. The genera here admitted into the thrush family are the following, the numbers prefixed to some of the genera indicating their position in Gray's *Hand List of the Genera and Species of Birds*:

(1143) Brachypteryx (8 sp.), Nepal to Java and Ceylon (this may belong to the Timaliidæ); Turdus (100 sp.) has the range of the whole family, abounding in the Palaearctic, Oriental and Neotropical regions, while it is less plentiful in the Nearctic and Ethiopian, and very scarce in the Australian; (934) Orcocincla (11 sp.), Palaearctic and Oriental regions, Australia and Tasmania; (942) Rhodinocichla (1 sp.), Venezuela; (946) Melanoptila (1 sp.), Honduras; (947 948) Catharus (10 sp.) Mexico to Equador; (949 950) Margarops (4 sp.), Hayti and Porto Rico to St. Lucia; (951) Nesocichla (1 sp.), Tristan d'Acunha; (952) Geocichla (8 sp.), India to Formosa and Celebes, Timor and North Australia; (954 955) Monticola (8 sp.), Central Europe to South Africa and to China, Philippine Islands, Gilolo and Java; (956) Oroctes (3 sp.), Himalayas and N. China; Zoothera (3 sp.) Himalayas, Aracan, Java, and Lombok; Mimus (20 sp.) Canada to Patagonia, West Indies and Galapagos; (962) Oreoscoptes (1 sp.), Rocky Mountains and Mexico; (963) Melanotis (2 sp.), South Mexico and Guatemala; (964) Galeoscoptes (1 sp.), Canada and Eastern United States to Cuba and Panama; (965 966) Mimocichla (5 sp.), Greater Antilles; (967 968) Harporhynchus (7 sp.), North America, from the great lakes to Mexico; Cinocercithia (3 sp.), Lesser Antilles; (969) Rhamphocinclus (1 sp.), Lesser Antilles; Chaetops (3 sp.), South Africa; Cossypha = Bessonornis (15 sp.) Ethiopian region and Palestine.

**Family 2.—SYLVIIDÆ.** (74 Genera, 640 Species.)

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This immense family, comprising all the birds usually known as "warblers," is, as here constituted, of almost universal distribution. Yet it is so numerous and preponderant over the whole Eastern Hemisphere, that it may be well termed an Old-World group; only two undoubted genera with very few species belonging to the Nearctic region, while two or three others whose position is somewhat doubtful, are found in California and the Neotropical region.

Canon Tristram, who has paid great attention to this difficult group, has kindly communicated to me a MSS. arrangement of the genera and species, which, with a very few additions and alterations, I implicitly follow. He divides the Sylviidae into seven sub-families, as follows:

1. Drymœcinæ (15 genera 194 sp.), confined to the Old World and Australia, and especially abundant in the three Tropical regions. 2. Calamoherpineæ (11 genera, 75 sp.), has the same general distribution as the last, but is scarce in the Australian and abundant in the Palaearctic region; 3. Phylloscopineæ (11 genera, 139 sp.), has the same distribution as the entire family, but is most abundant in the Oriental and Palaearctic regions. 4. Sylviinæ (6 genera, 33 sp.), most abundant in the Palaearctic region, very scarce in the Australian and Oriental regions, absent from America. 5. Ruticillinae (10 genera, 50 sp.); entirely absent from America and Australia; abounds in the Oriental and Palaearctic regions. 6. Saxicolinae (12 genera, 126 sp.), absent from America (except the extreme north-west), abundant in the Oriental region and moderately so in the Palaearctic, Ethiopian, and Australian. 7. Accentorinae (6 genera, 21 sp.), absent from the Ethiopian region and South America, most abundant in Australia, one small genus (Sialia), in North America.

The distribution of the several genera arranged under these sub-families, is as follows:

1. Drymœcinæ.—(736) Orthotomus (13 sp.), all the Oriental region; (737) Prinia (11 sp.), all the Oriental region; (738 740 742 746) Drymœca (83 sp.), Ethiopian and Oriental regions, most abundant in the former; (743 to 745 and 749 to 752) Cisticola (32 sp.), Ethiopian and Oriental regions, with South Europe, China
and Australia; \((7^{41}) Suya\) (5 sp.), Nepal to South China and Formosa; \((7^{73}) Spheneaeacus\) (7 sp.), Australia, New Zealand, and Chatham Island, with one species (?) in South Africa; \((7^{70}, 7^{72}) Megalurus\) (4 sp.), Central India to Java and Timor; \((7^{74}, 7^{75}) Poodytes\) (2 sp.), Australia; \((7^{66}) Amytis\) (3 sp.), Australia; \((7^{68}) Sphcnura\) (4 sp.), Australia; \((7^{64}) Malurus\) (16 sp.), Australia and Tasmania; \((7^{72}, 7^{63}) Chthonicola\) (3 sp.), Australia; \((7^{61}) Calamantan\) (2 sp.), Australia and Tasmania; \((7^{59}) Camaroptera\) (5 sp.), Africa and Fernando Po; \((7^{53}) Apalis\) (1 sp.), South Africa.

2. **Calamoherpinæ.**—\((7^{77} \text{ to } 7^{51} \text{ and sp. } 2^{963}) Acrocephalus\) (35 sp.), Palearctic, Ethiopian, continental part of Oriental region, Moluccas, Caroline Islands, and Australia; \((7^{82}, 8^{18}) Dumericola\) (4 sp.), Nepal to East Thibet, Central Asia, high regions; \((7^{83}, 7^{90}) Potamo\) modus (3 sp.), Central and South Europe, and East Thibet; \((7^{39} \text{ and sp. } 2^{969}) Luscinio\) (1 sp.), South Europe; \((7^{91}, 7^{92}) Locustella\) (8 sp.), Palearctic region to Central India and China; \((7^{93}) Horites\) (5 sp.), Nepal to North-west China and Formosa; \((7^{84} - 7^{56}) Bradyptetus = Cettia\) (10 sp.), South Europe, Palestine, and South Africa; \((7^{47}, 7^{48}) Catriscus\) (3 sp.), Tropical and South Africa; \((7^{76}) Bernicia\) (2 sp.), and \((7^{56}) Ellisia\) (3 sp.), Madagascar; \((8^{32}, 8^{1}) Mystacornis\) (1 sp.), Madagascar; \((7^{37}) Calamodus\) (2 sp.), Europe and Palestine; \((7^{34}) Tatara\) (2 sp.) Samoa to Marquesas Islands.

3. **Phylloscopinæ.**—\((7^{57}, 7^{58}, 8^{29}) Eremomela\) (16 sp.), Tropical and South Africa; \((7^{54}) Eroessa\) (1 sp.), Madagascar; \(Hypolais\) (12 sp.), Palearctic region, all India, Timor, North and South Africa; \((8^{15}, 8^{16}, 8^{19}) Abrornis\) (26 sp.), Oriental region; \((8^{14}) Regulo\) ides (4 sp.), Palearctic and continental Oriental regions; \((8^{22}) Scricornis\) (7 sp.), Australia and Tasmania; \((8^{23}, 8^{24}, 1^{43}) Acan\) thiza (14 sp.), Australia and New Caledonia; \((8^{21}) Regulus\) (7 sp.), all Palearctic and Nearctic regions and south to Guatemala; \((8^{90}) Polioptila\) (13 sp.), Paraguay to New Mexico; \((8^{25}) Gerygone\) (22 sp.), Australia, Papuan and Timor groups, New Zealand and Norfolk Island.

The species of the genera **Phylloscopus** and **Hypolais** are so mixed up in the *Hand List*, that Mr. Tristram has furnished me with the following...
4. SYLVIINÉ.—(793) Aedon (9 sp.), Spain and Palestine, to East and South Africa; (858) Drymodes (2 sp.), Australia; (800) Pyrophthalma (2 sp.), South Europe and Palestine; (801) Melizophilus (3 sp.), South-west Europe and North-east Africa; (802 804) Sylvia = Alsecus (8 sp.), Palaearctic region to India and Ceylon, and North-east Africa; (806 809) Currucu (7 sp.), Central and South Europe, Madeira, Palestine, Central India, North-east Africa, and South Africa.

5. RUTICILLINÉ.—(827) Luscinia (2 sp.), West Asia, Europe, North Africa; (839) Cyanecula (3 sp.), Europe, North-east Africa, India, Ceylon, and China; (849) Calliope (2 sp.), North Asia, Himalayas, Central India, and China; (838) Erithacus (3 sp.), Europe, North-east Africa, Japan, and North China; (828 830 837) Ruticilla (20 sp.), Palaearctic and Oriental regions to Senegal and Abyssinia, and east to Timor; abounds in Himalayas; (829) Chasmarrhornis (1 sp.), Himalayas; (831 832 834) Larvivora (10 sp.), Oriental region and Japan; (833) Notodela (3 sp.), Himalayas, Pegu, Formosa, Java; (835) Tarsiger (2 sp.), Nepal; (841) Grandala (1 sp.), High Himalayas of Nepal.

6. SAXICONÉ.—(975) Copsychus (7 sp.), all Oriental region and Madagascar; (976) Kultucinela (5 sp.), Oriental region to enumeration of the species which in his view properly belong to them, by the numbers in that work:—

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<th>Phylloscopus</th>
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Ceylon, Andaman Islands, Formosa, and Borneo; (794—799) Thamnobia (10 sp.), Ethiopian region and India to foot of Himalayas; (857) Gerrevasia (2 sp.), Madagascar and Seychelles Islands; (845 847) Dromolaea (18 sp.), Africa to South Europe, Palestine, North-west India, and North China; (842 843 846) Sericola (36 sp.), Africa, North-west India, whole Palaearctic region, migrating to Alaska and Greenland; (848 849) Oreicola (5 sp.), Timor, Lombok, and Burmah; (844) Cercomela (6 sp.), North-east Africa to North-west India; (850) Pratincola (15 sp.), Europe, Ethiopian, and Oriental regions to Celebes and Timor; (817) Ephthianura (3 sp.), Australia; (851—856) Petreeca (17 sp.), Australian region, Papua to New Zealand, Chatham and Auckland Islands, and Samoa; (857) Miro (2 sp.), New Zealand (doubtfully placed here).

7. Accentorinae.—(771) Cinclorhamphus (2 sp.), Australia; (860) Origma (1 sp.), East Australia; (859) Sialia (8 sp.), United States to Guatemala; (861) Accentor (12 sp.), Palaearctic region to Himalayas and North-west China; (763) Orthonyx (4 sp.), East Australia and New Zealand (doubtfully placed here).

The following two genera, which have been usually classed as Ampelidae, are arranged by Messrs. Sclater and Salvin in the Sylviidae:

(1362) Myiadestes (8 sp.), Peru and Bolivia, along the Andes to Mexico and California, also the Antilles; (1364) Cichlopes (1 sp.), Brazil.

Family 3.—Timaliidæ. (35 Genera, 240 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Timaliidæ, or babbling thrushes, are a group of small strong-legged active birds, mostly of dull colours, which are especially characteristic of the Oriental region, in every part of which they abound, while they are much less plentiful in
Australia and Africa. The Indo-Chinese sub-region is the head quarters of the family, whence it diminishes rapidly in all directions in variety of both generic and specific forms. Viscount Walden has kindly assisted me in the determination of the limits of this family, as to which there is still much difference of opinion. The distribution of the genera here admitted is as follows; and as the genera are widely scattered in the Hand List, reference numbers are prefixed in every case.

\(^{1023} - ^{1026} 1008\) Pomatorhinus (27 sp.), the whole Oriental region (excluding Philippines), Australia and New Guinea; \(^{1027}\) Pterohinus (3 sp.), North China, East Thibet; \(^{1029} 1030\) Mala- cocircus (9 sp.), Continental India and Ceylon, Arabia, Nubia; \(^{1031}\) Chaturrhaca (5 sp.), Abyssinia, Palestine, India, Nepal, Burmah, and Philippines; \(^{1032}\) Layardia (3 sp.), India and Cey- lon; \(^{1033}\) Acanthoptila (1 sp.), Nepal; \(^{1034}\) Cinclosoma (4 sp.), Australia and Tasmania; \(^{1035} 1036\) Crateropus (18 sp.), all Africa, Persia; \(^{1037}\) Hyperjerus (1 sp.), West Africa; \(^{1038}\) Cichladusa (3 sp.), Tropical Africa; \(^{1039}\) Garrulax (23 sp.), the Oriental region (excluding Philippines); \(^{1040}\) Janthoinula (10 sp.), Nepal, to East Thibet, Sumatra, Formosa; \(^{1041} 1042\) Gamporhynchus (2 sp.), Himalayas; \(^{1043}\) Grammatoptila (1 sp.) North India; \(^{1043} - 1045\) Trochalopteron (24 sp.), all India to China and Formosa; \(^{1046}\) Actinodura (4 sp.), Nepal to Burmah, 3,000 - 10,000 feet; \(^{1047}\) Pellorneum (4 sp.), Nepal to Ceylon, Tenasserim; \(^{1158} 1159\) Timalia (12 sp.), Malaya; \(^{1160}\) Dumetia (2 sp.), Central India and Cey- lon; \(^{1162}\) Stachyris (6 sp.), Nepal to Assam, Sumatra, Formosa; \(^{1164}\) Pyctorhis (3 sp.), India to Ceylon and Burmah; \(^{1165}\) Mixornis (8 sp.), Himalayas and Malaya; \(^{1167}\) Malacocteron (3 sp.), Ma- laya; \(^{1168} 1169\) Alcippe (15 sp.), Ceylon and South India, Hima- layas to Aracan, Malaya, Formosa, New Guinea; \(^{1170}\) Macronus (2 sp.), Malaya; \(^{1171}\) Cacopitta (5 sp.), Malaya; \(^{1172}\) Trichastoma (11 sp.), Nepal, Burmah, Malaya, Celebes; \(^{1173}\) Napothera (6 sp.), Malaya; \(^{1174}\) Drymocataphus (8 sp.), Burmah, Malaya, Ceylon.

1 The term “Malaya” is used here to include the Malay Peninsula, Sumatra, Borneo, and Java, a district to which many species and genera are confined. “Malay Archipelago” will be used to include both Indo-Malaya and Austro-Malaya.
Timor; (1175) Turdinus (5 sp.), Khasia Hills, Malacca, Tenasserim; (1176) Trichizos (1 sp.), Borneo, Malacca; (1004) Sibia (6 sp.), Nepal to Assam, Tenasserim, Formosa; (1177 1178) Alethe (4 sp.), West Africa; (1173a) Oxylabes (1 sp.), Madagascar; (1050) Psophodes (2 sp.), South, East, and West Australia; (1048) Turnagra (3 sp.), New Zealand.

Family 4.—PANURIDÆ. (4 Genera, 13 Species).

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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This new family is adopted, at the suggestion of Professor Newton, to include some peculiar groups of Himalayan birds whose position has usually been among the Timaliidae or the Paridae, but which are now found to be allied to our Bearded Reedling. The supposed affinity of this bird for the Tits has been long known to be erroneous, and the family Panuridæ was formed for its reception (Yarrell's British Birds, 4th edit. p. 512). The genera having hitherto been widely scattered in systematic works, are referred to by the numbers of Mr. G. R. Gray's Hand List.

(1003) Paradoxornis (3 sp.), Himalayas and East Thibet; (1004) Conostoma (1 sp.), Himalayas and East Thibet; (876) Suthora (8 sp.), Himalayas to North-west China, Formosa; (877) Chlenasicus (1 sp.), Darjeeling; (887) Panurus (1 sp.), Central and Southern Europe; (1902) Heteromorpha (1 sp.), Nepal, 10,000 feet altitude; Cholornis (1 sp.), Moupin in East Thibet.

Family 5.—CINCLIDÆ. (4 Genera, 27 Species.)

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<th>Neotropical Sub-regions</th>
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[PART IV.]
The Cinclidae consist of a number of more or less thrush-like ground-birds, of which the most remarkable are the Dippers, forming the genus Cinclus. These are curiously distributed, from the Palaearctic region as a centre, to the alpine districts of North and South America; while the three genera which are here included as somewhat allied to Cinclus, all inhabit the Oriental region. The genera which I class in this family are the following:—

(978) Cinclus (9 sp.), Palaearctic region to West China and Formosa, Rocky Mountains, and Mexico in North America, and southward to the Andes of Peru; (916) Enicurus (9 sp.), Himalayas to Java and West China; (979) Eupetes (4 sp.), Indo-Malay sub-region and New Guinea; (971) Myiophonus (5 sp.), Himalayas to Ceylon, Java, South China, and Formosa.

(981) Mesites (1 sp.), Madagascar, is an anomalous bird placed with Eupetes by Mr. G. R. Gray, but of very uncertain affinities.

**Family 6.—TROGLODYTIDÆ.** (17 Genera, 94 Species.)

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The Trogodytidæ, or Wrens, are small birds, rather abundant and varied in the Neotropical region, with a few species scattered through the Nearctic, Palaearctic, and parts of the Oriental regions, and one doubtful genus in Africa. The constitution of the family is by no means well determined. The South American genera are taken from Messrs. Sclater and Salvin's Nomenclator Avium Neotropicalium.

Tesia (2 sp.), Eastern Himalayas; Pnoeopyga (6 sp.), Himalayas to East Thibet, Java; (716 and 728) Troglodytes (15 sp.), Neotropical, Nearctic, and Palaearctic regions to the Higher Himalayas; (907) Rimator (1 sp.), Darjeeling; Thryothorus (13 sp.), South Brazil to Mexico, Martinique, and Nearctic region; Thryophilus (13 sp.), Brazil to Mexico, and North-west America; Cistoitherus

Vol. II.—18
(5 sp.), Patagonia to Greenland; *Uropsila* (1 sp.), Mexico; *Donacobius* (2 sp.), Tropical America; *Campylorhynchus* (18 sp.), Brazil, and Bolivia to Mexico and the Gila valley; *Cyphorhinus* (5 sp.), Equatorial South America to Costa Rica; *Microcerceulus* (5 sp.), Brazil and Peru to Mexico; *Hemicorhina* (2 sp.), Peru and Guiana to Costa Rica; *Salpinetes* (1 sp.), High Plains of Rocky Mountains; *Catherpes* (1 sp.), Mexico and Rio Grande; *Cinnicerthia* (2 sp.), Ecuador and Columbia. (*760*) *Sylvietta* (2 sp.), Tropical and South Africa,—is placed in this family by Mr. Tristram.

**Family 7.—Chamaeidae.** (1 Genus, 1 Species).

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The bird which forms the genus *Chamaea* inhabits California; and though allied to the wrens it has certain peculiarities of structure which, in the opinion of many ornithologists, require that it should be placed in a distinct family.

**Family 8.—Certthiidae.** (6 Genera, 18 Species).

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The Certhiidae, or Creepers, form a small family whose species are thinly scattered over North America from Mexico, the Palearctic region, parts of the Oriental region, and Australia, where they are somewhat more abundant. The distribution of the genera is as follows:

*Certhia* (6 sp.), Nearctic and Palearctic regions, Nepal, and Sikkim; *Salpornis* (1 sp.), Central India; *Tichodroma* (1 sp.), South
Europe to Abyssinia, Nepal, and North China; *Rhabdornis* (1 sp.), Philippine Islands; *Climacteris* (8 sp.), Australia and New Guinea.

**FAMILY 9.—SITTIDÆ.** (6 Genera, 31 Species.)

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The Sittidae, or Nuthatches, are another small family of tree-creeping birds, whose distribution is very similar to that of the Certhiidae, but with a more uniform range over the Oriental region, and extending to New Zealand and Madagascar. The genera are as follows:—

*Sitta* (17 sp.), Palæarctic and Nearctic regions to South India and Mexico; *Dendrophila* (2 sp.), Ceylon and India to Burmah and Malaya; *Hypherpes* (1 sp.), Madagascar; *Sittella* (6 sp.), Australia and New Guinea. *Acanthisitta* (1 sp.) and *Xenicus* (4 sp.), New Zealand, are placed with some doubt in this family.

**FAMILY 10.—PARIDÆ.** (14 Genera, 92 Species.)

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The Paridæ, or Tits, are very abundant in the Nearctic and Palæarctic regions; many fine species are found in the Himalayas, but they are sparingly scattered through the Ethiopian, Oriental, and Australian regions. The genera usually admitted into this family are the following, but the position of some of them, especially of the Australian forms, is doubtful.

(864—867) *Parnus* (46 sp.), North America, from Mexico, Palæarctic, and Oriental regions, Tropical and South Africa;
(868 869) *Lophophanes* (10 sp.), Europe, the Higher Himalayas to Sikhim, North America to Mexico; *Acreola = Orites* (6 sp.), Palaearctic region; *Melanochlora* (2 sp.), Nepal to Sumatra; *Psaltalia* (1 sp.), Java; *Psaltiparace* (3 sp.), Guatemala to California, and Rocky Mountains; *Auiparace* (1 sp.), Rio Grande; (881 882) *Parisoma* (5 sp.), Tropical and South Africa; (883 884) *Aegithalus* (6 sp.), South-east Europe to South Africa; (885 889) *Aegithaliscus* (6 sp.), Afghanistan and Himalayas to Amoy; *Cephalopyrus* (1 sp.), North-west Himalayas; *Sylviparace* (1 sp.), Himalayas and Central India; *Ceithiparace* (2 sp.), New Zealand; (879 880) *Sphenostoma* (2 sp.), East and South Australia.

**Family 11.—LIOTRICHIDÆ.** (11 Genera, 35 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Liotrichidæ, or Hill-Tits, are small, active, delicately-coloured birds, almost confined to the Himalayas and their extension eastward to China. They are now generally admitted to form a distinct family. The genera are distributed as follows:

(1146) *Liothrix* (3 sp.), Himalayas to China; *Siva* (3 sp.), Himalayas; *Minla* (4 sp.), Himalayas and East Thibet; *Proparace* (7 sp.), Nepal to East Thibet and Aracan; (1153) *Pteruthius* (6 sp.), Himalayas to Java and West China; (1155) *Cutia* (2 sp.), Nepal; (1019) *Yuhina* (3 sp.), High Himalayas and Moupin; (1229) *Lexus* (3 sp.), Himalayas to Tenasserim; (1021) *Myzornis* (1 sp.), Darjeeling.

**Family 12.—PHYLLORNITHIDÆ.** (3 Genera, 14 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Phyllornithidæ, or "Green Bulbuls," are a small group of fruit-eating birds, strictly confined to the Oriental region, and ranging over the whole of it, with the one exception of the Philippine Islands. The genera are:

(1002) Phyllornis (12 sp.), India to Java, Ceylon, and Hainan; (1166) Iora (4 sp.), the whole Oriental region; (1163) Erpornis (2 sp.), Himalayas, Hainan, Formosa, and Borneo.

Family 13.—Pycnonotidæ. (9 Genera, 139 Species.)

The Pycnonotidæ, Bulbuls, or fruit-thrushes, are highly characteristic of the Oriental region, in every part of which they abound; less plentiful in the Ethiopian region, and extending to Palestine and Japan in the Palearctic, and to the Moluccas in the Australian region, but absent from the intervening island of Celebes. The genera are:

Microscelis (6 sp.), Burmah, the Indo-Malay Islands, and Japan; Pycnonotus (52 sp., in many sub-genera), Palestine to South Africa, the whole Oriental region, China and Japan; Alectoris (1 sp.), Himalayas; Hemixus (2 sp.), Nepal, Bootan, Hainan; Phyllastrephus (4 sp.), West and South Africa; Hypsipetes (20 sp.), the whole Oriental region, Madagascar and the Mascarene Islands; Tylas (1 sp.), Madagascar; Oriniger (30 sp.), the whole Oriental region (excluding Philippines), West and South Africa, Moluccas; Ixornotus (7 sp.), West Africa; (1015 1017) Setornis (3 sp.), Malacca, Sumatra, and Borneo; Iole (4 sp.), Aracan and Malaya; Andropadus (9 sp.), Tropical Africa; (1157) Lioptilus (1 sp.), South Africa.
FAMILY 14.—ORIOLIDÆ. (5 Genera, 40 Species.)

**General Distribution.**

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The Orioles, or Golden Thrushes, are a small group characteristic of the Oriental and Ethiopian regions, migrating into the western Palearctic region, and with some of the less typical forms in Australia. The genera are:—

*Oriolus* (24 sp.), Central Europe, throughout Africa, and the whole Oriental region, northward to Pekin, and eastward to Flores; (*Analcipus* (3 sp.), Himalayas, Formosa, Java and Borneo; *Mimeta* (9 sp.), the Moluccas and Australia; *Sphecotheres* (3 sp.), Timor and Australia. *Artamia* (1 sp.), Madagascar,—perhaps belongs to the next family or to Laniidæ.

FAMILY 15.—CAMPEPHAGIDÆ. (3 Genera, 100 Species.)

**General Distribution.**

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The Campephagidæ, or Cuckoo Shrikes, (Campephaginæ of the *Hand List*, with the addition of *Cochoa*) are most abundant in the Australian region (especially in the Austro-Malay sub-region) less so in the Oriental, and still less in the Ethiopian region. The genera, for the most part as adopted by Dr. Hartlaub, are as follows:—

*Pericrocotus* (22 sp.), the whole Oriental region, extending north to Pekin, and east to Lombok; (*Lanieterus* (4 sp.), West and South Africa; (*Graucalus* (25 sp.), the whole Oriental region, and eastward to Austro-Malaya, the New
Hebrides, and Tasmania; *Artamides* (1 sp.), Celebes; *Pteropodocys* (1 sp.), Australia; (1243 1250 1257 1258) *Campephaga* (16 sp.), Austro-Malaya, and New Caledonia, Philippines, the Ethiopian region; *Volvocivora* (8 sp.) the Oriental region (excluding Philippines); *Lalage* (18 sp.), the whole Malay Archipelago to New Caledonia and Australia; *Symmorphus* (1 sp.), Australia; *Oxynotus* (2 sp.), Mauritius and Bourbon; (1264) *Cochoa* (3 sp.), Himalayas, Java. The position of this last genus is doubtful. Jerdon puts it in the Li ionsidae; Sundeval in the Sturnidae; Bonaparte in the Dicruridae; Professor Newton suggests the Pycnonotidiæ; but it seems on the whole best placed here.

Family 16.—**Dicuridae**. (6 Genera, 53 Species.)

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The Dicuridae, or Drongo Shrikes (Dicuridae of the *Hand List*, omitting the genus *Melanornis*), have nearly the same distribution as the last family, with which they are sometimes united. They are, however, most abundant and varied in the Oriental region, much less so both in the Australian and Ethiopian regions. The distribution of the genera is as follows:—

*Dicurus* (46 sp., in several sub-genera), has the range of the whole family, extending east to New Ireland, and one species in Australia; *Chatorhynchus* (1 sp.), New Guinea; *Bhringa* (2 sp.), Himalayas to Borneo (Plate IX. vol. i. p. 339); *Chibia* (2 sp.) Himalayas eastward to North China; *Chaptia* (3 sp.), all India to Malacca and Formosa; *Irena* (4 sp.), Central India, Assam, and Burmah to Borneo and the Philippine Islands. This last genus is placed by Jerdon among the Pycnonotidiæ, but seems to come most naturally here or in the last family.
Family 17.—Muscicapidæ. (44 Genera, 283 Species.)

General Distribution.

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The Muscicapidæ, or Flycatchers (Muscicapinae and Myiagrinæ of the Hand List, omitting Cochoa and including Pogonocichla) form an extensive family of usually small-sized and often bright-coloured birds, very abundant in the warmer regions of the Old World and Australia, but becoming scarce as we approach the temperate and colder regions. They are wholly absent from North and South America. The genera, many of which are not well defined, are distributed as follows:—

Peltops (1 sp.), Papuan Islands; Monarcha (28 sp.), Moluccas to the Carolines and Marquesas Islands, Australia and Tasmania; Leucophantes (1 sp.), New Guinea; Butalis (4 sp.), Ethiopian and Palearctic regions, Moluccas and Formosa; Muscicapa (12 sp.), Europe and Africa; Muscicapula (6 sp.), India to Western China; Alsonax (1 sp.), South Africa; Erythrosterina (7 sp.), Europe to China and Java; Newtonia (1 sp.), Madagascar; Xanthopygia (2 sp.), Japan, China, Malacca; Hemipus (1 sp.), India and Ceylon; Pyenophrys (1 sp.), Java; Hyliotæ (2 sp.), West Africa; Erythrocerus (2 sp.), West Africa and Zambesi; Microeca (6 sp.), Australia, Timor, and Papuan Islands; Artomyias (2 sp.), West Africa; Pseudohias (1 sp.), Madagascar; Hemichelidon (3 sp.), the Oriental region and North China; Smithornis (2 sp.), West and South Africa; Megabias (1 sp.), West Africa; Cassinia (2 sp.), West Africa; Bias, (1 sp.), Tropical Africa; Niltava (3 sp.), Himalayas to West China; Cyornis (16 sp.), the whole Oriental region; Cyanoptila (1 sp.), Japan, China, Hainan; Eumyias (7 sp.), India to South China, Ceylon, and Sumatra; (1213 and 1216) Sphïa (8 sp.), North India, Formosa, Timor; Anthipes (1 sp.), Nepal; Seisura (5 sp.), Australia and Austral-
Malaya (excluding Celebes); (Myiagra (16 sp.), Australia and Moluccas to Caroline and Samoa Islands: Hypothymis (2 sp.), Oriental region and Celebes; Elminia (2 sp.), Tropical Africa; Muscitodus (2 sp.), Fiji Islands; Machæirirhynæhus (4 sp.), Papuan Islands and North Australia; Platystira (12 sp.), Tropical and South Africa; Rhipidura (45 sp.), the Oriental and Australian regions to the Samoa Islands and Tasmania; Chelidonyx (1 sp.), North India; Myialcestes (2 sp.), India to Ceylon, China, Java and Celebes; Tchitreæ (26 sp.), the entire Ethiopian and Oriental regions, and to North China and Japan; Philentoma (4 sp.) Malacca, Sumatra, Borneo, and Philippine Islands; Todopsis (6 sp.), Papuan Islands; (886) Pogonocichla (1 sp.), South Africa; (1061 – 1063) Bradyornis (7 sp.), Tropical and South Africa; (1460) Chasiempis (2 sp.), Sandwich Islands.

**Family 18.—PACHYCEPHALIDÆ. (5 Genera, 62 Species.)**

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Pachycephalidæ, or Thick-headed Shrikes (Pachycephalineæ of the Hand List omitting Colluricincla, Cracticus, and Pardalotus) are almost confined to the Australian region, a single species extending to Java and Aracan, and another (?) to Madagascar. The family has generally been united with the Laniidæ, but most modern ornithologists consider it to be distinct. The distribution of the genera is as follows:—

_Oceæa_ (1 sp.), Australia; _Falcunculus_ (2 sp.), Australia; _Pachycephala_ (44 sp.), Sula Islands (east of Celebes) to the Fiji Islands, and Australia; _Hylocharis_ (4 sp.), Timor, Celebes, Indo-Malaya, and Aracan; _Calicalicus_ (1 sp.), Madagascar; _Eopsaltria_ (14 sp.), Australia, New Caledonia, and the New Hebrides; _Artemia_ (4 sp.), Madagascar,—may belong to this family, or to Laniidæ, Oriolidæ, or Artamidæ, according to different authors.
### FAMILY 19.—LANIIDÆ.

(19 Genera, 145 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Laniidæ, or Shrikes (Laniinae and Malaconotinae of the Hand List, and including Colluricincla), are most abundant and varied in Africa, less plentiful in the Oriental, Australian, and Palaearctic regions, with a few species in the Nearctic region as far as Mexico. The constitution of the family is, however, somewhat uncertain. The genera here admitted are:

**Colluricincla** (4 sp.), Australia and Tasmania; **Recetes** (18 sp.), Papuan Islands, North Australia, to Pelew and Fiji Islands; (1462 — 1464 1466 1470 1471 — 1473) **Lanius** (50 sp.), the whole Nearctic, Palaearctic, Ethiopian, and Oriental regions, one species reaching Timor, none in Madagascar; **Laniellus** (1 sp.), Java; **Hypocolius** (1 sp.), Abyssinia and Upper Nile; **Corvinella** (1 sp.), South and West Africa; **Urolestes** (1 sp.), South and East Africa; **Tephrodornis** (4 sp.), Oriental region to Hainan and Java; **Hypodes** (1 sp.), West Africa; **Frascia** (2 sp.), West Africa; **Cuphopterus** (1 sp.), Princes' Island; **Nilaus** (1 sp.), South and West Africa; **Prionops** (9 sp.), Tropical Africa; **Euroeuphus** (2 sp.), North, East, and South Africa, and Abyssinia; **Chauvonotus** (1 sp.), West Africa; **Vanga** (4 sp.), Madagascar (Plate VI. vol. i. p. 278); **Laniarius** (36 sp.), the whole Ethiopian region; **Telephonus** (10 sp.), all Africa and South Europe; **Meristes** (2 sp.), Tropical and South Africa; **Nicator** (1 sp.), East Africa.

### FAMILY 20.—CORVIDÆ.

(24 Genera, 190 Species.)

**General Distribution.**

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The Corvidae, or Crows, Jays, &c., form an extensive and somewhat heterogeneous group, some members of which inhabit almost every part of the globe, although none of the genera are cosmopolitan. The true crows are found everywhere but in South America; the magpies, choughs, and nutcrackers are characteristic of the Palaearctic region; the jays are Palaearctic, Oriental, and American; while the piping crows are peculiarly Australian. The more detailed distribution of the genera is as follows:

Sub-family I. Gymnorhininæ (Piping Crows).—Strepera (4 sp.), and Gymnorhina (3 sp.), are Australian only; Cracticus (9 sp.), ranges from New Guinea to Tasmania (this is usually put with the Shrikes, but it has more affinity with the preceding genera); Pityriasis (1 sp.), Borneo (an extraordinary bird of very doubtful affinities); Grrallina (1 sp.), Australia, is put here by Sundevall,—among Motacillidæ, by Gould.

Sub-family II. Garrulinae (Jays).—Platylophus = Lophocitta (4 sp.), Malaya; Garrulus (12 sp.), Palaearctic region, China and Himalayas; Perisoreus (2 sp.), North of Palaearctic and Nearctic regions; Cyanurus (22 sp.), American, from Bolivia to Canada, most abundant in Central America, but absent from the Antilles; Cyanocorax (15 sp.), La Plata to Mexico; Calocitta (2 sp.), Guatemala and Mexico; Psilorhinus (3 sp.), Costa Rica to Texas; Urocissa (6 sp.), Western Himalayas to China and Formosa; Cissa (3 sp.), South-eastern Himalayas to Tenasserim, Ceylon, Sumatra, and Java.

Sub-family III. Dendrocittinæ (Tree Crows).—Temnurus (3 sp.), Cochin China, Malacca to Borneo (not Java); Dendrocitta (9 sp.), the Oriental region to Sumatra, Hainan, and Formosa; Crypsirhina (3 sp.), Pegu, Siam, and Java; Ptilostomus (2 sp.), West, East, and South Africa.

Sub-family IV. Corvinae (Crows and Magpies).—Nucifraga (4 sp.), Palaearctic region to the Himalayas and North China; Pici-corvus (1 sp.), the Rocky Mountains and California; Gymnokitta (1 sp.), Rocky Mountains and Arizona (Plate XVIII., Vol. II., p. 128); Pica (9 sp.), Palaearctic region, Arctic America, and California; Cyanopica (3 sp.), Spain, North-east Asia, Japan;
Streptocitta (2 sp.), Celebes; Charitornis (1 sp.), Sula Islands; Corvus (55 sp.), universally distributed except South America and New Zealand, but found in Guatemala and the Antilles to Porto Rico; reaches the extreme north of Europe and Asia; Gymnocorvus (2 sp.), Papuan Islands; Picathartes (1 sp.), West Africa; Corvultur (2 sp.), Tropical and South Africa.

Sub-family V. Fregilinae (Choughs).—Fregilus (3 sp.), mountains and cliffs of Palæarctic region from West Europe to the Himalayas and North China, Abyssinia (Plate I., Vol. I., p. 195); Corcorax (1 sp.), Australia.

**Family 21.—PARADISEIDÆ.** (19 Genera, 34 Species.)

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<th>Neotropical Sub-regions</th>
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The Paradiseidæ, or "Birds of Paradise," form one of the most remarkable families of birds, unsurpassed alike for the singularity and the beauty of their plumage. Till recently the family was restricted to about eight species of the more typical Paradise birds, but in his splendid monograph of the group, Mr. Elliot has combined together a number of allied forms which had been doubtfully placed in several adjacent families. The various species of true Paradise birds, having ornamental plumes developed from different parts of the body, are almost wholly confined to New Guinea and the adjacent Papuan Islands, one species only being found in the Moluccas and one in North Australia; while the less typical Bower-birds, having no such developments of plumage, are most characteristic of the north and east of Australia, with a few species in New Guinea. The distribution of the genera according to Mr. Elliot’s monograph is as follows:

Sub-family I. Paradiseinae.—Paradisa (4 sp.), Papuan Islands; Manucodia (3 sp.), Papuan Islands and North Australia; Astrapia (1 sp.), New Guinea; Parotia (1 sp.), New Guinea; Lophorhina (1 sp.), New Guinea; Diphylloides (3 sp.), Papuan
Islands; Xanthomelus (1 sp.), New Guinea; Cicinnurus (1 sp.), Papuan Islands; Paradigalla (1 sp.), New Guinea; Semioptera (1 sp.), Gilolo and Batchian.

Sub-family II. Epimachinæ.—Epimachus (1 sp.), New Guinea; Drepanornis (1 sp.), New Guinea; Scelevides (1 sp.), New Guinea (Plate X., Vol. I., p. 414); Ptilorhis (4 sp.), New Guinea and North Australia.

Sub-family III. Tectonarchinæ (Bower-birds).—Sericulns (1 sp.), Eastern Australia; Ptilonorhynchus (1 sp.), Eastern Australia; Chlamydolodia (4 sp.), North and East Australia; Elurædos (3 sp.), Papuan Islands and East Australia; Amblyornis (1 sp.), New Guinea.

Family 22.—Meliphagidæ. (23 Genera, 190 Species.)

General Distribution.

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(As in the Hand List, but omitting Zosterops, and slightly altering the arrangement.)

The extensive group of the Meliphagidæ, or Honey-suckers, is wholly Australian, for the genus Zosterops, which extends into the Oriental and Ethiopian regions, does not naturally belong to it. Several of the genera are confined to Australia, others to New Zealand, while a few range over the whole Australian region. The genera are distributed as follows:—

Myzomela (18 sp.), has the widest range, extending from Celebes to the Samoa Islands, and to Timor and Eastern Australia; Entomophila (4 sp.), Australia and New Guinea; Glicipila (10 sp.), Australia, Timor, New Guinea, and New Caledonia; Acanthorhynchus (2 sp.), Australia and Tasmania; Meliphaga (1 sp.), Australia; Ptilotis (40 sp.), Gilolo and Lombok to Australia and Tasmania, and to the Samoa and Tonga Islands; Meliornis (5 sp.), Australia and Tasmania; Prothemadera (1 sp.), Pogonornis (1 sp.), New Zealand; Anthornis (4 sp.), New Zealand and Chatham Islands; Anihochæra (4 sp.), Australia and Tasmania; Xan-
thotis (4 sp.), Papuan Islands and Australia; Leptornis (2 sp.), Samoa Islands and New Caledonia; Philemon = Tropidorrhyncus (18 sp.), Moluccas and Lombok to New Guinea, Australia, Tasmania and New Caledonia; Entomiza (2 sp.), Australia; Manornhina (5 sp.), Australia and Tasmania; Euthyrhynchus (3 sp.), New Guinea; Melirrhophetes (2 sp.), New Guinea; Melideetes (1 sp.), New Guinea; Melipotes (1 sp.), New Guinea; Melithreptus (8 sp.), New Guinea, Australia, and Tasmania; (397) Moho (3 sp.), Sandwich Islands; Chaetoptila (1 sp.), Sandwich Islands.

Family 23.—NECTARINIIIDÆ. (11 Genera, 122 Species.)

General Distribution.

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The Nectariniidae, or Sun-birds, form a rather extensive group of insectivorous honey-suckers, often adorned with brilliant metallic plumage, and bearing a superficial resemblance to the American humming-birds, although not in any way related to them. They abound in the Ethiopian, Oriental, and Australian regions, as far east as New Ireland, and south to Queensland, while one species inhabits the hot Jordan Valley in the Palaearctic region. For the Eastern genera I follow Lord Walden’s classification (Ibis, 1870); the African species not having been so carefully studied are mostly placed in one genus. The genera adopted are as follows:—

Promerops (1 sp.), South Africa; Nectarinia (60 sp.), the whole Ethiopian region; Cinnycinclus (5 sp.), West Africa; Neodrepanis (1 sp.), Madagascar; Arachneclira (13 sp.), Palestine, all India to Hainan, the Papuan Islands, and North-east Australia; Ethopyga (15 sp.), Himalayas and Central India to West China, Hainan, Java, and Northern Celebes; Nectarophila (5 sp.), Central India and Ceylon, Assam and Aracan to Java, Celebes and the Philippines; Chaleostetha (6 sp.), Malay Peninsula to New Guinea; Anthreptes (1 sp.), Siam, Malay Peninsula to
Sula Islands, and Flores; *Cosmeteira* (1 sp.), Papuan Islands; *Arachnothera* (15 sp.), the Oriental region (excluding Philippines) Celebes, Lombok, and Papuan Islands.

**FAMILY 24.—DICÆIDÆ.** (5 Genera, 107 Species.)

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<th>Neotropical Sub-regions</th>
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The Dicæidæ, or Flower-peckers, consist of very small, gaily-coloured birds, rather abundant over the whole Oriental and much of the Australian regions, and one genus extending over the Ethiopian region. The genera here adopted are the following:

(623) *Zosterops* (68 sp.), the whole Ethiopian, Oriental, and Australian regions, as far east as the Fiji Islands, and north to Pekin and Japan; (409 – 403) *Dicranum* (25 sp.), the whole Oriental region, except China, with the Australian region as far as the Solomon Islands; (404) *Pachyglossa* (2 sp. 1437 1442), Nepal and Northern Celebes; (406) *Piprisoma* (2 sp.), Himalayas to Ceylon and Timor; (1450) *Pardalotus* (10 sp.), Australia and Tasmania; (407 – 405) *Prionochilus* (5 sp.), Indo-Malay sub-region and Papuan Islands.

**FAMILY 25.—DREPANIDIDÆ.** (4 Genera, 8 Species.)

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<th>Neotropical Sub-regions</th>
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The Drepanididæ are confined to the Sandwich Islands, and I follow Mr. Sclater’s suggestion in bringing together the following genera to form this family:

*Drepanis* (3 sp.); *Hemignathus* (3 sp.); *Loxops* (1 sp.); *Psittirostra* (1 sp.). If these are correctly associated, the great
differences in the bill indicate that they are the remains of a larger and more varied family, once inhabiting more extensive land surfaces in the Pacific.

**Family 26.—Cœrebidae.** (11 Genera, 55 Species.)

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(According to the arrangement of Messrs. Sclater and Salvin.)

The Cœrebidae, or Sugar-birds, are delicate little birds allied to the preceding families, but with extensile honey-sucking tongues. They are almost wholly confined to the tropical parts of America, only one species of *Certhiola* ranging so far north as Florida. The following is the distribution of the genera:—

*Diglossa* (14 sp.), Peru and Bolivia to Guiana and Mexico; *Diglossopis* (1 sp.), Ecuador to Venezuela; *Orecomanes* (1 sp.), Ecuador; *Conirostrum* (6 sp.), Bolivia to Ecuador and Columbia; *Hemidaenins* (1 sp.), Upper Amazon and Columbia; *Daeinis* (13 sp.), Brazil to Ecuador and Costa Rica; *Certhidea* (2 sp.), Galapagos Islands; *Chlorophanes* (2 sp.), Brazil to Central America and Cuba; *Cereba* (4 sp.), Brazil to Mexico; *Certhiola* (10 sp.), Amazon to Mexico, West Indies, and Florida; *Glossoptila* (1 sp.), Jamaica.

**Family 27.—Mniotiltaidae.** (18 Genera, 115 Species.)

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(Messrs. Sclater and Salvin are followed for the Neotropical, Baird and Allen for the Nearctic region.)

The Mniotiltidae, or Wood-warblers, are an interesting group of small and elegant birds, allied to the preceding family and to the greenlets, and perhaps also to the warblers and tits of Europe.
They range over all North America from Panama to the Arctic regions, but do not extend far beyond the tropic in Southern America. They are almost as abundant in the Nearctic as in the Neotropical region; and considering the favourable conditions of existence in Tropical America, this fact, in connection with their absence from the South Temperate zone would lead us to suppose that they originated in North Temperate America, and subsequently spread southward into the tropics. This supposition is strengthened by the fact that their metropolis, in the breeding season, is to the north of the United States. The genera adopted by Messrs. Sclater and Salvin are as follows:

(183) Siurus (4 sp.), Venezuela and West Indies to Eastern States and Canada; Mniotilta (1 sp.), Venezuela, Mexico, and Antilles to the Eastern States; Parula (5 sp.), Brazil to Mexico, and the Eastern States, and Canada; Protonotaria (1 sp.), Antilles to Ohio; Helminthophaga (8 sp.), Columbia to Arctic America Helmintherus (2 sp.), Central America to Eastern States; Perissosglossa (1 sp.), Antilles and Eastern States; Dendroica (33 sp.), Amazon to Antilles, and Arctic America, and south to Chili; Oporornis (2 sp.), Guatemala to Eastern States; Geothlypis (11 sp.), all North America and Brazil; Myiobaeus (5 sp.), all North America and Columbia; Basiluterus (22 sp.), Bolivia and Brazil to Mexico; Setophaga (15 sp.), Brazil to Canada; Ergaticus (2 sp.), Guatemala and Mexico; Cardellina (1 sp.), Guatemala and Mexico; (1449) Granatellus (3 sp.), Amazon to Mexico; (1441) Terestritis (2 sp.), Cuba; (1439) Icteria (2 sp.), Costa Rica and United States to Canada.

Family 28.—VIREONIDÆ. (7 Genera, 63 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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(Messrs. Sclater and Salvin are followed for the Neotropical genera; Professor Baird and Mr. Allen for those of the Nearctic region.)

Vol. II.—19
The Vireonidae, or Greenlets, are a family of small fly-catching birds wholly restricted to the American continent, where they range from Paraguay to Canada. They are allied to the Mniotil-tidae and perhaps also to the Australian Pachycephalidae. Only two of the genera, with about a dozen species, inhabit the Nearctic region. The distribution of the genera is as follows:—

*Vireosylvia* (13 sp.), Venezuela to Mexico, the Antilles, the Eastern States and Canada; *Virco* (14 sp.), Central America and the Antilles to Canada; *Neochloe* (1 sp.), Mexico; *Hylophilus* (20 sp.), Brazil to Mexico; *Laletes* (1 sp.), Jamaica; *Vircolanius* (5 sp.), Amazonia to Mexico; *Cychlorhis* (9 sp.), Paraguay to Mexico.

**Family 29.—AMPELIDÆ.** (4 Genera, 9 Species.)

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The Ampelidae, represented in Europe by the waxwing, are a small family, characteristic of the Nearctic and Palearctic regions, but extending southward to Costa Rica and the West Indian islands. The genera are distributed as follows:—

(1539) *Ampelis* (3 sp.), the Palearctic and Nearctic regions, and southward to Guatemala; (1360) *Ptilogonyx* (2 sp.), Central America; (1442) *Dulus* (2 sp.), West Indian Islands; (1301) *Phenopepla* (1 sp.), Mexico and the Gila Valley.

**Family 30.—HIRUNDINIDÆ.** (9 Genera, 91 Species.)

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<th>Neotropical Sub-regions</th>
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The Hirundinidae, or Swallows, are true cosmopolites. Although they do not range quite so far north (except as stragglers) as a few of the extreme polar birds, yet they pass beyond the Arctic Circle both in America and Europe, *Cotyle riparia* having been observed in the Parry Islands, while *Hirundo rustica* has been seen both in Spitzbergen and Nova Zembla. *Cotyle riparia* and *Chelidon urbica* also breed in great numbers in northern Lapland, latitude 67° to 70° north. Many of the species also, have an enormous range, the common swallow (*Hirundo rustica*) inhabiting Europe, Asia and Africa, from Lapland to the Cape of Good Hope and to the Moluccas. The genera of swallows are not well determined, a number having been established of which the value is uncertain. I admit the following, referring by numbers to the Hand List:—

(215 — 221 225 — 228) *Hirundo* (40 sp.), the range of the entire family; (222 223) *Psalidoprogne* (10 sp.), Tropical and South Africa; (224) *Phedina* (1 sp.), Madagascar and Mascarene Islands; (225) *Petrochelidon* (5 sp.), North and South America and Cape of Good Hope; (229 — 232 234) *Atticora* (8 sp.), the Neotropical region and ? Australia; (235 237) *Cotyle* (11 sp.), Europe, India, Africa, North America, Antilles and Ecuador; (230) *Stelgidopteryx* (5 sp.), La Plata to United States; (238 and 239) *Chelidon* (6 sp.), Palearctic region, Nepal, Borneo; (240 — 242) *Progne* (5 sp.), all North and South America.

**Family 31.—ICTERIDÆ.** (24 Genera, 110 Species.)

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The Icteridae, or American hang-nests, range over the whole continent, from Patagonia and the Falkland Islands to the Arctic Circle. Only about 20 species inhabit the Nearctic region, while, as usual with exclusively American families, the larger proportion of the genera and species are found in the
tropical parts of South America. The genera adopted by Messrs. Sclater and Salvin are the following:

*Clupeicterus* (1 sp.), Upper Amazon; *Ocyalus* (2 sp.), Upper Amazon to Mexico; *Ostinops* (8 sp.), Brazil and Bolivia to Mexico; *Cassiculus* (1 sp.), Mexico; *Cassicus* (10 sp.), South Brazil and Bolivia to Costa Rica; *Icterus* (34 sp.), La Plata to the Antilles and United States; *Dolichonyx* (1 sp.), Paraguay to Canada; *Molothrus* (8 sp.), La Plata to Northern United States; *Aglaeus* (7 sp.), La Plata and Chili to Northern United States; *Xanthocoephalus* (1 sp.), Mexico to California and Canada; *Xanthosomus* (4 sp.), La Plata to Venezuela; *Amblyrhambphus* (1 sp.), La Plata and Bolivia; *Gymnomystax* (1 sp.), Amazonia and Guiana; *Pseudoleistes* (2 sp.), La Plata and Brazil; *Leistes* (3 sp.), La Plata to Venezuela; *Sturnella* (5 sp.), Patagonia and Falkland Islands to Middle United States; *Curaeus* (1 sp.), Chili; *Nesopsar* (1 sp.), Jamaica; *Scolecoptagaus* (2 sp.), Mexico to Arctic Circle; *Lampropsar* (4 sp.), Amazonia and Ecuador to Mexico; *Quiscalus* (10 sp.), Venezuela and Columbia to South and Central United States; *Hypopyrrhus* (1 sp.), Columbia; *Aphobus* (1 sp.), Brazil and Bolivia; *Cassidix* (2 sp.), Brazil to Mexico and Cuba.

**Family 32.—TANAGRIDÆ.** (43 Genera, 304 Species.)

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The Tanagers are an extensive family of varied and beautiful fruit-eating birds, almost peculiar to the Neotropical region, only four species of a single genus (*Pyranga*) extending into the Eastern United States and Rocky Mountains. Southward they range to La Plata. They are especially abundant in the forest regions of South America east of the Andes, where no less than 40 out of the 43 genera occur; 23 of the genera are peculiar to this sub-region, while only 1 (*Phlogothraupis*) is
peculiar to Central America and Mexico, and 2 (Spindalis and Phaenicoophilus) to the West Indian islands. The genera adopted by Messrs. Sclater and Salvin with their distribution will be found at Vol. II., p. 99, in our account of Neotropical Zoology.

**FAMILY 33.—FRINGILLIDÆ.** (74 Genera, 509 Species.)

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The great family of the Fringillidæ, or finches, is in a very unsettled state as regards their division into genera, the most divergent views being held by ornithologists as to the constitution and affinities of many of the groups. All the Australian finch-like birds appear to belong to the Ploceidæ, so that the finches, as here constituted, are found in every region and sub-region, except the Australian region from which they are entirely absent—a peculiar distribution hardly to be found in any other family of birds.

Many European ornithologists separate the Emberizidæ, or buntings, as a distinct family, but as the American genera have not been so divided I am obliged to keep them together; but the genera usually classed as "buntings" are placed last, as a sub-family. In the following arrangement of the genera, I have done what I could to harmonize the views of the best modern writers. For convenience of reference the succession of the genera is that of the *Hand List*, and the numbers of the sub-genera are given whenever practicable:—

(1793 1795) Fringilla (6 sp.), the whole Palearctic region, including the Atlantic Islands; (1794) Acanthis (3 sp.), Europe to Siberia, Persia, and North-West Himalayas; (1796) Procarduelis (1 sp.), High Himalayas and East Thibet; (1797 1803) Chrysothrix (18 sp.), Neotropical and Nearctic regions, Europe, and Siberia; (1804) Metoponia (1 sp.), East Europe to North West Himalayas; (1805 and 1809) Chlorospiza (9 sp.), Palearctic region and Africa to the
Cape of Good Hope; (1806—1809) *Dryospiza* (14 sp.), South Europe, Palestine, Canaries, and all Africa; (1810) *Sylalis* (18 sp.), the whole Neotropical region; (1811—1813 1816—1819) *Pygrita* (34 sp.), Palearctic and Oriental regions, and all Africa; (1814) *Montifringilla* (4 sp.), Palearctic region; (1815) *Fringillaenda* (2 sp.), North-West Himalayas to East Thibet; (1820—1825) *Coccothraustes* (6 sp.), Palearctic region and Nepal, Nearctic region to Mexico; (1823) *Eophona* (2 sp.), China and Japan; (1824) *Myerobas* (2 sp.), Central Asia to Persia, High Himalayas, and East Thibet; (1825) *Channoprocclus* (1 sp.), Bonin Islands, south-east of Japan, (probably Palearctic); (1826) *Geospiza* (7 sp.), Galapagos Islands; (1827) *Camarhynchus* (5 sp.), Galapagos Islands; (1828) *Cactornis* (4 sp.), Galapagos Islands; (1830—1832) *Phrygilus* (10 sp.), Columbia to Fuegia and the Falkland Islands; (1833) *Xenospingus* (1 sp.), Peru; (1834) *Dinca* (3 sp.), Peru to Chili and Patagonia; (1835 and 1837) *Emberizoides* (3 sp.), Venezuela to Paraguay; (1836) *Donacospiza* (1 sp.), South Brazil and La Plata; (1838) *Chamaespiza* (1 sp.), Mexico; (1838 and 1840) *Embernagra* (9 sp.), Arizona to La Plata; (1841) *Hæmophila* (6 sp.), Mexico to Costa Rica; (1842) *Atlapetes* (1 sp.), Mexico; (1843) *Pyrgisoma* (5 sp.), Mexico to Costa Rica; (1844 and 1845) *Pipilo* (12 sp.), all North America to Guatemala; (1846) *Junco* (6 sp.), all the United States to Guatemala; (1847) *Zonotrichia* (9 sp.), the whole Nearctic and Neotropical regions; (1848 1849) *Melospiza* (7 sp.), Sitka and United States to Guatemala; (1850) *Spizella* (7 sp.), Canada to Guatemala; (1851) *Passerella* (4 sp.), the Nearctic region and Northern Asia; (1852) *Passerculus* (6 sp.), Nearctic region and to Guatemala; (1853) *Poecetes* (1 sp.), all United States and Mexico; (1854) *Ammodromus* (4 sp.), all United States to Guatemala; (1855) *Coturniculus* (6 sp.), north and east of North America to Jamaica and Bolivia; (1856) *Peneza* (6 sp.), South Atlantic States and California to Mexico; (1857) *Tiaris* (1 sp.), Brazil; (1858) *Volatinia* (1 sp.), Mexico to Brazil and Bolivia; (1859) *Cyanospiza* (5 sp.), Canada to Guatemala; (1860 1861) *Parnaria* (6 sp.), Tropical South America, east of the Andes; (1862) *Coryphospingus* (4 sp.), Tropical South America; (1863) *Haplospiza* (2 sp.), Mexico and Brazil; (1864 1861) *Phonipara* (8 sp.), Mexico to Columbia, the greater Antilles; (1865) *Poospiza*
(13 sp.), California and South Central States to Bolivia and La Plata; \(1824\) *Spodiornis* (1 sp.), Andes of Quito; \(1806 - 1867\) *Pyrrhula* (9 sp.), the whole Palaearctic region to the Azores and High Himalayas; \(1868\) *Crichtona* (17 sp.), Tropical and South Africa, Mauritius, Syria; \(1890\) *Ligurnus* (2 sp.), West Africa; \(1870 - 1871\) *Carpodacus* (18 sp.), Nearctic and Palaearctic regions to Mexico and Central India; \(1872 - 1874\) *Erythropsiza* (6 sp.), Southern parts of Palaearctic region; \(1875\) *Uragus* (2 sp.), Siberia and Japan; \(1876\) *Cardinalis* (2 sp.), South and Central States to Venezuela; \(1877\) *Pyrrhuloxia* (1 sp.), Texas and Rio Grande; \(1878\) *Gniraca* (6 sp.), Southern United States to La Plata; \(1889\) *Amaurospiza* (2 sp.), Costa Rica and Brazil; \(1881\) *Hedy-meles* (2 sp.), all United States to Columbia; \(1882\) *Pheucticus* (5 sp.), Mexico to Peru and Bolivia; \(1883\) *Oryzoborus* (6 sp.), Mexico to Ecuador and South Brazil; \(1884\) *Melopyrrha* (1 sp.), Cuba; \(1885\) *Locigilla* (4 sp.), Antilles; \(1886, 1887\) *Spermophila* (44 sp.), Texas to Bolivia and Uruguay; \(1888\) *Catamenia* (4 sp.), Columbia to Bolivia; \(1889\) *Neorhynchus* (3 sp.), West Peru; \(1892\) *Catamblyrhynchos* (1 sp.), Columbia; \(1893\) *Loxia* (7 sp.), Europe to North-west India and Japan, Arctic America to Pennsylvania, Mexico; \(1894\) *Pinicola* (3 sp.), Arctic America, Northeast Europe to the Amoor, Camaroons Mountains West Africa; \(1895\) *Propyrrhula* (1 sp.), Darjeeling in the winter, ? Thibet; \(1896\) *Pyrrhospiza* (1 sp.), Snowy Himalayas; \(1897\) *Hæmatospiza* (1 sp.), South-east Himalayas, 5,000 - 10,000 feet; \(1898, 1899\) *Linota* (12 sp.), Europe to Central Asia, north and east of North America; \(1899\) *Leucosticta* (7 sp.), Siberia and Thibet to Kamschatka, and from Alaska to Utah.

Sub-family Emberizinae.—\(1900\) *Calamospiza* (1 sp.), Arizona and Texas to Mexico; \(1905\) *Chondistes* (2 sp.), Western, Central, and Southern States to Mexico and Nicaragua; \(1907 - 1910\) *Eu-ospiza* (9 sp.), Palaearctic region, India, Burmah, and South China, South-east United States to Columbia; \(1911 - 1920\) *Emberiza* (28 sp.), the whole Palaearctic region (continental), to Central India in winter; \(1921\) *Gubernatrix* (1 sp.), Paraguay and La Plata, (according to Messrs. Selater and Salvin this comes next to Pipilo); \(1923\) *Fringillaria* (8 sp.), Africa and South Europe;
(1923 - 1925) *Plectrophanes* (6 sp.), Arctic Zone to Northern Europe and North China, Arctic America, and east side of Rocky Mountains; (1926) *Centronyx* (1 sp.), Mouth of Yellowstone River.

**Family 34.—Ploceidæ.** (29 Genera, 252 species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Ploceidæ, or Weaver-finches, are especially characteristic of the Ethiopian region, where most of the genera and nearly four-fifths of the species are found; the remainder being pretty equally divided between the Oriental and Australian regions. Like the true finches these have never been properly studied, and it is exceedingly difficult to ascertain what genera are natural and how far those of Australia and Africa are distinct. The following enumeration must therefore be taken as altogether tentative and provisional. When the genera adopted differ from those of the *Hand List* they will be referred to by numbers.

*Textor* (5 sp.), Tropical and South Africa; *(1650 - 1654 1657) Hypphanornis* (32 sp.), Tropical and South Africa; *(1655 1656) Symplectes* (8 sp.), Tropical and South Africa; *Malimbus* (9 sp.), West Africa; *(1650 1661) Plocus* (6 sp.), West and East Africa, the Oriental region (excluding Philippines); *(1660) Nelicurvis* (1 sp.), Madagascar; *Foudia* (12 sp.), Madagascar and Mascarene Islands, Tropical Africa; *(1663 1664) Sporopipes* (2 sp.), Tropical and South Africa; *(1665 - 1667) Pyromelana* (14 sp.), Tropical and South Africa, Abyssinia to 10,500 feet; *Philetærus* (1 sp.), South Africa; *Nigrita* (7 sp.), West Africa to Upper Nile; *Plocepasser* (4 sp.), East and South Africa; *(1672 - 1674) Vidua* (7 sp.), Tropical and South Africa (Plate V., Vol. I., p. 264); *(1675 - 1677) Coliuspasser* (9 sp.), Tropical and South Africa; *Chera* (1 sp.), South Africa; *Spermospiza* (2 sp.), West Africa; *Pyrenestes* (6 sp.), Tropical and South Africa; *(1682 - 1687 1689 1692 1693 1698) Estrilda* (26 sp.), Tropical and South Africa, India, Burmah, and Java to Australia; *(1688 1690*
Family 35.—STURNIDÆ. (29 Genera, 124 Species.)

The Sturnidæ, or Starlings, are a highly characteristic Old-World group, extending to every part of the great Eastern continent and its islands, and over the Pacific Ocean to the Samoa Islands and New Zealand, yet wholly absent from the mainland of Australia. The family appears to be tolerably well-defined, and the following genera are generally considered to belong to it: (1558 1559 1562) Eulabes (13 sp.), the Oriental region to South-west China, Hainan, and Java,—and Flores, New Guinea and the Solomon Islands in the Australian region; Ampeliceps (1 sp.), Tenasserim, Burmah, and Cochin China; Gymnops (1 sp.), Philippine Islands; Basilornis (2 sp.), Celebes and Ceram; Pastor (1 sp.), South-east Europe to India, Ceylon, and Burmah; Acridoitheres (7 sp.), the whole Oriental region and Celebes; (1568 1569) Sturnia (12 sp.), the whole Oriental region, North China, Japan, and Siberia, Celebes; Dilophus (1 sp.) South Africa; Sturnus (6 sp.), Palearctic region, to India and South China in winter; Sturnopastor (4 sp.), India to Burmah and East Java; Creadion (2 sp.) New Zealand; Heterolocha (1 sp.), New Zealand; (1520) Callias

1691 1695 1696) Ptyelia (24 sp.), Tropical and South Africa; (1694) Hypargos (2 sp.), Mozambique and Madagascar; (1697) Emblema (1 sp.), North-west Australia; (1699 1712 - 1717) Amadina (15 sp.), Tropical and South Africa, Moluccas to Australia and the Samoa Islands; (1700 1701 1710) Spermestes (8 sp.), Tropical Africa and Madagascar; (1702) Amaurosthes (1 sp.), East and West Africa; (1703 1707 - 1709 1711) Munia (30 sp.), Oriental region to Timor and New Guinea; (1704) Donacola (3 sp.), Australia; (1705 1706) Poephila (6 sp.), Australia; (1713 - 1721) Erythrus (7 sp.), Sumatra to Java, Moluccas, Timor, New Guinea, and Fiji Islands; (1722) Hypochera (3 sp.), Tropical and South Africa.
(2 sp.), New Zealand; *Buphaga* (2 sp.), Tropical and South Africa; *Euryceros* (1 sp.), Madagascar (see Plate VI., Vol. I., p. 278.). This genus and the last should perhaps form distinct families. ([1577] *Juida* (5 sp.), Central, West, and South Africa; ([575] *Lamprocolius* (20 sp.), Tropical and South Africa; *Cinnycricinclus* (2 sp.), Tropical and South Africa; *Onychognathus* (2 sp.), West Africa; ([1581] *Spreo* (4 sp.), Tropical and South Africa; ([1582]—[1585] *Amydrus* (7 sp.), South and East Africa, Palestine; *Aplonis* (9 sp.), New Caledonia to the Tonga Islands; ([1587]—[1589] *Calornis* (18 sp.), the whole Malay Archipelago and eastward to the Ladrone and Samoa Islands; ([1596] *Enodes* (1 sp.), Celebes; *Scissirostrum* (1 sp.), Celebes; ([1592] *Saroglossa* (1 sp.), Himalayas; ([1593] *Hartlaubius* (1 sp.), Madagascar; *Fregilupus* (1 sp.), Bourbon, but it has recently become extinct; ([308] *Falculia* (1 sp.), Madagascar.

**Family 36.—Artamidæ.** (1 Genus, 17 Species.)

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The Artamidæ, or Swallow-shrikes, are a curious group of birds, ranging over the greater part of the Oriental and Australian regions as far east as the Fiji Islands and south to Tasmania. Only a single species inhabits India, and they are more plentiful in Australia than in any other locality. The only well-marked genus is *Artamus*.

There are a few Madagascar birds belonging to the genus *Artamia*, which some ornithologists place in this family, others with the Laniidæ, but which are here classed with the Oriolidæ.
**Family 37.—ALAUDIDÆ.** (15 Genera, 110 Species.)

**General Distribution.**

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The Alaudidæ, or Larks, may be considered as exclusively belonging to the great Eastern continent, since the Nearctic, Neotropical, and Australian regions have each only a single species. They abound most in the open plains and deserts of Africa and Asia, and are especially numerous in South Africa. The genera, including those recently established by Mr. Sharpe, are as follows:—

**Otocorys** (8 sp.); the Palearctic region, North America and south to the Andes of Columbia, North India; (1928–1929) *Alauda* (17 sp.), Palearctic region, all Africa, the Peninsula of India, and Ceylon; (1931) *Galerita* (10 sp.), Central Europe to Senegal and Abyssinia, Persia, India and North China; (1932) *Calendula* (2 sp.), Abyssinia and South Africa; (1933–1934) *Calandrella* (6 sp.), Europe, North Africa, India, Burmah, North China, and Mongolia; (1935–1937) *Melanocorypha* (7 sp.), South Europe to Tartary, Abyssinia, and North-west India; *Pallasia* (*sp. 7781*), East Asia; (1938) *Certhilauda* (4 sp.), South Europe, South Africa; *Heterocorys* (*sp. 7792*) South Africa; (1939) *Almon* (3 sp.), South-east Europe to Western India, and South Africa; (1940) *Mirafra* (25 sp.), the Oriental and Ethiopian regions to Australia; (1941) *Ammomanes* (10 sp.), South Europe to Palestine and Central India, and to Cape Verd Islands and South Africa; (1942–1943) *Megalophonus* (6 sp.), Tropical and South Africa; *Tephrocorys* (1 sp.), South Africa; *Pyrrhulauda* (9 sp.), all Africa, Canary Islands, India and Ceylon.
Family 38.—MOTACILLIDÆ. (9 Genera, 80 Species.)

General Distribution.

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The Motacillidae, or Wagtails and Pipits, are universally distributed, but are most abundant in the Palearctic, Ethiopian, and Oriental regions, to which the true wagtails are almost confined. The following genera are usually adopted, but some of them are not very well defined:

Motacilla (15 sp.), ranges over the greater part of Europe, Asia, and Africa, and to Alaska in North-west America; Budytes (10 sp.), Europe, Africa, Asia to Philippines, Moluccas, Timor, and North Australia; Calobates (3 sp.), South Palearctic and Oriental regions to Java; Nemoricola (1 sp.), Oriental region; Anthus (30 sp.), all the great continents; Neocorys (1 sp.), Central North America; Corydilla (14 sp.), South Europe to India, China, the Malay Islands, Australia, New Zealand and the Auckland Islands; Macronyx (5 sp.), Tropical and South Africa; Heterura (1 sp.), Himalayas.

Family 39.—TYRANNIDÆ. (71 Genera, 329 Species.)

General Distribution.

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The Tyrannidae, or Tyrant Shrikes, form one of the most extensive and truly characteristic American families of birds; as they extend over the whole continent from Patagonia to the Arctic regions, and are found also in all the chief American islands—the Antilles, the Galapagos, the Falkland Islands, and
Juan Fernandez. As the genera are all enumerated in the table, at p. 101 of this volume, I shall here confine myself to the distribution of the sub-families, only referring to such genera as are of special geographical interest.

Sub-family I. Conopha-genae (2 genera, 13 species). Confined to tropical South America, from Brazil and Bolivia to Guiana and Columbia.

Sub-family II. Tanioptera-genae (19 genera, 76 species). This group ranges from Patagonia and the Falkland Islands to the northern United States; yet it is almost wholly South American, only 2 genera and 4 species passing north of Panama, and none inhabiting the West Indian islands. Sayornis has 3 species in North America, while Tanioptera, Chipolagus, Muscisaxicola, and Centrites, range south to Patagonia.

Sub-family III. Platyrrhyncha-genae (16 genera, 60 species). This sub-family is wholly Neotropical and mostly South American, only 7 of the genera passing Panama and but 3 reaching Mexico, while there are none in the West Indian islands. Only 3 genera extend south to the temperate sub-region, and one of these, Ancretes, has a species in Juan Fernandez.

Sub-family IV. Elainea-genae (17 genera, 91 species). This sub-family is more exclusively tropical, only two genera extending south as far as Chili and La Plata, while none enter the Nearctic region. No less than 10 of the genera pass north of Panama, and one of these, Elainea, which ranges from Chili to Costa Rica has several species in the West Indian islands. About one fourth of the species of this sub-family are found north of Panama.

Sub-family V. Tyrannae-genae (17 genera, 89 species). This sub-family is that which is best represented in the Nearctic region, where 6 genera and 24 species occur. Milvulus reaches Texas; Tyrannus and Myiarchus range over all the United States; Empidias, the Eastern States and California; Contopus extends to Canada; Empidonax ranges all over North America; and Pyrocephalus reaches the Gila Valley as well as the Galapagos Islands. No less than 5 genera of this sub-family occur in the West Indian islands.
FAMILY 39a.—OXYRHAMPHIDÆ. (1 Genus, 2 Species.)

General Distribution.

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The genus *Oxyrhynchus* (2 sp.) which ranges from Brazil to Costa Rica, has usually been placed in the Dendrocolaptidæ; but Messrs. Sclater and Salvin consider it to be the type of a distinct family group, most allied to the Tyrannidæ.

FAMILY 40.—PIPRIDÆ. (15 Genera, 60 Species.)

General Distribution.

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The Pipridæ, or Manakins, have generally been associated with the next family, and they have a very similar distribution. The great majority of the genera and species are found in the equatorial regions of South America, only 9 species belonging to 5 genera ranging north of Panama, while 2 or 3 species extend to the southern limit of the tropical forests in Paraguay and Brazil. The genera which go north of Panama are *Piprites*, *Pipra*, *Chiroxiphia*, *Chiromachewis*, and *Heteropelma*. *Pipra* is the largest genus, containing 19 species, and having representatives throughout the whole range of the family. As in all the more extensive families peculiar to the Neotropical region, the distribution of the genera will be found in the tables appended to the chapter on the Neotropical region in the Third Part of this work. (Vol. II. p. 103).
FAMILY 41.—\textit{Cotingidae}. (28 Genera, 93 Species.)

General Distribution.

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The Cotingidae, or Chatterers, comprise some of the most beautiful and some of the most remarkable of American birds, for such we must consider the azure and purple Cotingas, the wine-coloured white-winged Pompadour, the snowy carunculated Bell-birds, the orange-coloured Cocks-of-the-Rock, and the marvellously-plumed Umbrella-birds, (Plate XV. Vol. II. p. 28). The Cotingidae are also one of the most pre-eminently Neotropical of all the Neotropical families, the great mass of the genera and species being concentrated in and around the vast equatorial forest region of the Amazon. Only 13 species extend north of Panama, one to the Antilles, and not more than 20 are found to the south of the Amazon Valley. Messrs. Sclater and Salvin divide the family into six sub-families, the distribution of which will be briefly indicated.

Sub-family I. \textit{Tityrinæ} (3 genera, 22 species). Ranges from Brazil to Mexico; one species of \textit{Hadrostomus} inhabiting Jamaica.

Sub-family II. \textit{Lipauginæ} (4 genera, 14 species) also ranges from Brazil to Mexico; one genus \textit{(Ptilochloris)} is confined to Brazil.

Sub-family III. \textit{Attalinæ} (2 genera, 10 species). Ranges from Paraguay to Costa Rica; one genus \textit{(Cusiornis)} is confined to South Brazil and Paraguay.

Sub-family IV. \textit{Rupicolinae} (2 genera, 5 species). This sub-family is restricted to the Amazonian region and Guiana, with one species extending along the Andean valleys to Bolivia. The genera are \textit{Rupicola} (3 species) and \textit{Phanicoecerus} (2 species).

Sub-family V. \textit{Cotinginae} (10 genera, 28 species). Ranges from Southern Brazil and Bolivia to Nicaragua; only two species
(belonging to the genera *Carpodectes* and *Cotinga*) are found north of Panama, and there are none in the West Indian islands. The great majority of these, the true Chatterers, are from the regions about the Equator.

Sub-family VI. *Gymnoderinæ* (7 genera, 14 species). Ranges from Brazil to Costa Rica; two species, of the genera *Chasmorhynchus* and *Cephalopterus*, are found north of Panama, while there are none in the West Indian islands. Only 2 species are found south of the Amazon valley.

**Family 42.—Phytotomidae.** (1 Genus, 3 Species.)

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The Phytotomidae, or Plant-cutters, are singular thick-billed birds, strictly confined to the temperate regions of South America. The single genus, *Phytotoma*, is found in Chili, La Plata, and Bolivia. Their affinities are uncertain, but they are believed to be allied to the series of families with which they are here associated. (Plate XVI. Vol. II. p. 128).

**Family 43.—Eurylæmidæ.** (6 Genera, 9 Species.)

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The Eurylæmidæ, or Broad-bills, form a very small family of birds, often adorned with striking colours, and which have their nearest allies in the South American Cotingidæ. They have a very limited distribution, from the lower slopes of the Himalayas through Burmah and Siam, to Sumatra, Borneo, and Java. They are evidently the remains of a once extensive group, and from the small number of specific forms remaining, seem to be on
the road to extinction. Thus we may understand their isolated geographical position. The following are the names and distribution of the genera:

*Eurylemus* (2 species), Malay Peninsula, Sumatra, Java, and Borneo; *Corydorn* (1 species), Malacca, Sumatra and Borneo (Plate IX. Vol. I. p. 339); *Psarismus* (1 species), Himalayas to Burmah, up to 6,000 feet; *Serilophus* (2 species), Nepal to Tenasserim; *Cymbirhynchus* (2 species), Siam to Sumatra and Borneo; *Calyptomena* (1 species), Penang to Sumatra and Borneo.

**Family 44.—DENDROCOLAPTIDÆ. (43 Genera, 217 Species.)**

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The Dendrocolaptidae, or American Creepers, are curious brown-coloured birds with more or less rigid tail feathers, strictly confined to the continental Neotropical region, and very numerous in its south-temperate extremity. They are divided by Messrs. Sclater and Salvin into five sub-families, to which I shall confine my remarks on their distribution. The details of the numerous genera, being only interesting to specialists, will be given in the table of genera of the Neotropical region. No less than 13 of the genera are confined to South-Temperate America and the High Andes; 14 are restricted to Tropical South America, while not one is peculiar to Tropical North America, and only 15 of the 43 genera extend into that sub-region, showing that this is one of the pre-eminently South American groups.

Sub-family I. *Furnariinæ* (8 genera, 30 species). Ranges over all South America, 4 genera and 18 species being restricted to the temperate sub-region; one species is found in the Falkland Islands.

Sub-family II. *Sclerurinæ* (1 genus, 6 species). Brazil to Guiana, Columbia, and north to Mexico.

Sub-family III. *Synallaxinæ* (12 genera, 78 species). Ranges from Patagonia to Mexico; 7 genera and 23 species are confined

Vol. II.—20
to the temperate sub-region; species occur in the islands of Mas-a-fuera, Trinidad, and Tobago.

Sub-family IV. Philydorinæ (6 genera, 35 species). Con-

fined to Tropical America from Brazil to Mexico; 4 genera and 8 species occur in Tropical North America.

Sub-family V. Dendrocolaptinæ (14 genera, 59 species).

Ranges from Chili and La Plata to Mexico; only 3 species occur in the South Temperate sub-region, while 9 of the genera extend into Tropical North America. Two of the continental species occur in the island of Tobago, which, together with Trinidad, forms part of the South American rather than of the true Antillean sub-region.

Family 45.—Formicariidæ. (32 Genera, 211 Species.)

General Distribution.

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The Formicariidæ, comprising the Bush-Shrikes and Ant-

thrushes, form one of the most exclusively Neotropical families; and the numerous species are rigidly confined to the warm and wooded districts, only a single species extending to La Plata, and none to the Antilles or to the Nearctic region. Less than 30 species are found north of Panama. Messrs. Selater and Salvin divide the group into three sub-families, whose distribution may be conveniently treated, as in the Dendrocolaptideæ, without enumerating the genera.

Sub-family I. Thamnophilinæ.—(10 genera, 70 species.) One species of Thamnophilus inhabits La Plata; only 3 genera and 12 species are found north of Panama, the species of this sub-family being especially abundant in the Equatorial forest districts.

Sub-family II. Formicivorinæ.—(14 genera, 95 species.) Only 8 species occur north of Panama, and less than one-third of the species belong to the districts south of the Equator.
Sub-family III. Formicariinæ.—(8 genera, 46 species.) About 12 species occur north of Panama, and only 5 south of the Equatorial district.

It appears, therefore, that this extensive family is especially characteristic of that part of South America from the Amazon valley northwards.

**Family 46.—Pteroptychidæ.** (8 Genera, 19 Species.)

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The Pteroptychidae are a group of curious Wren-like birds, almost confined to the temperate regions of South America, extending along the Andes beyond the Equator, and with a few species in South-east Brazil, and one in the valley of the Madeira. The genera are as follows:

*Scytalopus* (8 sp.), Chili and West Patagonia to the Andes of Columbia; *Merulaxis* (1 sp.), South-east Brazil; *Rhinocrypta* (2 sp.), Northern Patagonia and La Plata; *Lioscelis* (1 sp.), Madeira valley; *Pteroptychus* (2 sp.), Chili; *Hylactes* (3 sp.), Western Patagonia and Chili; *Acropternis* (1 sp.), Andes of Ecuador and Columbia; *Triptorhinus* (1 sp.), Chili.

**Family 47.—Pittidæ.** (4 Genera, 40 Species.)

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The Pittas comprise a number of beautifully-coloured Thrush-like birds, which, although confined to the Old World, are more nearly allied to the South American Pteroptychidae than to any other family. They are most abundant in the Malay Archipelago,
between the Oriental and Australian divisions of which they are pretty equally divided. They seem, however, to attain their maximum of beauty and variety in the large islands of Borneo and Sumatra; from whence they diminish in numbers in every direction till we find single species only in North China, West Africa, and Australia. The genera here adopted are the following:

\[ (1087 \ 1088 \ 1090 \ 1092 \ 1093) \ Pitta \ (33 \text{ sp.}), \] has the range of the family; \[ (1099) \ Hydrornis \ (3 \text{ sp.}), \] Himalayas and Malaya; \[ Encichla \ (3 \text{ sp.}), \] Malaya; \[ Melampitta \ (1 \text{ sp.}), \] recently discovered in New Guinea.

**FAMILY 48.—PAICTIDÆ.** (1 Genus, 2 Species.)

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This family was established by Professor Sundevall, for an anomalous bird of Madagascar, which he believes to have some affinity for the American Formicariidae, but which perhaps comes best near the Pittas. The only genus is *Philepitta*, containing two species.

**FAMILY 49.—MENURIDÆ.** (1 Genus, 2 Species.)

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The Menuridæ, or Lyre Birds, remarkable for the extreme elegance of the lyre-shaped tail in the species first discovered, are birds of a very anomalous structure, and have no near affinity to any other family. Two species of *Menura* are known, confined to South and East Australia (Plate XII. Vol. I. p. 441).
FAMILY 50.—ATRICHIIDÆ. (1 Genus, 2 Species.)

General Distribution.

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The genus *Atrichia*, or Scrub-birds of Australia, have been formed into a separate family by Professor Newton, on account of peculiarities in the skeleton which separate them from all other Passeres. Only two species are known, inhabiting East and West Australia respectively. They are very noisy, brown-coloured birds, and have been usually classed with the warblers, near *Amytis* and other Australian species.

General remarks on the distribution of the Passeres.

The order Passeres, is the most extensive among birds, comprehending about 5,700 species grouped in 870 genera, and 51 families. The distribution of the genera, and of the families considered individually, has been already sufficiently given, and we now have to consider the peculiarities of distribution of the families collectively, and in their relations to each other, as representing well-marked types of bird-structure. The first thing to be noted is, how very few of these families are truly cosmopolitan; for although there are seven which are found in each of the great regions, yet few of these are widely distributed throughout all the regions, and we can only find three that inhabit every sub-region, and are distributed with tolerable uniformity; these are the Hirundinidae, or swallows, the Motacillidae or wagtails and pipits, and the Corvidae or crows,—but the latter is a family of so heterogeneous a nature, that it possibly contains the materials of several natural families, and if so divided, the parts would probably all cease to be cosmopolitan. The Sylviidae, the
Turdidæ, and the Paridæ, are the only other families that approach universality of distribution, and all these are wanting in one or more sub-regions. If, now, we divide the globe into the New and the Old World, the former including the whole American continent, the latter all the rest of the earth, we find that the Old World possesses exclusively 23 families, the New World exclusively 14, of which 5 are common to North and South America. But if we take the division proposed by Professor Huxley—a northern world, comprising our first four regions (from Nearctic to Oriental), and a southern world comprising our last two regions (the Australian and Neotropical)—we find that the northern division possesses only 5 families exclusively, and the southern division 13 exclusively, of which not one is common to Australia and South America. This plainly indicates that, as far as the Passeres are concerned, the latter bipartite division is not so natural as the former. Again, if we compare temperate with tropical families (not too rigidly, but as regards their general character), we find in the northern hemisphere only two families that have the character of being typically temperate— the Cinclidæ, and in a less degree the Ampelidæ—both of small extent. In the southern hemisphere we have also two, the Phytotomidæ, and in a less degree, the Pteroptochidæ; making two wholly and two mainly temperate families. Of exclusively tropical families on the other hand, we have about 12, and several others that are mainly tropical.

The several regions do not differ greatly in the number of families found in each. The Nearctic has 19, the Palearctic 21, the Ethiopian 23, the Oriental 28, the Australian 29, and the Neotropical 23. But many of these families are only represented by a few species, or in limited districts; and if we count only those families which are tolerably well represented, and help to form the ornithological character of the region, the richness of the several tropical regions will appear to be (as it really is) comparatively much greater. The families that are confined to single regions are not very numerous, except in the case of the Neotropical region, which has 5. The Australian has only
3, the Oriental 1, the Ethiopian 1, and the other regions have no peculiar families.

The distribution of the Passeres may be advantageously considered as divided into the five series of Turdoid, Tanagroid, Sturnoid, Formicarioid, and Anomalous Passeres. The Turdoid Passeres, consisting of the first 23 families, are especially characteristic of the Old World, none being found exclusively in America, and only two or three being at all abundant there. The Tanagroid Passeres (Families 24-33) are very characteristic of the New World, five being confined to it, and three others being quite as abundant there as in the Old World; while there is not a single exclusively Old World family in the series, except the Drepanididae confined to the Sandwich Islands. The Sturnoid Passeres (Families 34-38) are all exclusively Old World, except that two larks inhabit parts of North America, and a few pipits South America. The Formicarioid Passeres (Families 39-48) are strikingly characteristic of the New World, to which seven of the families exclusively belong; the two Old World groups being small, and with a very restricted distribution. The Anomalous Passeres (Families 49-50) are confined to Australia.

The most remarkable feature in the geographical distribution of the Passeres is the richness of the American continent, and the large development of characteristic types that occurs there. The fact that America possesses 14 altogether peculiar families, while no less than 23 Old-World families are entirely absent from it, plainly indicates, that, if this division does not represent the most ancient and radical separation of the land surface of the globe, it must still be one of very great antiquity, and have modified in a very marked way the distribution of all living things. Not less remarkable is the richness in specific forms of the 13 peculiar American families. These contain no less than 1,570 species, leaving only about 500 American species in the 13 other Passerine families represented in the New World. If we make a deduction for those Nearctic species which occur only north of Panama, we may estimate the truly Neotropical species of Passerine birds at 1,900, which is almost exactly
one-third of the total number of Passeres; a wonderful illustration of the Ornithological riches of South America.

Order II.—PICARLÆ.

Family 51.—PICIDÆ. (36 Genera, 320 Species.)

General Distribution.

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaeartic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
<th>Oriental Sub-regions</th>
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The Woodpeckers are very widely distributed, being only absent from the Australian region beyond Celebes and Flores. They are most abundant in the Neotropical and Oriental regions, both of which possess a number of peculiar genera; while the other regions possess few or no peculiar forms, even the Ethiopian region having only three genera not found elsewhere. The soft-tailed Picumnineæ inhabit the tropical regions only, Picumnus being Neotropical, Vivia and Sasia Oriental, and Verreauxia Ethiopian. Picoides, or Apterinus, is an Arctic form peculiar to the Nearctic and Palæartic regions. Celeus, Chrysopilus, ChlORONERPS, and some smaller genera, are Neotropical exclusively, and there are two peculiar forms in Cuba. Yungipicus, Chrysocolaptes, Hemicercus, Mulleripicus, Brachypterus, Tiga, and Micropterus, are the most important of the peculiar Oriental genera. Dendropicus and Geocolaptes are Ethiopian; but there are no woodpeckers in Madagascar. The Palæartic woodpeckers belong to the genera Picus—which is widely distributed, Gecinus—which is an Oriental form, and Dryocopus—which is South American. Except Picoides, the Nearctic woodpeckers are mostly of Neotropical genera; but Sphyrapicus and Hylatomus are peculiar. The geological record is, as yet, almost silent as to this family; but remains doubtfully referred to it have been found in the Miocene of Europe and the Eocene of the United States. Yet the group is evidently one of very high antiquity, as is shown by
its extreme isolation, its great specialization of structure, its abundant generic forms, and its wide distribution. It originated, probably, in Central Asia, and passed through the Nearctic region to South America, in whose rich and varied forests it found the conditions for rapid development, and for the specialization of the many generic forms now found there.

A large number of genera have been established by various authors, but their limitations and affinities are not very well made out. Those which seem best established are the following:

\(^{(2107 - 2112)}\) Piuminus (22 sp.), Tropical South America to Honduras; \(^{(2113)}\) Vivia (1 sp.), Himalayas to East Thibet; \(^{(2114)}\) Sasia (2 sp.), Nepal to Java; \(^{(2115)}\) Verreauxia (1 sp.), West Africa; Picoides (5 sp.), northern parts of Nearctic and Palæarctic regions, and Mountains of East Thibet; Picus (42 sp.), the whole Palæarctic, Oriental, Nearctic, and Neotropical regions; \(^{(2123)}\) Hyopicus (2 sp.), Himalayas and North China; \(^{(2124)}\) Yungipicus (16 sp.), Oriental region, and to Flores, Celebes, North China, and Japan; \(^{(2127 - 2128)}\) Sphyrocicus (7 sp.), Nearctic region, Mexico, and Bolivia; \(^{(2130 - 2133 2139)}\) Campephilus (14 sp.), Neotropical and Nearctic regions; \(^{(2134)}\) Reinwardtipicus (1 sp.), Penang to Borneo; \(^{(2135 2136)}\) Venilia (2 sp.), Nepal to Borneo; Chrysocolaptes (8 sp.), India and Indo-Malaya; Dendropicus (16 sp.), Tropical and South Africa; Hemicercus (5 sp.), Malabar and Pegu to Malaya; Gecinus (18 sp.), Palæarctic and Oriental regions to Java; \(^{(2151 - 2156)}\) Dendromus (15 sp.), West and South Africa, Zanzibar, and Abyssinia; \(^{(2157 - 2159)}\) Mulleripicus (6 sp.), Malabar, Pegu, Indo-Malaya, and Celebes; Celceus (17 sp.), Paraguay to Mexico; Nesoceleus (sp. 8333) Cuba; \(^{(2162)}\) Chrysopilus (9 sp.), Chili and South Brazil to Mexico; Brachypternus (5 sp.), India, Ceylon, and China; \(^{(2165 2166)}\) Tiga (5 sp.), all India to Malaya; \(^{(2167)}\) Gecinlus (2 sp.), South-east Himalayas to Burmah; Centurus (13 sp.), Nearctic Region to Antilles and Venezuela; Chloronerpes (35 sp.), Tropical America, Hayti; \(^{(2177)}\) Xiphidiopicus (1 sp.), Cuba; Melanerpes (11 sp.), Brazil to
Canada, Porto Rico; *Leuconerpes* (1 sp.), Bolivia to North Brazil; *Colaptes* (9 sp.), La Plata and Bolivia to Arctic America, Greater Antilles; *Hypoxanthus* (1 sp.), Venezuela and Ecuador; *Geocolaptes* (1 sp.), South Africa; *Miglyptes* (3 sp.), Malaya; *Micropternus* (8 sp.), India and Ceylon to South China, Sumatra and Borneo.

**Family 52.—** Yungidæ. (1 Genus, 5 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Wrynecks (*Yunnx*), which constitute this family, are small tree-creeping birds characteristic of the Palaearctic region, but extending into North and East Africa, over the greater part of the peninsula of India (but not to Ceylon), and just reaching the lower ranges of the Himalayas. There is also one species isolated in South Africa.

**Family 53.—** Indicatoridæ. (1 Genus, 12 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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</table>

The Honey-guides (*Indicator*) constitute a small family of doubtful affinities; perhaps most nearly allied to the woodpeckers and barbets. They catch bees and sometimes kill small birds; and some of the species are parasitical like the cuckoo. Their distribution is very interesting, as they are found in every part of the Ethiopian region, except Madagascar, and in the Oriental region only in Sikhim and Borneo, being absent from the peninsula of India which is nearest, both geographically and zoologically, to Africa.


The Megalæmidae, or Barbets, consist of rather small, fruit-eating birds, of heavy ungraceful shape, but adorned with the most gaudy colours, especially about the head and neck. They form a very isolated family; their nearest allies being, perhaps, the still more isolated Toucans of South America. Barbets are found in all the tropics except Australia, but are especially characteristic of the great Equatorial forest-zone; all the most remarkable forms being confined to Equatorial America, West Africa, and the Indo-Malay Islands. They are most abundant in the Ethiopian and Oriental regions, and in the latter are universally distributed.

In the beautiful monograph of this family by the Messrs. Marshall, the barbets are divided into three sub-families, as follows:—

Pogonorhynchinae (3 genera, 15 sp.), which are Ethiopian except the 2 species of *Tetragonops*, which are Neotropical; Megalæminæ (6 genera, 45 sp.), which are Oriental and Ethiopian; and Capitoninae (4 genera, 18 sp.), common to the three regions.

The genera are each confined to a single region. Africa possesses the largest number of peculiar forms, while the Oriental region is richest in species.

This is probably a very ancient group, and its existing distribution may be due to its former range over the Miocene South Palaearctic land, which we know possessed Trogons, Parrots, Apes, and Tapirs, groups which are now equally abundant in Equatorial countries.
The following is a tabular view of the genera with their distribution:

<table>
<thead>
<tr>
<th>Genera</th>
<th>Ethiopian Region</th>
<th>Oriental Region</th>
<th>Neotropical Region</th>
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<tbody>
<tr>
<td><strong>Poconorhynchine.</strong></td>
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<tr>
<td>Tricholema ... 1 sp.</td>
<td>W. Africa</td>
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<td>Peru &amp; Costa Rica</td>
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<td>Pogonorrhynchus 12,</td>
<td>All Trop. &amp; S. Af.</td>
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<td>Tetragonops ... 2</td>
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<tr>
<td><strong>Megalemine.</strong></td>
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<td>Megalema ... 29</td>
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<td>Xantholema ... 4</td>
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<td>Xylophoeuo ... 2</td>
<td>W. Africa</td>
<td>Sumatra</td>
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<tr>
<td>Barbatula ... 9</td>
<td>Trop. &amp; S. Africa</td>
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<td>Psilopogon ... 1</td>
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<tr>
<td>Gymnobucceo ... 2</td>
<td>W. Africa</td>
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<tr>
<td><strong>Capitonine.</strong></td>
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<tr>
<td>Trachyphonus ... 5</td>
<td>Trop. &amp; S. Africa</td>
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<td>Equatorial Amer. to Costa Rica</td>
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<td>Capito ... 10</td>
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<td>Calorhamphus ... 2</td>
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<td>Malay Pen., Sumatra, Borneo</td>
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<td>Stactolema ... 1</td>
<td>W. Africa</td>
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**Family 55.—Rhamphastidae.** (5 Genera, 51 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaeartic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Toucans form one of the most remarkable and characteristic families of the Neotropical region, to which they are strictly confined. They differ from all other birds by their long feathered tongues, their huge yet elegant bills, and the peculiar texture and coloration of their plumage. Being fruit-eaters, and strictly adapted for an arboreal life, they are not found beyond the forest regions; but they nevertheless range from Mexico to Paraguay, and from the Atlantic to the Pacific. One genus,
Andiyena, is confined to the forest slopes of the South American Andes. The genera are:

Rhamphastos (12 sp.), Mexico to South Brazil; Pteroglossus (16 sp.), Nicaragua to South Brazil (Plate XV. Vol. II. p. 28); Selenidea (7 sp.), Veragua to Brazil, east of the Andes; Andigena (6 sp.), the Andes, from Columbia to Bolivia, and West Brazil; Aulacorhamphus (10 sp.), Mexico to Peru and Bolivia.

Family 56.—Musophagidae. (2 Genera, 18 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaeartic Sub-regions</th>
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The Musophagidae, or Plantain-eaters and Turacos, are handsome birds, somewhat intermediate between Toucans and Cuc-koos. They are confined to the Ethiopian region and are most abundant in West Africa. The Plantain eaters (Musophaga, 2 sp.), are confined to West Africa; the Turacos (Turacus, 16 sp., including the sub-genera Corythaix and Schizorhisis) range over all Africa from Abyssinia to the Cape (Plate V. Vol. I. p. 264).

Family 57.—Coliidae. (1 Genus, 7 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Colies, consisting of the single genus Colius, are an anomalous group of small finch-like birds, occupying a position between the Picariæ and Passeres, but of very doubtful affinities. Their range is nearly identical with that of the Musophagidae, but they are most abundant in South and East Africa.
FAMILY 58.—CUCULIDÆ. (35 Genera, 180 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Cuculidæ, of which our well-known Cuckoo is one of the most widely distributed types, are essentially a tropical group of weak insectivorous birds, abounding in varied forms in all the warmer parts of the globe, but very scarce or only appearing as migrants in the temperate and colder zones. Many of the smaller Eastern species are adorned with the most intense golden or violet metallic lustre, while some of the larger forms have gaily-coloured bills or bare patches of bright red on the cheeks. Many of the cuckoos of the Eastern Hemisphere are parasitic, laying their eggs in other birds' nests; and they are also remarkable for the manner in which they resemble other birds, as hawks, pheasants, or drongo-shrikes. The distribution of the Cuckoo family is rather remarkable. They abound most in the Oriental region, which produces no less than 18 genera, of which 11 are peculiar; the Australian has 8, most of which are also Oriental, but 3 are peculiar, one of these being confined to Celebes and closely allied to an Oriental group; the Ethiopian region has only 7 genera, all of which are Oriental but three, 2 of these being peculiar to Madagascar, and the other common to Madagascar and Africa. America has 11 genera, all quite distinct from those of the Eastern Hemisphere, and only three enter the Nearctic region, one species extending to Canada.

Remembering our conclusions as to the early history of the several regions, these facts enable us to indicate, with considerable probability, the origin and mode of dispersal of the cuckoos. They were almost certainly developed in the Oriental and Palaearctic regions, but reached the Neotropical at a very early date, where they have since been completely isolated. Africa must have long remained without cuckoos, the earliest immigration
being to Madagascar at the time of the approximation of that sub-region to Ceylon and Malaya. A later infusion of Oriental forms took place probably by way of Arabia and Persia, when those countries were more fertile and perhaps more extensive. Australia has also received its cuckoos at a somewhat late date, a few having reached the Austro-Malay Islands somewhat earlier.

The classification of the family is somewhat unsettled. For the American genera I follow Messrs. Sclater and Salvin; and, for those of the Old World, Mr. Sharpe's suggestive paper in the *Proceedings of the Zoological Society*, 1873, p. 600. The following is the distribution of the various genera:—

(2105) *Phenicophilus* (1 sp.), Ceylon; (2106) *Rhamphocoecyx* (1 sp.), Celebes; (2106) *Rhinococcyx* (1 sp.), Java; (2106 r.t. and 2203) *Rhodopites* (6 sp.), Himalayas to Ceylon, Hainan, and Malaya; (2203 r.t.) *Polioecocyx* (1 sp.), Malacca, Sumatra, and Borneo; (2107) *Dasylphus* (1 sp.), Philippine Islands; (2108) *Lepidogrammus* (1 sp.), Philippine Islands; (2200) *Zanclostomus* (1 sp.), Malaya; (2201) *Ceuthmochares* (2 sp.), Tropical and South Africa and Madagascar; (2202) *Taccocua* (4 sp.), Himalayas to Ceylon and Malacca; (2204) *Rhinowhita* (1 sp.), Malacca, Sumatra, Borneo; (2109) *Carpococcyx* (1 sp.), Borneo and Sumatra; (2200) *Neomorphus* (4 sp.), Brazil to Mexico; (2205 2206) *Cowa* (10 sp.), Madagascar; (2207) *Cochlothraustes* (1 sp.), Madagascar; (2221) *Centropus* (35 sp.), Tropical and South Africa, the whole Oriental region, Austro-Malaya and Australia; (2213) *Crotophaga* (3 sp.), Brazil to Antilles and Pennsylvania; (2212) *Guira* (1 sp.), Brazil and Paraguay; (2200) *Geococcyx* (2 sp.), Guatemala to Texas and California; (2211) *Dromococcyx* (2 sp.), Brazil to Mexico; (2210) *Diplopterus* (1 sp.), Mexico to Ecuador and Brazil; (2208) *Saurothera* (4 sp.), Greater Antilles; (2210) *Hyctornis* (2 sp.), Jamaica and Hayti; (2215) *Piaya* (3 sp.), Mexico to West Ecuador and Brazil; (2215) *Moroecocyx* (1 sp.), Costa Rica to Mexico; (2214) *Coccygus* (10 sp.), La Plata to Antilles, Mexico and Pennsylvania, Cocos Island; (2207) *Cuculus* (22 sp.), Palæarctic, Ethiopian, and Oriental regions, to Moluccas and Australia; (2229) *Calietheos* (1 sp.), Papuan Islands; (2230—2232) *Cucomantis* (15 sp.), Oriental and Australian
regions to Fiji Islands and Tasmania; \(^{(2233-2237)}\) *Chrysococcyx* (16 sp.), Tropical and South Africa, the Oriental and Australian regions to New Zealand and Fiji Islands; \(^{(2238)}\) *Surniculus* (2 sp.), India, Ceylon, and Malaya; \(^{(2239)}\) *Hicrococcyx* (7 sp.), the Oriental region to Amoorland and Celebes; \(^{(2240 \quad 2241)}\) *Coccystes* (6 sp.), Tropical and South Africa, the Oriental region, excluding Philippines; \(^{(2242)}\) *Eudynamis* (8 sp.), the Oriental and Australian regions, excluding Sandwich Islands; \(^{(2243)}\) *Scythrops* (1 sp.), East Australia to Moluccas and North Celebes.

**Family 59.—Leptosomidae.** (1 Genus, 1 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The *Leptosomus discolor*, which constitutes this family, is a bird of very abnormal characters, having some affinities both with Cuckoos and Rollers. It is confined to Madagascar (Plate VI. Vol. I. p. 278).

**Family 60.—Bucconidae.** (5 Genera, 43 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Bucconidae, or Puff-birds, are generally of small size and dull colours, with rather thick bodies and dense plumage. They form one of the characteristic Neotropical families, being most abundant in the great Equatorial forest plains, but extending as far north as Guatemala, though absent from the West Indian Islands.

The genera are:—*Bucco* (21 sp.), Guatemala to Paraguay, and West of the Andes in Ecuador; *Malacoptila* (10 sp.), Guatemala
to Bolivia and Brazil; *Nonnula* (3 sp.), Amazon and Columbia; *Monasa* (7 sp.), Costa Rica to Brazil; *Chelidoptera* (2 sp.), Columbia and Guiana to Brazil.

**Family 61.—GALBULIDÆ.** (6 Genera, 19 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Galbulidæ, or Jacamars, are small slender birds, of generally metallic plumage; somewhat resembling in form the Bee-eaters of the Old World but less active. They have the same general distribution as the last family, but they do not occur west of the Equatorial Andes. The genera are:—

*Galbula* (9 sp.), Guatemala to Brazil and Bolivia; *Urogalba* (2 sp.), Guiana and the lower Amazon; *Brachygalba* (4 sp.), Venezuela to Brazil and Bolivia; *Jacamaralecyon* (1 sp.), Brazil; *Jacamerops* (2 sp.), Panama to the Amazon; *Galbaleyrhynchus* (1 sp.), Upper Amazon.

**Family 62.—CORACIIDÆ.** (3 Genera, 19 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Rollers are a family of insectivorous birds allied to the Bee-eaters, and are very characteristic of the Ethiopian and Oriental regions; but one species (*Coracias garrula*) spreads over the Palæarctic region as far north as Sweden and the Altai mountains, while the genus *Eurystomus* reaches the Amoor valley, Australia, and the Solomon Islands. The distribution of the genera is as follows:—

*Coracias* (8 sp.), the whole Ethiopian region, the Oriental Vol. II.—21
region except Indo-Malaya, the Palaearctic to the above-named limits, and the island of Celebes on the confines of the Australian region; Eurystomus (8 sp.), West and East Africa and Madagascar, the whole Oriental region except the Peninsula of India, and the Australian as far as Australia and the Solomon Islands; Brachypteracias (possibly allied to Leptosomus?) (4 sp.), Madagascar only, but these abnormal birds form a distinct sub-family, and according to Mr. Sharpe, three genera, Brachypteracias, Atelornis, and Geobiastes.

A most remarkable feature in the distribution of this family is the occurrence of a true roller (Coracias temminckii) in the island of Celebes, entirely cut off from the rest of the genus, which does not occur again till we reach Siam and Burmah.

The curious Pseudochelidon from West Africa may perhaps belong to this family or to the Cypselidae. (Ibis. 1861, p. 321.)

Family 63.—Meropidae. (5 Genera, 34 Species.)

The Meropidae, or Bee-eaters, have nearly the same distribution as the Rollers, but they do not penetrate quite so far either into the Eastern Palaearctic or the Australian regions. The distribution of the genera is as follows:

Merops (21 sp.), has the range of the family extending on the north to South Scandinavia, and east to Australia and New Guinea; Nyctornis (3 sp.), the Oriental region, except Ceylon and Java; Meropogon (1 sp.), Celebes; Meropiscus (3 sp.), West Africa; Melittophagus (6 sp.), Ethiopian region, except Madagascar.
The Todies are delicate, bright-coloured, insectivorous birds, of small size, and allied to the Motmots, although externally more resembling flycatchers. They are wholly confined to the greater Antilles, the islands of Cuba, Hayti, Jamaica, and Porto Rico having each a peculiar species of Todus, while another species, said to be from Jamaica, has been recently described (Plate XVI. Vol. II. p. 67).

The Motmots range from Mexico to Paraguay and to the west coast of Ecuador, but seem to have their head-quarters in Central America, five of the genera and eleven species occurring from Panama northwards, two of the genera not occurring in South America. The genera are as follows:—

Momotus (10 sp.), Mexico to Brazil and Bolivia, one species extending to Tobago, and one to Western Ecuador; Urospatha (1 sp.), Costa Rica to the Amazon; Baryphthengus (1 sp.), Brazil and Paraguay; Hylomanes (2 sp.), Guatemala; Prionirhynchus (2 sp.), Guatemala to Upper Amazon; Eumomota (1 sp.), Honduras to Chiriqui.
FAMILY 66.—TROGONIDÆ. (7 Genera, 44 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Trogons form a well-marked family of insectivorous forest-haunting birds, whose dense yet puffy plumage exhibits the most exquisite tints of pink, crimson, orange, brown, or metallic green, often relieved by delicate bands of pure white. In one Guatemalan species the tail coverts are enormously lengthened into waving plumes of rich metallic green, as graceful and marvellous as those of the Paradise-birds. Trogons are tolerably abundant in the Neotropical and Oriental regions, and are represented in Africa by a single species of a peculiar genus. The genera now generally admitted are the following:

*Trogon* (24 sp.), Paraguay to Mexico, and west of the Andes in Ecuador; *Temnotrogon* (1 sp.), Hayti; *Prionoteles* (1 sp.), Cuba (Plate XVII. Vol. II. p. 67); *Apaloderma* (2 sp.), Tropical and South Africa; *Harpactes* (10 sp.), the Oriental region, excluding China; *Pharomacrus* (5 sp.), Amazonia to Guatemala; *Euptilotis* (1 sp.), Mexico.

Remains of *Trogon* have been found in the Miocene deposits of France; and we are thus able to understand the existing distribution of the family. At that exceptionally mild period in the northern hemisphere, these birds may have ranged over all Europe and North America; but, as the climate became more severe they gradually became restricted to the tropical regions, where alone a sufficiency of fruit and insect-food is found all the year round.
The Kingfishers are distributed universally, but very unequally, over the globe, and in this respect present some of the most curious anomalies to be found among birds. They have their metropolis in the eastern half of the Malay Archipelago (our first Australian sub-region), from Celebes to New Guinea, in which district no less than 13 out of the 19 genera occur, 8 of them being peculiar; and it is probable that in no other equally varied group of universal distribution, is so large a proportion of the generic forms confined to so limited a district. From this centre kingfishers decrease rapidly in every direction. In Australia itself there are only 4 genera with 13 species; the whole Oriental region has only 6 genera, 1 being peculiar; the Ethiopian also 6 genera, but 3 peculiar; and each of these have less than half the number of species possessed by the Australian region. The Palaearctic region possesses only 3 genera, all derived from the Oriental region; but the most extraordinary deficiency is shown by the usually rich Neotropical region, which possesses but a single genus, common to the larger part of the Eastern Hemisphere, and the same genus is alone found in the Nearctic region, the only difference being that the former possesses eight, while the latter has but a single species. These facts almost inevitably lead to the conclusion that America long existed without kingfishers; and that in comparatively recent times (perhaps during the Miocene or Pliocene period), a species of the Old World genus, Ceryle, found its way into North America, and spreading rapidly southward along the great river-valleys has become differentiated in South America into the few closely allied forms that alone inhabit that vast country—the richest in the world in
fresh-water fish, and apparently the best fitted to sustain a varied and numerous body of kingfishers.

The names of the genera, with their distribution and the number of species in each, as given by Mr. Sharpe in his excellent monograph of the family, is as follows:

**Alcedo** (9 sp.), Palaearctic, Ethiopian, and Oriental regions (but absent from Madagascar), and extending into the Austro-Malayan sub-region; **Corythornis** (3 sp.), the whole Ethiopian region; **Alcyone** (7 sp.), Australia and the Austro-Malayan sub-region, with one species in the Philippine Islands; **Ceryle** (13 sp.), absent only from Australia, the northern half of the Palaearctic region, and Madagascar; **Pelargopsis** (9 sp.), the whole Oriental region, and extending to Celebes and Timor in the Austro-Malayan sub-region; **Ceyx** (11 sp.), the Oriental region and Austro-Malayan sub-region, but absent from Celebes, and only one species in continental India and Ceylon; **Ceycopis** (1 sp.), Celebes; **Myioceyx** (2 sp.), West Africa; **Ipsidina** (4 sp.), Ethiopian region; **Syma** (2 sp.), Papua and North Australia; **Halcyon** (36 sp.), Australian, Oriental, and Ethiopian regions, and the southern part of the Palaearctic; **Dacelo** (6 sp.), Australia and New Guinea; **Todiramphus** (3 sp.), Eastern Pacific Islands only; **Monachalcyon** (1 sp.), Celebes; **Caridonax** (1 sp.), Lombok and Flores; **Carcinocetes** (2 sp.), Siam to Borneo and Java; **Tanysiptera** (14 sp.), Moluccas New Guinea, and North Australia (Plate X. Vol. I. p. 414); **Cittura** (2 sp.), Celebes group; **Melidora** (1 sp.), New Guinea.

**Family 68.—Bucerotidae.** (12 Genera, 50 Species.)

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The Hornbills form an isolated group of generally large-sized birds, whose huge bills form their most prominent feature. They are popularly associated with the American Toucans, but have no close relationship to them, and are now generally
considered to show most resemblance, though still a very distant one, to the kingfishers. They are abundant in the Ethiopian and Oriental regions, and extend eastward to the Solomon Islands. Their classification is very unsettled, for though they have been divided into more than twenty genera they have not yet been carefully studied. The following grouping of the genera—referring to the numbers in the Hand List—must therefore be considered as only provisional:

(1907 1908 1903) *Buceros* (6 sp.), all Indo-Malaya, Arakan, Nepal and the Neilgherries (Plate IX. Vol. I. p. 339); (1909 − 1901) *Hydrocissa* (7 sp.), India and Ceylon to Malaya and Celebes; (1902) *Berenicornis* (2 sp.), Sumatra and West Africa; (1904) *Calao* (3 sp.), Tennasserim, Malaya, Moluccas to the Solomon Islands; (1905) *Aceros* (1 sp.), South-east Himalayas; (1906 1907) *Cranorhinaus* (3 sp.), Malacca, Sumatra, Borneo, Philippines, Celebes; (1908) *Penelopides* (1 sp.), Celebes; (1909 − 1971) *Tockus* (15 sp.), Tropical and South Africa; (1907) *Rhinoplax* (1 sp.), Sumatra and Borneo; (1907 − 1975) *Bycanistes* (6 sp.), West Africa with East and South Africa; (1975 1977) *Meniceros* (3 sp.), India and Ceylon to Tenasserim; (1972) *Bucorvus* (2 sp.), Tropical and South Africa.

**Family 69.—UPUPIDÆ.** (1 Genus, 6 Species.)

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The Hoopoes form a small and isolated group of semi-terrestrial insectivorous birds, whose nearest affinities are with the Hornbills. They are most characteristic of the Ethiopian region, but extend into the South of Europe and into all the continental divisions of the Oriental region, as well as to Ceylon, and northwards to Pekin and Mongolia.
Family 70.—Irrisoridae. (1 Genus, 12 Species.)

General Distribution.

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The Irrisors are birds of generally metallic plumage, which have often been placed with the Epunachidae and near the Sunbirds, or Birds of Paradise, but which are undoubtedly allied to the Hoopoes. They are strictly confined to the continent of Africa, ranging from Abyssinia to the west coast, and southward to the Cape Colony. They have been divided into several subgenera which it is not necessary here to notice (Plate IV. Vol. I. p. 261).

Family 71.—Podargidae. (3 Genera, 20 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Podargidae, or Frog-mouthis, are a family of rather large-sized nocturnal insectivorous birds, closely allied to the Goat-suckers, but distinguished by their generally thicker bills, and especially by hunting for their food on trees or on the ground, instead of seizing it on the wing. They abound most in the Australian region, but one genus extends over a large part of the Oriental region. The following are the genera with their distribution:—

Podargus (10 sp.), Australia, Tasmania, and the Papuan Islands (Plate XII. Vol. I. p. 441); Batrachostomus (6 sp.), the Oriental region (excluding Philippine Islands and China) and the northern Moluccas; Egothelss (4 sp.), Australia, Tasmania, and Papuan Islands.
**Family 72.—Steatornithidae.** (1 Genus, 1 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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This family contains a single bird—the Guacharo—forming the genus *Steatornis*, first discovered by Humboldt in a cavern in Venezuela, and since found in deep ravines near Bogota, and also in Trinidad. Although apparently allied to the Goat-suckers it is a vegetable-feeder, and is altogether a very anomalous bird whose position in the system is still undetermined.

**Family 73.—Caprimulgidae.** (17 Genera, 91 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Goat-suckers, or Night-jars, are crepuscular insectivorous birds, which take their prey on the wing, and are remarkable for their soft and beautifully mottled plumage, swift and silent flight, and strange cries often imitating the human voice. They are universally distributed, except that they do not reach New Zealand or the remoter Pacific Islands. The South American genus, *Nyctibiä*, differs in structure and habits from the other goat-suckers and should perhaps form a distinct family. More than half the genera inhabit the Neotropical region. The genera are as follows:

- *Nyctibiä* (6 sp.), Brazil to Guatemala, Jamaica; *Caprimulgus* (35 sp.), Palearctic, Oriental, and Ethiopian regions, with the Austro-Malay Islands and North Australia; *Hydropsalis* (8 sp.), Tropical South America to La Plata; *Antrostomus* (10
sp.), La Plata and Bolivia to Canada, Cuba; Stenopsis (4 sp.), Martinique to Columbia, West Peru and Chili; Siphonorus (1 sp.), Jamaica; Holothreptus (1 sp.), Demerara; Nyctidromus (2 sp.), South Brazil to Central America; Scortornis (3 sp.), West and East Africa; Macrodactylyx (2 sp.), West and Central Africa; Cosmetornis (1 sp.), all Tropical Africa; Podager (1 sp.), Tropical South America to La Plata; Lurocalis (2 sp.), Brazil and Guiana; Chordeiles (8 sp.), Brazil and West Peru to Canada, Porto Rico, Jamaica; Nyctiprogne (1 sp.), Brazil and Amazonia; Eurostopodus (2 sp.), Australia and Papuan Islands; Lyncornis (4 sp.), Burmah, Philippines, Borneo, Celebes.

**Family 74.—**Cypselidae. (7 Genera, 53 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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The Swifts can almost claim to be a cosmopolitan group, but for their absence from New Zealand. They are most abundant both in genera and species in the Neotropical and Oriental regions. The following is the distribution of the genera:—

Cypselus (1 sp.), absent only from the whole of North America and the Pacific; Panyptila (3 sp.), Guatemala and Guiana, and extending into North-west America; Collocalia (10 sp.), Madagascar, the whole Oriental region and eastward through New Guinea to the Marquesas Islands; Dendrochelidon (5 sp.), Oriental region and eastward to New Guinea; Chastura (15 sp.), Continental America (excluding South Temperate), West Africa and Madagascar, the Oriental region, North China and the Amoor, Celebes, Australia; Hemiprocne (3 sp.), Mexico to La Plata, Jamaica and Hayti; Cypseloides (2 sp.), Brazil and Peru; Neaphoetes (2 sp.), Cuba, Jamaica, North-west America.
FAMILY 75.—TROCHILIDÆ. (118 Genera, 390 Species.)

**General Distribution.**

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The wonderfully varied and beautiful Humming-Birds are confined to the American continent, where they range from Sitka to Cape Horn, while the island of Juan Fernandez has two peculiar species. Only 6 species, belonging to 3 genera, are found in the Nearctic region, and most of these have extended their range from the south. They are excessively abundant in the forest-clad Andes from Mexico to Chili, some species extending up to the limits of perpetual snow; but they diminish in number and variety in the plains, however luxuriant the vegetation. In place of giving here the names and distribution of the numerous genera into which they are now divided (which will be found in the tables of the genera of the Neotropical region), it may be more useful to present a summary of their distribution in the sub-divisions of the American continent, as follows:

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<thead>
<tr>
<th>Sub-region I (Patagonia &amp; S. Andes)</th>
<th>Sub-region II (Tropical S. Amer.)</th>
<th>Sub-region III (Tropical N. Amer.)</th>
<th>Sub-region IV (Antilles)</th>
<th>Neartic region (Temp. N. Amer.)</th>
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<tbody>
<tr>
<td>Genera in each Sub-region</td>
<td>10</td>
<td>90</td>
<td>41</td>
<td>8</td>
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<tr>
<td>Peculiar Genera</td>
<td>3</td>
<td>58</td>
<td>14</td>
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<td>Species in each Sub-region</td>
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<td>275</td>
<td>100</td>
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The island of Juan Fernandez has two species, and Masafuera, an island beyond it, one; the three forming a peculiar genus. The island of Tres Marias, about 60 miles from the west coast of Mexico, possesses a peculiar species of humming-bird, and the Bahamas two species; but none inhabit either the Falkland Islands or the Galapagos.

Like most groups which are very rich in species and in generic forms, the humming-birds are generally very local, small
generic groups being confined to limited districts; while single mountains, valleys, or small islands, often possess species found nowhere else. It is now well ascertained that the Trochilidæ are really insectivorous birds, although they also feed largely, but probably never exclusively, on the nectar of flowers. Their nearest allies are undoubtedly the Swifts; but the wide gap that now separates them from these, as well as the wonderful variety of form and of development of plumage, that is found among them, alike point to their origin, at a very remote period, in the forests of the once insular Andes. There is perhaps no more striking contrast of the like nature, to be found, than that between the American kingfishers—confined to a few closely allied forms of one Old World genus—and the American humming-birds with more than a hundred diversified generic forms unlike everything else upon the globe; and we can hardly imagine any other cause for this difference, than a (comparatively) very recent introduction in the one case, and a very high antiquity in the other.

General Remarks on the Distribution of the Picariæ.

The very heterogeneous mass of birds forming the Order Picariæ, contains 25 families, 307 genera and 1,604 species. This gives about 64 species to each family, while in the Passeres the proportion is nearly double, or 111 species per family. There are, in fact, only two very large families in the Order, which happen to be the first and last in the series—Picidæ and Trochilidæ. Two others—Cuculidæ and Alcedinidæ—are rather large; while the rest are all small, seven of them consisting only of a single genus and from one to a dozen species. Only one of the families—Alcedinidæ—is absolutely cosmopolitan, but three others are nearly so, Caprimulgidæ and Cypselidæ being only absent from New Zealand, and Cuculidæ from the Canadian sub-region of North America. Eleven families inhabit the Old World only, while seven are confined to the New World, only one of these—Trochilidæ—being common to the Neotropical and Nearctic regions.

The Picariæ are highly characteristic of tropical faunas, for
while no less than 15 out of the 25 families are exclusively tropical, none are confined to, or have their chief development in, the temperate regions. They are best represented in the Ethiopian region, which possesses 17 families, 4 of which are peculiar to it; while the Oriental region has only 14 families, none of which are peculiar. The Neotropical region has also 14 families, but 6 of them are peculiar. The Australian region has 8, the Palaearctic 9 and the Nearctic 6 families, but none of these are peculiar.

We may see a reason for the great specialization of this tropical assemblage of birds in the Ethiopian and Neotropical regions, in the fact of the large extent of land on both sides of the Equator which these two regions alone possess, and their extreme isolation either by sea or deserts from other regions,—an isolation which we know was in both cases much greater in early Tertiary times. It is, perhaps, for a similar reason that we here find hardly any trace of the connection between Australia and South America which other groups exhibit; for that connection has most probably been effected by a former communication between the temperate southern extremities of those two continents. The most interesting and suggestive fact, is that presented by the distribution of the Megalæmidae and Trogonidae over the tropics of America, Africa, and Asia. In the absence of palæontological evidence as to the former history of the Megalæmidae, we are unable to say positively, whether it owes its present distribution to a former closer union between these continents in intertropical latitudes, or to a much greater northern range of the group at the period when a luxuriant sub-tropical vegetation extended far toward the Arctic regions; but the discovery of *Trogön* in the Miocene deposits of the South of France renders it almost certain that the latter is the true explanation in the case of both these families.

The Neotropical region, owing to its enormous family of humming-birds, is by far the richest in Picariae, possessing nearly half the total number of species, and a still larger proportion of genera. Three families, the Bucerotidæ, Meropidæ and Coraciidæ are equally characteristic of the Oriental and
Ethiopian regions, a few outlying species only entering the Australian or the Palæarctic regions. One family (Todidae) is confined to the West Indian Islands; and another (Leptosomidae) consisting of but a single species, to Madagascar; parallel cases to the Drepanididae among the Passeres, peculiar to the Sandwich Islands, and the Apterygidae among the Struthiones, peculiar to New Zealand.

Order III.—Psittaci.

The Parrots have been the subject of much difference of opinion among ornithologists, and no satisfactory arrangement of the order into families and genera has yet been reached. Professor Garrod has lately examined certain points in the anatomy of a large number of genera, and proposes to revolutionize the ordinary classifications. Until, however, a general examination of their whole anatomy, internal and external, has been made by some competent authority, it will be unsafe to adopt the new system, as we have as yet no guide to the comparative value of the characters made use of. I therefore keep as much as possible to the old groups, founded on external characters, only using the indications furnished by Professor Garrod's paper, to determine the position of doubtful genera.

Family 76.—Cacatuidæ. (5 Genera, 35 Species.)

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<th>Neotropical Sub-regions</th>
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The Cacatuidæ, Plyctolophiæ, or Camptolophiæ, as they have been variously termed, comprise all those crested parrots usually termed Cockatoos, together with one or two doubtful forms. They are very abundant in the Australian region, more especially in the Austro-Malayan portion of it, one species inhabiting
the Philippine Islands; but they do not pass further east than the Solomon Islands and are not found in New Zealand. The distribution of the genera is as follow:—

*Cacatua* (18 sp.) ranges from the Philippine Islands, Celebes and Lombok, to the Solomon Islands and to Tasmania; *Calopsitta* (1 sp.) Australia; *Calyptorhynchus* (8 sp.) is confined to Australia and Tasmania; *Microglossus* (2 sp.) (perhaps a distinct family) to the Papuan district and North Australia; *Licmetis* (3 sp.) Australia, Solomon Islands, and (?) New Guinea; *Nasiterna* (3 sp.), a minute form, the smallest of the whole order, and perhaps not belonging to this family, is only known from the Papuan and Solomon Islands.

**Family 77.—PLATYCERCIDÆ.** (11 Genera, 57 Species.)

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<thead>
<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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</table>

The Platycercidæ comprise a series of large-tailed Parrots, of weak structure and gorgeous colours, with a few ground-feeding genera of more sober protective tints; the whole family being confined to the Australian region. The genera are:—

*1926 1909 2000* *Platycercus* (14 sp.), Australia, Tasmania, and Norfolk Island; *Psophotus* (6 sp.), Australia; *Polytelis* (3 sp.), Australia; *Nymphicus* (1 sp.), Australia and New Caledonia; *(2002 2003)* *Aprosmictus* (6 sp.), Australia, Papua, Timor, and Moluccas; *Pyrrhulopsis* (3 sp.), Tonga and Fiji Islands; *Cyanooramphus* (14 sp.), New Zealand, Norfolk Island, New Caledonia, and Society Islands; *Melopsittacus* (1 sp.), Australia; *Euphema* (7 sp.), Australia; *Pezoporus* (1 sp.), Australia and Tasmania; *Geopsittacus* (1 sp.), West Australia. The four last genera are ground-feeders, and are believed by Professor Garrod to be allied to the Owl-Parrot of New Zealand (*Stringops*).
Family 78.—Palæornithidæ. (8 Genera, 65 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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</table>

I class here a group of birds brought together, for the most part, by geographical distribution as well as by agreement in internal structure, but which is nevertheless of a very uncertain and provisional character.

Palæornis (18 sp.), the Oriental region, Mauritius, Rodriguez, and Seychelle Islands, and a species in Tropical Africa, apparently identical with the Indian *P. torquatus*, and therefore—considering the very ancient intercourse between the two countries, and the improbability of the species remaining unchanged if originating by natural causes—most likely the progeny of domestic birds introduced from India. *Prioniturus* (3 sp.), Celebes and the Philippine Islands; (2001) *Geoffroyus* (5 sp.), Bouru to Timor and the Solomon Islands; *Tanygnathus* (5 sp.), Philippines, Celebes, and Moluccas to New Guinea; *Eeclectus* (8 sp.), Moluccas and Papuan Islands; *Psittinus* (1 sp.), Tenasserim to Sumatra and Borneo; *Cyclopsitta* (8 sp.), Papuan Islands, Philippines and North-east Australia; *Loriculus* (17 sp.), ranges over the whole Oriental region to Flores, the Moluccas, and the Papuan island of Mysol; but most of the species are concentrated in the district including the Philippines, Celebes, Gilolo, and Flores, there being 1 in India, 1 in South China, 1 in Ceylon, 1 in Java, 1 in Malacca, Sumatra, and Borneo, 3 in Celebes, 5 in the Philippines, and the rest in the Moluccas, Mysol, and Flores. This genus forms a transition to the next family.
FAMILY 79.—TRICHOGLOSSIDÆ. (6 Genera, 57 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Trichoglossidae, or Brush-tongued Paroquets, including the Lories, are exclusively confined to the Australian region, where they extend from Celebes to the Marquesas Islands, and south to Tasmania. The genus *Nanodes* (= *Lathamus*) has been shown by Professor Garrod to differ from *Trichoglossus* in the position of the carotid arteries. I therefore make it a distinct genus but do not consider that it should be placed in another family. The genera here admitted are as follows:—

*Trichoglossus* (29 sp.), ranges over the whole Austro-Malay and Australian sub-regions, and to the Society Islands; (2047) *Nanodes* (1 sp.), Australia and Tasmania; *Charmosyna* (1 sp.), New Guinea (Plate X. Vol. I. p. 414); *Eos* (9 sp.), Bouru and Sanguir Island north of Celebes, to the Solomon Islands, and in Puynipet Island to the north-east of New Ireland; (2030 2040) *Lorius* (13 sp.), Bouru and the Solomon Islands; (2041 2043) *Coriphilus* (4 sp.), Samoa, Tonga, Society and Marquesas Islands.

FAMILY 80.—CONURIDÆ. (7 Genera, 79 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Conuridæ, which consist of the Macaws and their allies, are wholly confined to America, ranging from the Straits of Magellan to South Carolina and Nebraska, with Cuba and Jamaica. Professor Garrod places *Pyrrhura* (which has generally

Vol. II.—22
been classed as a part of the genus *Conurus* in a separate family, on account of the absence of the ambiens muscle of the knee, but as we are quite ignorant of the classificational value of this character, it is better for the present to keep both as distinct genera of the same family. The genera are:

*Ara* (15 sp.), Paraguay to Mexico and Cuba; *Rhynchopsitta* (1 sp.), Mexico; *Homicognathus* (1 sp.), Chili; *Conurus* (30 sp.), the range of the family; *Pyrrhura* (16 sp.), Paraguay and Bolivia to Costa Rica; *Bolborhynchus* (7 sp.), La Plata, Bolivia and West Peru, with one species in Mexico and Guatemala; *Brotogeris* (9 sp.), Brazil to Mexico.

**Family 81.—Psittacidæ.—(12 Genera, 87 Species.)**

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<th>Neotropical Sub-regions</th>
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The Psittacidæ comprise a somewhat heterogeneous assemblage of Parrots and Paroquets of the Neotropical and Ethiopian regions, which are combined here more for convenience than because they are believed to form a natural group. The genera *Chrysotis* and *Pionus* have no oil-gland, while *Psittacula* and *Agapornis* have lost the furcula, but neither of these characters are probably of more than generic value. The genera are:

*Psittacus* (2 sp.), West Africa; *Coracopsis* (5 sp.), Madagascar, Comoro, and Seychelle Islands; *Pavocephalus* (9 sp.), all Tropical and South Africa; *(2063—2065)* *Caica* (9 sp.), Mexico to Amazonia; *Chrysotis* (32 sp.), Paraguay to Mexico and the West Indian Islands; *Trichuria* (1 sp.), Brazil; *Deroptyus* (1 sp.), Amazonia; *Pionus* (9 sp.), Paraguay to Mexico; *Urochroma* (7 sp.), Tropical South America; *Psittacula* (6 sp.), Brazil to Mexico; *Poliopsitta* (2 sp.), Madagascar and West Africa; *Agapornis* (4 sp.), Tropical and South Africa.
**Family 82.—NESTORIDÆ.** (? 2 Genera, 6 Species.)

**General Distribution.**

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The present family is formed to receive the genus *Nestor* (5 sp.), confined to New Zealand and Norfolk Island. Its affinities are doubtful, but it appears to have relations with the American Conuridae and the Australian Trichoglossidae. With it is placed the rare and remarkable *Dasyptilus* (1 sp.), of New Guinea, of which however very little is known.

**Family 83.—STRINGOPIDÆ.** (1 Genus, 2 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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<th>Ethiopian Sub-regions</th>
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This family contains only the curious owl-like nocturnal Parrot of New Zealand, *Stringops habroptilus* (Plate XIII. Vol. I. p. 455). An allied species is said to inhabit the Chatham Islands, if not now extinct.

**General Remarks on the Distribution of the Psittaci.**

Although the Parrots are now generally divided into several distinct families, yet they form so well marked and natural a group, and are so widely separated from all other birds, that we may best discuss their peculiarities of geographical distribution by treating them as a whole. By the preceding enumeration we find that there are about 386 species of known parrots, which are divided into 52 genera. They are pre-eminently a tropical group, for although a few species extend a considerable distance into the temperate zone, these are
marked exceptions to the rule which limits the parrot tribe to the tropical and sub-tropical regions, roughly defined as extending about 30° on each side of the equator. In America a species of Conurus reaches the straits of Magellan on the south, while another inhabits the United States, and once extended to the great lakes, although now confined to the south-eastern districts. In Africa parrots do not reach the northern tropic, owing to the desert nature of the country; and in the south they barely reach the Orange River. In India they extend to about 35° N. in the western Himalayas; and in the Australian region, not only to New Zealand but to Macquarie Islands in 54° S., the farthest point from the equator reached by the group. But although found in all the tropical regions they are most unequally distributed. Africa is poorest, possessing only 6 genera and 25 species; the Oriental region is also very poor, having but 6 genera and 29 species; the Neotropical region is much richer, having 14 genera and 141 species; while the smallest in area and the least tropical in climate—the Australian region, possesses 31 genera and 176 species, and it also possesses exclusively 5 of the families, Trichoglossidae, Platycercidae, Cacatuidae, Nestoridae, and Stringopidae. The portion of the earth's surface that contains the largest number of parrots in proportion to its area is, undoubtedly, the Austro-Malayan sub-region, including the islands from Celebes to the Solomon Islands. The area of these islands is probably not one-fifteenth of that of the four tropical regions, yet they contain from one-fifth to one-fourth of all the known parrots. In this area too are found many of the most remarkable forms,—all the crimson lories, the great black Cockatoos, the pigmy Nasiterna, the raquet-tailed Prioniturus, and the bareheaded Dasyptilus.

The almost universal distribution of Parrots wherever the climate is sufficiently mild or uniform to furnish them with a perennial supply of food, no less than their varied details of organization, combined with a great uniformity of general type,—tell us, in unmistakable language, of a very remote antiquity. The only early record of extinct parrots is, however, in the Miocene of France, where remains apparently allied to the West
African *Psittacus*, have been found. But the origin of so widespread, isolated, and varied a group, must be far earlier than this, and not improbably dates back beyond the dawn of the Tertiary period. Some primeval forms may have entered the Australian region with the Marsupials, or not long after them; while perhaps at a somewhat later epoch they were introduced into South America. In these two regions they have greatly flourished, while in the two other tropical regions only a few types have been found, capable of maintaining themselves, among the higher forms of mammalia, and in competition with a more varied series of birds. This seems much more probable than the supposition that so highly organized a group should have originated in the Australian region, and subsequently become so widely spread over the globe.

**Order IV.—COLUMBÆ.**

**Family 84.—COLUMBIDÆ.** (44 Genera, 355 Species.)

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
<th>Oriental Sub-regions</th>
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The Columbidae, or Pigeons and Doves, are almost universally distributed, but very unequally in the different regions. Being best adapted to live in warm or temperate climates, they diminish rapidly northwards, reaching about 62° N. Latitude in North America, but considerably farther in Europe. Both the Nearctic and Palearctic regions are very poor in genera and species of pigeons, those of the former region being mostly allied to Neotropical, and those of the latter to Oriental and Ethiopian types. The Ethiopian region is, however, itself very poor, and several of its peculiar forms are confined to the Madagascar sub-region. The Neotropical region is very rich in peculiar genera, though but moderately so in number of species. The Oriental
region closely approaches it in both respects; but the Australian region is by far the richest, possessing nearly double the genera and species of any other region, and abounding in remarkable forms quite unlike those of any other part of the globe. The following table gives the number of genera and species in each region, and enables us readily to determine the comparative richness and isolation of each, as regards this extensive family:

<table>
<thead>
<tr>
<th>Regions</th>
<th>No. of Genera</th>
<th>Peculiar Genera</th>
<th>No. of Species</th>
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<tbody>
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<td>Neotropical</td>
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<td>13</td>
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<td>Nearectic</td>
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<td>Palearctic</td>
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<td>Ethiopian</td>
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<td>37</td>
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<tr>
<td>Oriental</td>
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<td>12</td>
<td>66</td>
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<tr>
<td>Australian</td>
<td>...</td>
<td>24</td>
<td>148</td>
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With the exception of Columba and Turtur, which have a wide range, Treron, common to the Oriental and Ethiopian regions, and Carpophaga, to the Oriental and Australian, most of the genera of pigeons are either restricted to or very characteristic of a single region.

The distribution of the genera here admitted is as follows:

Treron (37 sp.), the whole Oriental region, and eastward to Celebes, Amboyna and Flores, also the whole Ethiopian region to Madagascar; Ptilopus (52 sp.), the Australian region (excluding New Zealand) and the Indo-Malay sub-region; Alectroenas (4 sp.), Madagascar and the Mascarene Islands: Carpophaga (50 sp.), the whole Australian and Oriental regions, but much the most abundant in the former; (2274) Ianthaenas (11 sp.), Japan, Andaman, Nicobar, and Philippine Islands, Timor and Gilolo to Samoa Islands; (2278) Leucomelena (1 sp.), Australia; Lopholaimus (1 sp.), Australia; (2270 and 2283) Alsacornus (2 sp.), Himalayas to Ceylon and Tenasserim; Columba (46 sp.), generally distributed over all the regions except the Australian, one species however in the Fiji Islands; Ectopistes (1 sp.), east of North America with British Columbia; Zenaidura (2 sp.), Veragua to Canada and British Columbia; Ena (1 sp.), Tropical and South Africa; Geopelia (6 sp.), Philippine Islands and Java to Australia; Macropygia (14 sp.), Nepal, Hainan, Nicobar, Java,
and Philippines to Australia and New Ireland; Turacæna (3 sp.), Celebes, Timor, and Solomon Islands; Reinwardtænas (1 sp.), Celebes to New Guinea; Turtur (24 sp.), Palæarctic, Ethiopian and Oriental regions with Austro-Malaya; Chæmepelia (7 sp.), Brazil and Bolivia to Jamaica, California, and South-east United States; Columbula (2 sp.), Brazil and La Plata to Chili; Scardafella (2 sp.), Brazil and Guatemala; Zenaida (10 sp.), Chili and La Plata to Columbia and the Antilles, Fernando Noronha; Melopelia (2 sp.), Chili to Mexico and California; Peristera (4 sp.), Brazil to Mexico; Metriopelia (2 sp.), West America from Ecuador to Chili; Gymnopelia (1 sp.), West Peru and Bolivia; Leptoptila (11 sp.), Paraguay to Mexico and the Antilles; (2317 2318 and 2329) Geotrygon (14 sp.), Paraguay to Mexico and the Antilles; Aplopelia (5 sp.), Tropical and South Africa, St. Thomas and Princes Island; Chalocopelia (4 sp.), Tropical and South Africa; Starnænas (1 sp.), Cuba; Ocyphaps (1 sp.), Australia (Plate XII. Vol. I. p. 441); Petrophassa (1 sp.), North-west Australia; Chalocophaps (8 sp.), the Oriental region to New Guinea and Australia; Trugon (1 sp.), New Guinea; Henicophaps (1 sp.), Waigiou and New Guinea; Phaps (3 sp.), Australia and Tasmania; Leucosarcia (1 sp.), East Australia; hapitreron (2 sp.), Philippine Islands; Geophaps (2 sp.), North and East Australia; Lophophaps (3 sp.), Australia; Calænas (1 sp.), scattered on the smaller islands from the Nicobars and Philippines to New Guinea; Otidiphaps (1 sp.), New Guinea; Phlogænas (7 sp.), Philippine Islands and Celebes to the Marquesas Islands; Goura (2 sp.), New Guinea and the islands on the north-east (Plate X. Vol. I. p 414).

Family 84a.—DIDUNCULIDÆ. (1 Genus, 1 Species.)

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<th>Neotropical Sub-regions</th>
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The Didunculus stigirostris, a hook-billed ground-pigeon, found only in the Samoa Islands, is so peculiar in its structure that it is considered to form a distinct family.

Family 85—Dididæ.—(2 Genera, 3 Species.)

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<th>Neotropical Sub-regions</th>
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The birds which constitute this family are now all extinct; but as numerous drawings are in existence, taken from living birds some of which were exhibited in Europe, and a stuffed specimen, fragments of which still remain, was in the Ashmolean Museum at Oxford down to 1755, they must be classed among recent, as opposed to geologically extinct species. The Dodo (Didus ineptus) a large, unwieldy, flightless bird, inhabited Mauritius down to the latter part of the 17th century; and an allied form, the Solitaire (Pezophaps solitaria), was found only in the island of Rodriguez, where it survived about a century later. Old voyagers mention a Dodo also in Bourbon, and a rude figure of it exists; but no remains of this bird have been found. Almost complete skeletons of the Dodo and Solitaire have, however, been recovered from the swamps of Mauritius and the caves of Rodriguez, proving that they were both extremely modified forms of pigeon. These large birds were formerly very abundant, and being excellent eating and readily captured, the early voyagers to these islands used them largely for food. As they could be caught by man, and very easily by dogs, they were soon greatly diminished in numbers; and the introduction of swine, which ran wild in the forests and fed on the eggs and young birds, completed their extermination.

The existence in the Mascarene Islands of a group of such remarkable terrestrial birds, with aborted wings, is parallel to that of the Apteryx and Dinornis in New Zealand, the Cassowaries of Austro-Malaya, and the short-winged Rails of New
Zealand, Tristan d'Acunha, and other oceanic islands; and the phenomenon is clearly dependent on the long-continued absence of enemies, which allowed of great increase of bulk and the total loss of the power of flight, without injury. In some few cases (the Ostrich for example) birds incapable of flight co-exist with large carnivorous mammalia; but these birds are large and powerful, as well as very swift, and are thus able to escape from some enemies and defend themselves against others. The entire absence of the smaller and more defenceless ground-birds from the adjacent island of Madagascar, is quite in accordance with this view, because that island has several small but destructive carnivorous animals.

**General Remarks on the Distribution of the Columbidae.**

The striking preponderance of Pigeons, both as to genera and species, in the Australian region, would seem to indicate that at some former period it possessed a more extensive land area in which this form of bird-life took its rise. But there are other considerations which throw doubt upon this view. The western half of the Malay Archipelago, belonging to the Oriental region, is also rich in pigeons, since it has 43 species belonging to 11 genera, rather more than are found in all the rest of the Oriental region. Again, we find that the Mascarene Islands and the Antilles both possess more pigeons than we should expect, in proportion to those of the regions to which they belong, and to their total amount of bird-life. This looks as if islands were more favourable to pigeon-development than continents; and if we group together the Pacific and the Malayan Islands, the Mascarene group and the Antilles, we find that they contain together about 170 species of pigeons belonging to 24 out of the 47 genera here adopted; while all the great continents united only produce about the same number of species belonging (if we omit those peculiar to Australia) to only 20 genera. The great development of the group in the Australian region may, therefore, be due to its consisting mainly of islands, and not to the order having originated there, and thus having had a longer period in which to develop. I have elsewhere suggested (*Ibis* 1865, p. 366)
a physical cause for this peculiarity of distribution. Pigeons build rude, open nests, and their young remain helpless for a considerable period. They are thus exposed to the attacks of such arboreal quadrupeds or other animals as feed on eggs or young birds. Monkeys are very destructive in this respect; and it is a noteworthy fact that over the whole Australian region, the Mascarene Islands and the Antilles, monkeys are unknown. In the Indo-Malay sub-region, where monkeys are generally plentiful, the greatest variety of pigeons occurs in the Philippines, where there is but a single species in one island; and in Java, where monkeys are far less numerous than in Sumatra or Borneo. If we add to this consideration the fact, that mammalia and rapacious birds are, as a rule, far less abundant in islands than on continents; and that the extreme development of pigeon-life is reached in the Papuan group of islands, in which mammalia (except a few marsupials, bats, and pigs) are wholly absent, we see further reason to adopt this view. It is also to be noted that in America, comparatively few pigeons are found in the rich forests (comparable to those of the Australian insular region in which they abound), but are mostly confined to the open campos, the high Andes, and the western coast districts, from which the monkey-tribe are wholly absent.

This view is further supported by the great development of colour that is found in the pigeons of these insular regions, culminating in the golden-yellow fruit-dove of the Fiji Islands, the metallic green Nicobar-pigeon of Malaya, and the black and crimson Alectroenas of Mauritius. Here also, alone, we meet with crested pigeons, rendering the possessors more conspicuous; such as the Lopholaimus of Australia and the crowned Goura of New Guinea; and here too are more peculiar forms of terrestrial pigeons than elsewhere, though none have completely lost the power of flight but the now extinct Dididae.

The curious liking of pigeons for an insular habitat is well shown in the genera Ianthanas and Caloenas. The former, containing 11 species, ranges over a hundred degrees of longitude, and forty-five of latitude, extending into three regions, yet nowhere inhabits a continent or even a large island. It is
found in the Andaman and Nicobar Islands; in the Philippines, Gilolo, and the smaller Papuan Islands, and in Japan; yet not in any of the large Malay Islands or in Australia. The other genus, *Calocasia*, consists of but a single species, yet this ranges from the Nicobar Islands to New Guinea. It is not, however, as far as known, found on any of the large islands, but seems to prefer the smaller islands which surround them. We here have the general preference of pigeons for islands, further developed in these two genera into a preference for small islands; and it is probable that the same cause—the greater freedom from danger—has produced both phenomena.

Of the geological antiquity of the Columbæ we have no evidence; but their wide distribution, their varied forms, and their great isolation, all point to an origin, at least as far back as that we have assigned as probable in the case of the Parrots.

*Order V.—GALLINAE.*

*Family 86.—PTEROCLIDÆ.* (2 Genera, 16 Species.)

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The Pteroclidæ, or Sand-grouse, are elegantly formed birds with pointed tails, and plumage of beautifully varied protective tints, characteristic of the Ethiopian region and Central Asia, though extending into Southern Europe and Hindostan. Being pre-eminently desert-birds, they avoid the forest-districts of all these countries, but abound in the most arid situations and on the most open and barren plains. The distribution of the genera is as follows:

*Pterocles* (14 sp.), has the same range as the family; *Syrrhaptes* (2 sp.), normally inhabits Tartary, Thibet, and Mongolia to the country around Pekin, and occasionally visits Eastern Europe. But a few years back (1863) great numbers suddenly appeared in
Europe and extended westward to the shores of the Atlantic, while some even reached Ireland and the Faeroes. (Plate III, Vol. I. p. 226.)

FAMILY 87.—TETRAONIDÆ. (29 Genera, 170 Species.)

**General Distribution.**

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The Tetraonidae, including the Grouse, Partridges, Quails, and allied forms, abound in all parts of the Eastern continents; they are less plentiful in North America and comparatively scarce in South America, more than half the Neotropical species being found north of Panama; and in the Australian region there are only a few of small size. The Ethiopian region probably contains most species; next comes the Oriental—India proper from the Himalayas to Ceylon having twenty; while the Australian region, with 15 species, is the poorest. These facts render it probable that the Tetraonidae are essentially denizens of the great northern continents, and that their entrance into South America, Australia, and even South Africa, is, comparatively speaking, recent. They have developed into forms equally suited to the tropical plains and the arctic regions, some of them being among the few denizens of the extreme north, as well as of the highest alpine snows. The genera are somewhat unsettled, and there is even some uncertainty as to the limits between this family and the next; but the following are those now generally admitted:—

*Ptilopaechus* (1 sp.), West Africa; *Francolinus* (34 sp.), all Africa, South Europe, India to Ceylon, and South China; *Ortygornis* (3 sp.), Himalayas to Ceylon, Sumatra, and Borneo; *Peliciperdix* (1 sp.), West Africa; *Perdix* (3 sp.), the whole Continental Palæarctic region; *Margaroperdix* (1 sp.), Madagascar; *Oreooperdix* (1 sp.), Formosa; *Arborophila* (8 sp.), the Oriental Continent and the Philippines; *Peloperdix* (4 sp.), Tenasserim and Malaya; *Coturnix* (21 sp.), Temperate Palæarctic, Ethiopian and
Oriental regions, and the Australian to New Zealand; Rollulus (2 sp.), Siam to Sumatra, Borneo, and Philippines; Caloperdix (1 sp.), Malacca and Sumatra; Odontophorus (17 sp.), Brazil and Peru to Mexico; Dendroryctyx (3 sp.), Guatemala and Mexico; Cyrtomyx (3 sp.), Guatemala to New Mexico; Ortyx (8 sp.), Honduras and Cuba to Canada; Eupsychortyx (6 sp.), Brazil and Ecuador to Mexico; Callipepla (3 sp.), Mexico to California; Lophoryctyx (2 sp.), Arizona and California; Oreortyx (1 sp.), California and Oregon (Plate XVIII., Vol. II. p. 128); Lerwa (1 sp.), Snowy Himalayas and East Thibet; Caccabia (10 sp.), Palaearctic region to Abyssinia, Arabia and the Punjaub; Tetraogallus (4 sp.), Caucasus and Himalayas to Altai Mountains; Tetrao (7 sp.), northern parts of Palaearctic and Nearctic regions; Centrocercus (1 sp.), Rocky Mountains; Padiocætes (2 sp.), North and North-west America (Plate XVIII. Vol. II. p. 128); Cupidonia (1 sp.), East and North-Central United States and Canada; Bonasa (3 sp.), north of Nearctic and Palaearctic regions; Lopopus (6 sp.), Arctic Zone and northern parts of Nearctic and Palaearctic regions.

Family 88.—Phasianidæ. (18 Genera, 75 Species.)

General Distribution.

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The Phasianidæ, including the Pea-fowl, Pheasants, and Jungle-fowl, the Turkeys, and the Guinea-fowl, are very widely distributed, but are far more abundant than elsewhere in the Eastern parts of Asia, both tropical and temperate. Leaving out the African guinea-fowls and the American turkeys, we have 13 genera and 63 species belonging to the Oriental and Palaearctic regions. These are grouped by Mr. Elliot (whose arrangement we mainly follow) in 5 sub-families, of which 3—Pavo, Euplocaminae, and Gallinæ—are chiefly Oriental, while the Lophophornæ and Phasianinæ are mostly Palaearctic or from the highlands on the
borders of the two regions. The genera adopted by Mr. Elliot in his *Monograph* are the following:

**Pavonine**, 4 genera.—*Pavo* (2 sp.), Himalayas to Ceylon, Siam, to South-west China and Java; *Argusianus* (4 sp.), Siam, Malay Peninsula, and Borneo (Plate IX. Vol. I. p. 339); *Polyplectron* (5 sp.), Upper Assam to South-west China and Sumatra; *Crossoptilon* (4 sp.), Thibet and North China. (Plate III. Vol. I. p. 226.)

**Lophophorine**, 4 genera.—*Lophophorus* (3 sp.), High woody region of Himalayas from Cashmere to West China; *Tetraophasia* (1 sp.), East Thibet; *Ceriornis* (5 sp.), Highest woody Himalayas from Cashmere to Bhotan and Western China (Plate VII. Vol. I. p. 331); *Pucrasia* (3 sp.), Lower and High woody Himalayas from the Hindoo Koosh to North-west China.

**Phasianine**, 2 genera.—*Phasianus* (12 sp.), Western Asia to Japan and Formosa, south to near Canton and Yunan, and the Western Himalayas, north to the Altai Mountains; *Thaumalea* (3 sp.), North-western China and Mongolia. (Plate III. Vol. I. p. 226.)

**Euplocaminé**, 2 genera.—*Euplocamus* (12 sp.), Cashmere, along Southern Himalayas to Siam, South China and Formosa, and to Sumatra and Borneo; *Ithaginis* (2 sp.), High Himalayas from Nepal to North-west China.

**Galline**, 1 genus.—*Gallus* (4 sp.), Cashmere to Hainan, Ceylon, Borneo, Java, and eastwards to Celebes and Timor. (Central India, Ceylon, and East Java, have each a distinct species of Jungle-fowl.)

**Meleagринé**, 1 genus.—*Meleagris* (3 sp.), Eastern and Central United States and south to Mexico, Guatemala and Yucatan.

**Agelastiné**, 2 genera.—*Phasidus* (1 sp.), West Africa; *Agelastes* (1 sp.), West Africa.

**Numidiné**, 2 genera.—*Acryllium* (1 sp.), West Africa; *Numida* (9 sp.), Ethiopian region, east to Madagascar, south to Natal and Great Fish River.
### Family 89.—Turnicidae. (2 Genera, 24 Species.)

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The Turnicidae are small Quail-like birds, supposed to have remote affinities with the American Tinamous, and with sufficient distinctive peculiarities to constitute a separate family. They range over the Old World, from Spain all through Africa and Madagascar, and over the whole Oriental region to Formosa, and then north again to Pekin, as well as south-eastward to Australia and Tasmania. The genus Turnix (23 sp.), has the range of the family; Ortyxelos (1 sp.), inhabits Senegal; but the latter genus may not belong to this family.

### Family 90.—Megapodiidae. (4 Genera, 20 Species.)

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The Megapodiidae, or Mound-makers and Brush-turkeys, are generally dull-coloured birds of remarkable habits and economy, which have no near allies, but are supposed to have a remote affinity with the South American Curassows. They are highly characteristic of the Australian region, extending into almost every part of it except New Zealand and the remotest Pacific islands, and only sending two species beyond its limits,—a Megapodius in the Philippine Islands and North-west Borneo, and another in the Nicobar Islands, separated by about 1,800 miles from its nearest ally in Lombok. The Philippine species offers little difficulty, for these birds are found on the smallest
islands and sand-banks, and can evidently pass over a few miles of sea with ease; but the Nicobar bird is a very different case, because none of the numerous intervening islands offer a single example of the family. Instead of being a well-marked and clearly differentiated form, as we should expect to find it if its remote and isolated habitat were due to natural causes, it so nearly resembles some of the closely-allied species of the Moluccas and New Guinea, that, had it been found with them, it would hardly have been thought specifically extinct. I therefore believe that it is probably an introduction by the Malays, and that, owing to the absence of enemies and general suitability of conditions, it has thriven in the islands and has become slightly differentiated in colour from the parent stock. The following is the distribution of the genera at present known:—

*Talegallus* (2 sp.), New Guinea and East Australia; *Megacephalon* (1 sp.), East Celebes; *Lipoa* (1 sp.), South Australia; *Megapodius* (16 sp.), Philippine Islands and Celebes, to Timor, North Australia, New Caledonia, the Marian and Samoa Islands, and probably every intervening island,—also a species (doubtfully indigenous) in the Nicobar Islands.

**Family 91.—CRACIDÆ. (12 Genera, 53 Species.)**

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(Messrs. Sclater and Salvin's arrangement is here followed).

The Cracidæ, or Curassows and Guans, comprise the largest and handsomest game-birds of the Neotropical region, where they take the place of the grouse and pheasants of the Old World. They are almost all forest-dwellers, and are a strictly Neotropical family, only one species just entering the Nearctic region as far as New Mexico. They extend southward to Paraguay and the extreme south of Brazil, but none are found in the
Antilles, nor west of the Andes south of the bay of Guayaquil. The sub-families and genera are as follows:

Cracinæ, 4 genera.—Crax (8 sp.), Mexico to Paraguay (Plate XV., Vol. II. p. 28); Notocrax (1 sp.), Guiana, Upper Rio Negro, and Upper Amazon; Pauxi (1 sp.), Guiana to Venezuela; Mitua (2 sp.), Guiana and Upper Amazon.

Penelopinæ, 7 genera.—Stegnolæma (1 sp.), Columbia and Ecuador; Penelope (14 sp.), Mexico to Paraguay and to western slope of Ecuadorian Andes; Penelopina (1 sp.), Guatemala; Pipile (3 sp.), Venezuela to Eastern Brazil; Aburria (1 sp.), Columbia; Chamaepetes (2 sp.), Costa Rica to Peru; Ortalida (18 sp.), New Mexico to Paraguay, also Tobago.

Oreophasinæ, 1 genus.—Oreophasis (1 sp.), Guatemala.

It thus appears that the Cracinæ are confined to South America east of the Andes, except one species in Central America; whereas nine Penelopinæ and Oreophasis are found north of Panama. The species of the larger genera are strictly representative, each having its own distinct geographical area, so that two species of the same genus are rarely or never found in the same locality.

Family 92.—Tinamidæ. (9 Genera, 39 Species.)

The Tinamous are a very remarkable family of birds, with the general appearance of partridges or hemipodes, but with the tail either very small or entirely wanting. They differ greatly in their organization from any of the Old World Gallinæ, and approach, in some respects, the Struthiones or Ostrich tribe. They are very terrestrial in their habits, inhabiting the forests, open plains, and mountains of the Neotropical region, from Patagonia and Chili to Mexico; but, like the Cracidæ, they are absent from the Antilles. Their colouring is very sober and protective, as is the case with so many ground-birds, and they are seldom adorned

Vol. II.—23
with crests or other ornamental plumes, so prevalent in the order to which they belong. The sub-families and genera, according to the arrangement of Messrs. Sclater and Salvin, are as follows:—

**Tinamini**, 7 genera.—*Tinamus* (7 sp.), Mexico to Paraguay; *Nothocephalus* (3 sp.), Costa Rica to Venezuela and Ecuador; *Crypturus* (16 sp.), Mexico to Paraguay and Bolivia; *Rhynchotus* (2 sp.), Bolivia and South Brazil to La Plata; *Nothoprocta* (4 sp.), Ecuador to Bolivia and Chili; *Nothurra* (4 sp.), Brazil and Bolivia to Patagonia; *Taoniscus* (1 sp.), Brazil to Paraguay.

**Tinamotini**, 2 genera.—*Calodromas* (1 sp.), La Plata and Patagonia; *Tinamotis* (1 sp.), Andes of Peru and Bolivia.

**General Remarks on the Distribution of Gallinæ.**

There are about 400 known species of Gallinaceous birds grouped into 76 genera, of which no less than 65 are each restricted to a single region. The Tetraonidae are the only cosmopolitan family, and even these do not extend into Temperate South America, and are very poorly represented in Australia. The Cracidae and Tinamidae are strictly Neotropical, the Megapodiidæ almost as strictly Australian. There remains the extensive family of the Phasianidæ, which offers some interesting facts. We have first the well-marked sub-families of the Numidinæ and Meleagrinæ, confined to the Ethiopian and Nearctic regions respectively, and we find the remaining five sub-families, comprising about 60 species, many of them the most magnificent of known birds, spread over the Oriental and the south-eastern portion of the Palaearctic regions. This restriction is remarkable, since there is no apparent cause in climate or vegetation why pheasants should not be found wild throughout southern Europe, as they were during late Tertiary and Post-Tertiary times. We have also to notice the remarkable absence of the Pheasant tribe from Hindostan and Ceylon, where the peacock and jungle-fowl are their sole representatives. These two forms also alone extend to Java, whereas in the adjacent islands of Borneo and Sumatra we have *Argusianus*, *Polyplectron*, and *Euplocamus*. The common jungle-fowl (the origin of our domestic poultry) is the only
species which enters the Australian region as far as Celebes and Timor, and another species (*Gallus canius*) as far as Flores, and it is not improbable that these may have been introduced by man and become wild.

We have very little knowledge of the extinct forms of Gallinæ, but what we have assures us of their high antiquity, since we find such distinct groups as the jungle-fowl, partridges, and *Pterocles*, represented in Europe in the Miocene period; while the Turkey, then as now, appears to have been a special American type.

*Order VI.*—*OPISTHOCOMI*.

*Family 93.*—*OPISTHOCOMIDÆ*. (1 Genus, 1 Species.)

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The Hoazin (*Opistikomus cristatus*) is the sole representative of this family and of the order Opisthocomi. It inhabits the eastern side of Equatorial America in Guiana and the Lower Amazon; and at Pará is called "Cigana" or gipsy. It is a large, brown, long-legged, weakly-formed and loosely-crested bird, having such anomalies of structure that it is impossible to class it along with any other family. It is one of those survivors, which tell us of extinct groups, of whose past existence we should otherwise, perhaps, remain for ever ignorant.

*Order VII.*—*ACCIPITRES*.

*Family 94.*—*VULTURIDÆ*. (10 Genera, 25 Species.)

---
Vultures range over all the great continents south of the Arctic Circle, being only absent from the Australian region, the Malay Islands, Ceylon, and Madagascar. The Old and New World forms are very distinct, belonging to two well-marked divisions, often ranked as families. The distribution of the genera is as follows:

Sub-family I. Vulturinæ (6 genera, 16 species), confined to the Old World.—*Vultur* (1 sp.), Spain and North Africa through Nepal to China north of Ningpo; *Gyps* (5 sp.), Europe south of 59° Africa, except the western sub-region, India, Siam, and Northern China; *Pseudogyps* (2 sp.), North-east Africa and Senegal, India and Burmah; *Otogyps* (2 sp.), South Europe, North-east and South Africa, India, and Siam; *Lophogyps* (1 sp.), North-east and South Africa and Senegal; *Neophron* (4 sp.), South Europe, India and the greater part of Africa.

Sub-family II. Sarcorhamphinæ (4 genera, 9 species), confined to the New World.—*Sarcorhamphus* (2 sp.), "The Condor," Andes of South America, and southern extremity below 41° south latitude; *Cathartes* (1 sp.), America from 20° south latitude to Trinidad and Mexico; *Catharistes* (1 sp.), America from 40° north to 40° south latitude, but not on Pacific coast of United States; *Pseudogryphus* (5 sp.), South America and Falkland Islands, and to 49° north latitude in North America, also Cuba and Jamaica.

Family 95.—Serpentariidae. (1 Genus, 1 Species.)

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The singular Secretary Bird (*Serpentarius*) is found over a large part of Africa. Its position is uncertain, as it has affinities both with the Accipitres, through *Polyboroides* (?) and with *Cariama*, which we place near the Bustards. (Plate IV. Vol. I. p. 261.)
FAMILY 96.—FALCONIDÆ. (69 Genera, 325 Species.)

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The Falconidæ, including the various groups of Hawks, Kites, Buzzards, Eagles, and Falcons, are absolutely cosmopolitan, ranging far into the arctic zone and visiting the most remote oceanic islands. They are abundant in all the great continents and larger islands, preferring open to woody regions. They are divided into several sub-families, the range of some of which are restricted. For this family as well as the preceding I follow the arrangement of Mr. Sharpe's British Museum Catalogue, and shall give the approximate distribution of each sub-family, as well as of the several genera.

Sub-family I. POLYBORINÆ (2 genera, 10 species), the Neotropical region with California and Florida, Tropical and South Africa.—Polyborus (2 sp.), South America, and to California and Florida; Ibycter (8 sp.), Tierra del Fuego to Honduras and Guatemala.

Cariama and Serpentarius, which Mr. Sharpe puts here, are so anomalous that I think it better to class them in separate families—Serpentariidæ among the Accipitres, and Caramiidæ near the Bustards.

Sub-family II. ACCIPITRINÆ (10 genera, 87 species).—Cosmopolitan.—Polyboroides (2 sp.), Africa and Madagascar; Circus (15 sp.), Old and New Worlds, widely scattered, but absent from Eastern Equatorial America, and the Malay Archipelago except Celebes; Micrastur (7 sp.), and Geranospiza (2 sp.), Tropical parts of Neotropical region; Urotiorchis (1 sp.), West Africa; Erythrocnema (1 sp.), Chili and La Plata to California and Texas; Melierax (5 sp.), Africa except West African sub-region; Astur (30 sp.), cosmopolitan, except the Temperate South American sub-region;
Nisoides (1 sp.), Madagascar; Eutriorchis (1 sp.), Madagascar; Accipiter (23 sp.), cosmopolitan, except Eastern Oceania.

Sub-family III. Buteoninae (13 genera, 51 sp.), cosmopolitan, except the Malay and Pacific Islands.—Urospizias (1 sp.), East and Central Australia; Heterospizias (1 sp.), Tropical South America east of the Andes; Tachytriorchis (2 sp.), Paraguay to California; Buteo (18 sp.), cosmopolitan, except the Australian region and the Indo-Malayan sub-region; Archibuteo (4 sp.), North America to Mexico and the cooler parts of the Palaearctic region; Buteola (1 sp.), Veragua to the Amazon Valley; Asturina (7 sp.), Paraguay and Bolivia to South-east United States; Busarellus (1 sp.), Brazil to Guiana; Buteogallus (1 sp.), Guiana and Columbia; Urubutinga (12 sp.), South Brazil and Bolivia to Mexico; Harpyhaliaetus (1 sp.), Chili and North Patagonia to Veragua; Morphnis (1 sp.), Amazonia to Panama; Thrasaëtus (1 sp.), Paraguay and Bolivia to Mexico.

Sub-family IV. Aquilinae (31 genera, 94 species), cosmopolitan.—Gypaetus (2 sp.), south of Palaearctic region from Spain to North China, Abyssinia, and South Africa; Uroaetus (1 sp.), Australia and Tasmania; Aquila (9 sp.), Nearctic, Palaearctic, and Ethiopian regions and India; Nisaëtus (4 sp.), Africa and South Europe, India, Ceylon, and Australia; Lophotriorchis (2 sp.), Indo-Malay sub-region, and Bogotá in South America; Neopus (1 sp.), India and Ceylon to Burmah, Java, Celebes and Ternate; Spiziaëtus (1 sp.), Guatemala to Brazil; Spizaëtus (10 sp.), Central and South America, Africa, India, and Ceylon, to Celebes and New Guinea, Formosa, and Japan; Lophoaëtus (1 sp.), all Africa; Asturinula (1 sp.), Africa, except extreme south; Herpetotheres (1 sp.), Bolivia and Paraguay to Southern Mexico; Dryotriorchis (1 sp.), West Africa; Ciraëtus (5 sp.) Africa to Central Europe, the Indian Peninsula, Timor; Spilornis (6 sp.), Oriental region and Celebes; Butastur (4 sp.), Oriental region to New Guinea and North-east Africa; Helotarsus (2 sp.), Africa south of the Sahara; Haliaëtus (7 sp.), cosmopolitan, except the Neotropical region; Gypohierax (1 sp.), West Africa and Zanzibar; Haliaëtus (2 sp.), Indian Peninsula to Ceylon, New Cale-
BIRDS.

donia, and Australia; *Nauclerus (= Elanoides) (1 sp.)*, Brazil to Southern United States; *Elanoides (= Nauclerus) (1 sp.)*, Western and North-eastern Africa; *Milvus* (6 sp.), the Old World and Australia; *Lophoictinia* (1 sp.), Australia; *Rostrhamus* (3 sp.), Antilles and Florida to Brazil and Peru; *Leptodon* (4 sp.), Central America to South Brazil and Bolivia; *Gypoidinia* (1 sp.), Brazil to Southern United States; *Elanis* (5 sp.), Africa, India, and Malay Archipelago to Australia, South America to California; *Gampsonyx* (1 sp.), Trinidad to Brazil; *Henicopernis* (1 sp.), Papuan Islands; *Machetramphus* (2 sp.), South-west Africa, Madagascar, and Malacca; *Pernis* (3 sp.), Palearctic, Oriental, and Ethiopian regions.

Sub-family V. FALCONINÆ (11 genera, 80 species), cosmopolitan. — *Baza* (10 sp.), India and Ceylon to the Moluccas and North Australia, West Coast of Africa, Natal, and Madagascar; *Harpagus* (3 sp.), Central America to Brazil and Peru; *Ictinia* (2 sp.), Brazil to Southern United States; *Hierax (=Microhierax, Sharpe)*, (4 sp.), Eastern Himalayas to Borneo and Philippines; *Poliohierax* (2 sp.), East Africa and Burmah; *Spiziapteryx* (1 sp.), La Plata; *Harpa* (1 sp.), New Zealand and the Auckland Islands; *Falco* (27 sp.), cosmopolitan, except the Pacific Islands; *Hierofalco* (6 sp.), Nearctic and Palaearctic regions; *Hierocieola* (2 sp.), Australia; *Cerchneis* (22 sp.), cosmopolitan, except Oceania.

**Family 97.—PANDIONIDÆ.** (2 Genera, 3 Species.)

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The Pandionidae, or Fishing Hawks, are universally distributed, with the exception of the Southern Temperate parts of South America. The genera are:—

*Pandion* (1 sp.), the range of the entire family; *Polioaëtus* (2 sp.), India through Malay Archipelago to Celebes and Sandwich Islands.
Family 98.—Strigidae. (23 Genera, 180 Species.)

**General Distribution.**

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The Strigidae, or Owls, form an extensive and well-known family of nocturnal birds, which, although invariably placed next the Hawks, are now believed to be not very closely allied to the other Accipitres. They range over the whole globe, extending to the extreme polar regions and to the remotest oceanic islands. Their classification is very unsettled, and we therefore place the genera, for convenience, in the order in which they follow each other in the Hand List of Birds. Those adopted by most ornithologists are the following:—

*Surnia* (1 sp.), the Arctic regions of both hemispheres; *Nyctea* (1 sp.), South Carolina to Greenland and Northern Europe; *Athene* (40 sp.), the Eastern hemisphere to New Zealand and the Solomon Islands; *Ninox* (7 sp.), the Oriental region, North China and Japan; *Glaucidium* (7 sp.), Neotropical region, California, and Oregon, Europe to North China; *Micrathene* (1 sp.), Mexico and Arizona; *Pholeopteryx* (2 sp.), Neotropical region, Texas, and North-west America; *Bubo* (16 sp.), universally distributed, excluding the Australian region; *Ketupa* (3 sp.), the Oriental region, Palestine; *Scotopelia* (2 sp.), West and South Africa; *Scops* (30 sp.), universally distributed, excluding Australia and Pacific Islands; *Gymnoglaux* (2 sp.), Antilles; *Lophostrix* (2 sp.), Lower Amazon to Guatemala; *Surnium* (22 sp.), all regions but the Australian; *Ciccaba* (10 sp.), Paraguay to Mexico; *Nyctaltinus* (1 sp.), Columbia; *Pulsatrix* (2 sp.), Brazil and Peru to Guatemala; *Asio* (6 sp.), all regions but the Australian, Sandwich Islands; *Nyctalops* (1 sp.), Cuba and Mexico to Brazil and Monte Video; *Pseudoseops* (1 sp.), Jamaica; *Nyctala* (4 sp.), the North Temperate zone; *Strix* (18 sp.), universally distributed; *Phodilus* (1 sp.), Himalayas and Malaya.
In Mr. Sharpe's Catalogue (published while this work was passing through the press) the genera of Owls are reduced to 19, arranged in two families—Strigidae, containing our last two genera, and Bubonidae, comprising the remainder. The species are increased to 190; but some genera are reduced, as Strix, which is said to contain only 5 species.

**General Remarks on the Distribution of the Accipitres.**

The Birds of Prey are so widely distributed over the world's surface that their general distribution calls for few remarks. Of the four families all but one are cosmopolites, Vultures alone being absent from the Australian region, as well as from Indo-Malaya and Madagascar. If we take the sub-families, we find that each region has several which are confined to it. The only parts of the world where there is a marked deficiency of Accipitres is in the islands of the Pacific; and it may be noted, as a rule, that these birds are more abundant in continents than in islands. There is not so much difference between the number of Birds of Prey in tropical and temperate regions, as is found in most other groups of land-birds. North America and Europe have about 60 species each, while India has about 80, and South America about 120. The total number of Accipitres is 550 comprised in 104 genera, and 4 (or perhaps more properly 5) families. In this estimate I have not included the Serpentariidae, containing the Secretary Bird of Africa, as there is some doubt whether it really belongs to the Order.

**Order VIII.—GRALLÆ.**

**Family 99.—RALLIDÆ.** (18 Genera, 153 Species.)

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The Rails are among the most widely distributed families of birds, many of the genera being cosmopolitan, and several of the
species ranging over half the globe. They are found in many remote islands; and in some of these—as the Gallinula of Tristan d’Acunha, and the Notornis of Lord Howe’s Island and New Zealand—they have lost the power of flight. The classification of the Rallidæ is not satisfactory, and the following enumeration of the genera must only be taken as affording a provisional sketch of the distribution of the group:

Rallus (18 sp.), Porzana (24 sp.), Gallinula (17 sp.), and Fulica (10 sp.), have a world-wide range; Ortygometra (1 sp.), ranges over the whole North Temperate zone; Porphyrio (14 sp.), is more especially Oriental and Australian, but occurs also in South America, in Africa, and in South Europe; Eulabeornis (15 sp.), is Ethiopian, Malayan, and Australian; Himantornis (1 sp.), is West African only; Aramides (24 sp.), is North and South American; Rallina (16 sp.), is Oriental, but ranges eastward to Papua; Habroptila (1 sp.), is confined to the Moluccas; Pareudiastes (1 sp.), the Samoa Islands; Tribonyx (4 sp.), is Australian, and has recently been found also in New Zealand; Ocydromus (4 sp.); Notornis (2 sp.), (Plate XIII. Vol. I. p. 455); and Cabalus (1 sp.), are peculiar to the New Zealand group.

The sub-family, Heliornithineæ (sometimes classed as a distinct family) consists of 2 genera, Heliornis (1 sp.), confined to the Neotropical region; and Podica (4 sp.), the Ethiopian region excluding Madagascar, and with a species (perhaps forming another genus) in Borneo.

Extinct Rallidæ.—Remains of some species of this family have been found in the Mascarene Islands, and historical evidence shows that they have perhaps been extinct little more than a century. They belong to the genus Fulica, and to two extinct genera, Aphanapteryx and Erythromachus. The Aphanapteryx was a large bird of a reddish colour, with loose plumage, and perhaps allied to Ocydromus. Erythromachus was much smaller, of a grey-and-white colour, and is said to have lived chiefly on the eggs of the land-tortoises. (See Ibis, 1869, p. 256; and Proc. Zool. Soc., 1875, p. 40.)
Family 100.—Scolopacidae. (21 Genera, 121 Species.)

General Distribution.

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The Scolopacidae, comprehending the Snipes, Sandpipers, Curlews, and allied genera, are perhaps as truly cosmopolitan as any family of birds, ranging to the extreme north and visiting the remotest islands. The genera of universal distribution are the following:

Numenius (16 sp.); Limosa (6 sp.); Totanus (12 sp.); Tringoides, (6 sp.); Himantopus (6 sp.); Tringa (20 sp.); and Gallinago (24 sp.). Those which have a more or less restricted distribution are:

Ibidorhyncha (1 sp.), Central Asia and the Himalayas (Plate VII. Vol. I. p. 331); Helodromas (1 sp.), Palearctic region and North India; Terekia (1 sp.), East Palearctic, wandering to India and Australia; Recurvirostra (6 sp.), Nearctic region to the High Andes, South Palearctic, East and South Africa, Hindostan and Australia; Micropelama (1 sp.), North America to Chili; Machetes (1 sp.), Palearctic region and Hindostan (Plate I. Vol. I. p. 195); Ereunetes (3 sp.), Nearctic and Neotropical; Eurinorhynchus (1 sp.), North-east Asia and Bengal; Calidris (1 sp.), all regions but Australian; Macrorhamphus (3 sp.), Palearctic and Nearctic, visits Brazil and India; Scolopax (4 sp.), the whole Palearctic region, to India, Java, and Australia; Philohela (1 sp.), East Nearctic; Rhynchwa (4 sp.), Ethiopian and Oriental, Australia, and Temperate South America; Phalaropus (3 sp.), North Temperate zone, and West Coast of America to Chili.
**Family 101.—CHIONIDIDÆ.** (1 Genus, 2 Species.)

**General Distribution.**

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The Sheath-bills, *Chionis* (2 sp.), are curious white birds, whose thick bill has a horny sheath at the base. Their nearest ally is *Haematopus*, a genus of Charadriidæ. These birds are confined to the Antarctic Islands, especially the Falkland Islands, the Crozets and Kerguelen’s Land.

**Family 102.—THINOCORIDÆ.** (2 Genera, 6 Species.)

**General Distribution.**

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The Thinocoridæ, or Quail-snipes, are small birds, confined to Temperate South America. They have much the appearance of Quails but are more nearly allied to Plovers. The two genera are:

*Attagis* (4 sp.), Falkland Islands, Straits of Magellan, Chili, Bolivia, and the High Andes of Peru and Ecuador; *Thinocorus* (2 sp.), La Plata, Chili, and Peru. (Plate XVI. Vol. II. p. 40.)

**Family 103.—PARRIDÆ.** (2 Genera, 11 Species.)

**General Distribution.**

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The Parridæ, or Jacanas, are remarkable long-toed birds, often of elegant plumage, frequenting swamps and marshes, and walking on the floating leaves of aquatic plants. They are found in all the tropics. *Parra* (10 sp.), has the distribution of the family; *Hydrophasianus* (1 sp.), is confined to the Oriental region.

**FAMILY 104.—GLAREOLIDÆ.** (3 Genera, 20 Species.)

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This family, comprising the Pratincoles and Courser, is universally distributed over the Old World and to Australia.

*Glareola* (9 sp.), has the distribution of the family; *Pluvianus* (1 sp.), is confined to North Africa; *Cursorius* (10 sp.), ranges over Africa, South Europe and India.

The position of the genus *Glareola* is uncertain, for though generally classed here, Prof. Lilljeborg considers it to be an aberrant form of the Caprimulgidae! It differs, in its insectivorous habits and in many points of external structure, from all its allies, and should probably form a distinct family.

**FAMILY 105.—CHARADIIDÆ.** (19 Genera, 101 Species.)

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The extensive family of the Plovers and their numerous allies, ranges over the whole globe. The genera now usually admitted into this family are the following:—

*Ediacenus* (9 sp.), is only absent from North America; *Esaucus* (2 sp.), India to Ceylon, Malay Islands and Australia;
Vanellus (3 sp.), Palearctic and Neotropical regions; Chactusia (15 sp.), the whole Eastern Hemisphere; Erythrogonyys (1 sp.), Australia; Hoplopterus (10 sp.), widely scattered, but absent from North America; Squatarola (1 sp.), all the regions; Charadrius (14 sp.), cosmopolitan; Eudromias (5 sp.), Eastern Hemisphere and South Temperate America; Egalitis (22 sp.), cosmopolitan; Oreophilus (1 sp.), South Temperate America; Thinornis (2 sp.), New Zealand; Anarhynchus (1 sp.), New Zealand (Plate XIII. Vol I. p. 455); Hamatopus (9 sp.), cosmopolitan; Strepsilis (2 sp.) almost cosmopolitan; Aphriza (1 sp.), West Coast of America; Pluvianellus (1 sp.), Straits of Magellan; Dromas (1 sp.), India, Madagascar, and North-east Africa; Pedionomus (1 sp.), Australia. This last genus has usually been placed with the Turnicidae.

**Family 106.—OTIDIDÆ.** (2 Genera, 26 Species.)

**General Distribution.**

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The Otididae, or Bustards, occur in all parts of the Old World and Australia where there are open tracts, being only absent from Madagascar and the Malay Archipelago.

*Otis* (2 sp.), ranges over most of the Palearctic region; while *Eupodotis* (24 sp.), has the range of the family, but is most abundant in the Ethiopian region, which contains three-fourths of the whole number of species.

**Family 107.—GRUIDÆ.** (3 Genera, 16 Species.)

**General Distribution.**

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The Gruidæ, or Cranes, are found in all the regions except the Neotropical.

*Grus* (12 sp.) inhabits the southern and western United States, the whole Paleartic region, South-east Africa, India, and Australia; *Anthropoides* (2 sp.), Europe, North and South Africa and India; *Balearica* (2 sp.), the Ethiopian region (except Madagascar).

**Family 108.—Cariamidæ.** (1 Genus, 2 Species.)

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The genus *Cariama* (2 sp.), consists of remarkable crested birds inhabiting the mountains and open plains of Brazil and La Plata. In the British Museum Catalogue of the Birds of Prey, they are classed as aberrant Falconidæ, but their anomalous characters seem to require them to be placed in a distinct family, which seems better placed among the Waders.

**Family 109.—Aramidæ.** (1 Genus, 2 Species.)

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The Guarainas are birds which have somewhat the appearance of Herons, but which are usually classed with the Rails. They are now, however, considered to form a distinct family. The only genus, *Aramus* (2 sp.), inhabits the Neotropical region, from Mexico and Cuba to Central Brazil.
Family 110.—PSOPHIDÆ. (1 Genus, 6 Species.)

**General Distribution.**

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The remarkable and beautiful birds called Trumpeters, are confined to the various parts of the Amazon valley; and it is an interesting fact, that the range of each species appears to be bounded by some of the great rivers. Thus, *Psophia crepitans* inhabits the interior of Guiana as far as the south bank of the Rio Negro; on the opposite or north bank of the Rio Negro *Psophia ochroptera* is found; beyond the next great rivers, Japura and Iça, *Psophia napensis* occurs; on the south bank of the Amazon, west of the Madeira, we have the beautiful *Psophia leucoptera*; east of the Madeira this is replaced by *Psophia viridis*, while near Pará, beyond the Tapajoz, Xingu and Tocantins, there is another species, *Psophia obscura*. Other species may exist in the intervening river districts; but we have here, apparently, a case of a number of well-marked species of birds capable of flight, yet with their range in certain directions accurately defined by great rivers. (Plate XV. Vol. II. p. 28.)

Family 111.—EURYPYGIDÆ. (1 Genus, 2 Species.)

**General Distribution.**

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The Eurypygidae, or Sun-Biterns, are small heron-like birds with beautifully-coloured wings, which frequent the muddy and wooded river-banks of tropical America. The only genus, *Eurypyga* (2 sp.), ranges from Central America to Brazil.
Family 112.—RHINOCHE'TIDÆ. (1 Genus, 1 Species.)

General Distribution.

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The genus Rhinochetus (1 sp.), consists of a singular bird called the Kagu, which inhabits New Caledonia, an island which may be placed with almost equal propriety in our 1st, 2nd, or 3rd Australian sub-regions. It is a bird of a bluish ash-colour, with a loose plumage, partaking something of the appearance of Rail, Plover, and Heron, but with peculiarities of structure which require it to be placed in a distinct family. Its anatomy shows that its nearest allies are the South American genera, Eurypyga and Psophia.

Family 113.—ARDEIDÆ. (5 Genera, 80 Species.)

General Distribution.

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The well-known Herons and Bitterns are found in every part of the globe, and everywhere closely resemble each other. Omitting the minuter sub-divisions, the genera are as follows:—

Ardea (60 sp.), cosmopolitan; Botaurus (6 sp.), almost cosmopolitan; Tigrisoma (4 sp.), Tropical America and West Africa; Nycticorax (9 sp.), cosmopolitan; Caneroma (1 sp.), Tropical America.

Vol. II.—24
### FAMILY 114.—PLATALEIDÆ. (6 Genera, 30 Species.)

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The Plataleidæ, including the Spoonbills and Ibises, have been classed either with the Herons or the Storks, but have most affinity with the latter. Though not very numerous they are found over the greater part of the globe, except the colder zones and the Pacific Islands. The following is the distribution of the genera:

- *Platalea* (6 sp.), all the warmer parts of the globe except the Moluccas and Pacific Islands; *Ibis* (2 sp.), Temperate North America and Tropical South America; *Falcinellus* (2 sp.), almost cosmopolitan; *Geronticus* (19 sp.), all Tropical countries and Temperate South America; *Scopus* (1 sp.), Tropical and South Africa; *Balaeniceps* (1 sp.), the Upper Nile. This last genus the “Shoe-bird,” or boat-billed heron, perhaps forms a distinct family.

### FAMILY 115.—CICONIIDÆ. (5 Genera, 20 Species.)

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The Ciconiidæ, or Storks, are mostly an Old World family, only three species inhabiting the Neotropical, and one, the Nearctic region. They are also absent from the islands of the Pacific, the Antilles, and, with one exception, from Madagascar. The genera are as follows:

- *Ciconia* (6 sp.), ranges through the Palearctic, Ethiopian and
Oriental regions as far as Celebes, and in South America; *Mycteria* (4 sp.), inhabits Africa, India, Australia and the Neotropical region; *Leptopilitus* (3 sp.), the Ethiopian and Oriental regions to Java; *Tantalus* (5 sp.), the Ethiopian, Oriental and Neotropical regions, and the South-east of North America; *Anastomus* (2 sp.), the Ethiopian region, and India to Ceylon.

**Family 116.—Palamedeidae.** (2 Genera, 3 Species.)

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The Palamedeidae, or Screamers, are curious semi-aquatic birds of doubtful affinities, perhaps intermediate between Gallinæ and Anseres. They are peculiar to South America. The genera are:

*Palamedea* (1 sp.), which inhabits the Amazon valley; *Chauna* (2 sp.), La Plata, Brazil and Columbia.

**Family 117.—Phoenicopteridae.** (1 Genus, 8 Species.)

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The Flamingoes (*Phoenicopterus*) seem peculiar to the Ethiopian and Neotropical regions, ranging from the former into India and South Europe. America has four species, inhabiting Chili and La Plata, the Galapagos, Mexico and the West Indian islands; the others range over all Africa, South Europe, India and Ceylon. These singular birds are placed by some authors near the Spoonbills and Ibises, by others with the Geese. Professor Huxley considers them to be “completely
intermediate between the Anserine birds on the one side and the Storks and Herons on the other.” The pterolysis according to Nitzsch is “completely stork-like.”

General Remarks on the Distribution of the Grallae, or Wading and Running Birds.

The Waders, as a rule, are birds of very wide distribution, the four largest families Rallidae, Scolopacidae, Charadriidae and Ardeidae, being quite cosmopolitan, as are many of the genera. But there are also a number of small families of very restricted distribution, and these all occur in the two most isolated regions, the Neotropical and the Australian. The Neotropical region is by far the richest in varied forms of Waders, having representatives of no less than 15 out of the 19 families, while 7 are altogether peculiar to it. The Australian region has 11 families, with 1 peculiar. The other two tropical regions each possess 11 families, but none are peculiar. The Palaeartic region has 10, and the Nearctic 7 families. No less than three families—Chionididae, Thinocoridae, and Cariamidae—are confined to the Temperate regions and highlands of South America; while four others,—Aramidae, Psophiidae, Eurypygidae and Palamedeidae,—are found in Tropical America only; and these present such an array of peculiar and interesting forms as no other part of the globe can furnish. The Phoenicopteridae or Flamingoes, common to the Tropical regions of Asia, Africa and America, but absent from Australia, is the only other feature of general interest presented by the distribution of the Waders.

The Order contains about 610 species, which gives about 32 species to each family, a smaller average than in the Gallinæ or Accipitres, and only about one-fourth of the average number in the Passeres. This is partly due to the unusual number of very small families, and partly to the wide average range of the species, which prevents that specialization of forms that occurs in the more sedentary groups of birds.
Order IX.—**Anseres.**

**Family 118.—Anatidae.** (40 Genera, 180 Species.)

The Anatidae, comprehending the Ducks, Geese, and Swans with their allies, are of such universal distribution that there is probably no part of the globe where some of them are not occasionally found. They are, however, most abundant in temperate and cold regions; and, contrary to what occurs in most other families, the most beautifully-coloured species are extra-tropical, and some even arctic. The distribution of the genera is as follows:—

*Anseranas* (1 sp.), Australia; *Plectropterus* (2 sp.), Tropical Africa; *Sarkidiornis* (1 sp.), South America, Africa, and India; *Chenalopex* (1 sp.), Amazonia; *Callochen* (1 sp.), South Europe, North, East, and South Africa; *Cercopsis* (1 sp.), Australia; *Anser* (13 sp.), Palearctic and Nearctic regions to Central America and the Antilles; *Berniela* (12 sp.), Temperate regions of the Northern and Southern Hemispheres; *Chloéphaga* (5 sp.), South Temperate America and Aleutian Islands; *Nettapus* (4 sp.), Tropical Africa and Madagascar, India and Ceylon to Malaya and Australia; *Cygnus* (10 sp.), Temperate regions of the Northern and Southern Hemispheres; *Dendrocygna* (10 sp.), Tropical and sub-tropical regions; *Tadorna* (3 sp.), Palearctic and Australian regions; *Casarea* (5 sp.), Palearctic, Oriental, Ethiopian, and Australian regions, to New Zealand; *Aix* (2 sp.), Temperate North America and Eastern Asia; *Mareca* (4 sp.), Palearctic region, North America, Temperate South America, and Australia; *Dafila* (3 sp.), all America and the Palearctic region; *Anas* (16 sp.), cosmopolitan; *Querquedula* (17 sp.),
cosmopolitan; Chauletelasmus (2 sp.), Palearctic region and North America; Spatula (5 sp.), all Temperate regions; Malacorhynchus (1 sp.), Australia; Cairina (1 sp.), Tropical South America; Branta (1 sp.), Palearctic region and India; Fuligula (5 sp.), North Temperate regions and New Zealand; Ethya (5 sp.), Palearctic and Nearctic regions, India, Australia, and South Africa; Metopiana (1 sp.), South Temperate America; Bucephala (4 sp.), Nearctic and Palearctic regions; Harelda (2 sp.), Northern Palearctic and Nearctic regions; Hymenolaimus (1 sp.), New Zealand; Camptolaimus (1 sp.), North-east of North America; Micropterus (1 sp.), Temperate South America; Somateria (5 sp.), Arctic and sub-arctic regions; Edemia (5 sp.), Nearctic and Palearctic regions; Biziura (1 sp.), Australia; Thalassornis (1 sp.), South Africa; Erismatura (6 sp.), all America, South-east Europe and South Africa; Nesonetta (1 sp.), Auckland Islands; Merganetta (3 sp.), Andes of Columbia to Chili; Mergus (6 sp.), Palearctic and Nearctic regions, Brazil, and the Auckland Islands.

**Family 119.—LARIDÆ.** (13 Genera, 132 Species.)

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<th>Neotropical Sub-regions</th>
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The Laridæ, or Gulls and Terns, are true cosmopolites, inhabiting the shores and islands of every zone; and most of the genera have also a wide range. They are therefore of little use in the study of geographical distribution. The genera are as follows:

Stercorarius (6 sp.), cosmopolitan, most abundant in cold and temperate zones; Rhodostethia (1 sp.), North America; Larus (60 sp.), cosmopolitan; Xema (1 sp.), North Temperate zone; Creagrus (1 sp.), North Pacific; Pagophila (1 sp.), Arctic seas; Risso (3 sp.), Arctic and Northern seas; Sterna (36 sp.), cosmopolitan; Hydrochelidon (12 sp.), Tropical and Temperate zones;
Gygis (1 sp.), Indian Ocean and Tropical Pacific Islands; Anous (6 sp.), Tropical and Temperate zones; Nanio (1 sp.), South Temperate America; Rhynchops (3 sp.), Tropical America, Africa, and India.

**FAMILY 120.—PROCHELLARIIDÆ.** (6 Genera, 96 Species.)

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The Procellariidæ, comprising the Shearwaters, Petrels, and Albatrosses, are universally distributed, but some of the genera are local.

*Puffinus* (20 sp.), *Procellaria* (18 sp.), and *Fulmarus* (40 sp.), are cosmopolitan; *Prion* (5 sp.) and *Pelecanoides* (3 sp.), belong to the South Temperate and Antarctic regions; *Diomedia* (10 sp.), comprises the Albatrosses, which are tropical, occasionally wandering into temperate seas.

**FAMILY 121.—PELECANIDÆ.** (6 Genera, 61 Species.)

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The Pelecanidæ, comprising the Gannets, Pelicans, Darters, and Frigate-Birds, although universally distributed, are more abundant in tropical and temperate regions.

*Sula* (8 sp.) and *Phalacrocorax* (35 sp.), are cosmopolitan; *Pelecanus* (9 sp.) is tropical and temperate; *Fregata* (2 sp.) and *Phaeton* (3 sp.) are confined to Tropical seas; *Phaetusa* (4 sp.) to Tropical and warm Temperate zones.
**Family 122.—SPHENISCIDÆ. (3 Genera, 18 Species.)**

**General Distribution.**

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The Penguins are entirely confined to the Antarctic and South Temperate regions, except two species which are found on the coast of Peru and the Galapagos. They are most plentiful in the southern parts of South America, Australia, New Zealand, and most of the Antarctic islands, and one or two species are found at the Cape of Good Hope. The genera as given in the *Hand List* are:

*Spheniscus* (1 sp.), South Africa and Cape Horn; *Eudyptes* (15 sp.), with the range of the family; *Aptenodytes* (2 sp.), Antarctic Islands.

**Family 123.—COLYMBIDÆ. (1 Genus, 4 Species.)**

**General Distribution.**

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The Northern Divers are confined to the Arctic and North Temperate Seas. The only genus, *Cylumbus*, has one species confined to the West Coast of North America, the others being common to the two northern continents.

**Family 124.—PODICIPIDÆ. (2 Genera, 33 Species.)**

**General Distribution.**

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The Grebes are universally distributed. The genera are *Podiceps* (26 sp.), cosmopolitan; and *Podilymbus* (2 sp.), confined to North and South America. Some ornithologists group these birds with the Colymbidae.

**Family 125.—Alcidae.** (7 Genera, 28 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
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The Alcidae, comprising the Auks, Guillemots, and Puffins, are confined to the North Temperate and Arctic regions, where they represent the Penguins of the Antarctic lands. One of the most remarkable of these birds, the Great Auk, formerly abundant in the North Atlantic, is now extinct. The genera are as follows:

*Alca* (2 sp.), North Atlantic and Arctic seas; *Fratercula* (4 sp.), Arctic and North Temperate zones; *Cerorhynchus* (2 sp.), North Pacific; *Simorhynchus* (8 sp.), North Pacific; *Brachyramphus* (3 sp.), North Pacific to Japan and Lower California; *Uria* (8 sp.), Arctic and North Temperate zones; *Mergulus* (1 sp.), North Atlantic and Arctic Seas. The last three genera constitute the family Uridae, of some ornithologists.

**General Remarks on the Distribution of the Anseres.**

The Anseres, or Swimmers, being truly aquatic birds, possess, as might be expected, a large number of cosmopolitan families and genera. No less than 5 out of the 8 families have a worldwide distribution, and the others are characteristic either of the North or the South Temperate zones. Hence arises a peculiarity of distribution to be found in no other order of birds; the Temperate being richer than the Tropical regions. The Neartic and Palearctic regions each have seven families of Anseres, two of which, the Colymbidae and Alcidae, are peculiar to them. The Ethiopian, Australian, and Neotropical regions, which all
extend into the South Temperate zone, have six families, with one peculiar to them; while the Oriental region, which is wholly tropical, possesses the five cosmopolitan families only.

There are about 78 genera and 552 species of Anseres, giving 69 species to a family, a high number compared with the Waders, and due to there being only one very small family, the Colymbidæ. The distribution of the Anseres, being more determined by temperature than by barriers, the great regions which are so well indicated by the genera and families of most other orders of birds, hardly limit these, except in the case of the genera of Anatidæ.

Order X.—STRUTHIONES.

Family 126.—STRUTHIONIDÆ. (2 Genera, 4 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Ostriches consist of two genera, sometimes formed into distinct families. *Struthio* (2 sp.) inhabits the desert regions of North, East, and South Africa, as well as Arabia and Syria. It therefore just enters the Palearctic region. *Rhea* (3 sp.) inhabits Temperate South America, from Patagonia to the confines of Brazil.

Family 127.—CASUARIIDÆ. (2 Genera, 11 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Cassowaries and Emeus are confined to the Australian region. The Emeus, *Dromæus* (2 sp.), are found only on the
main-land of Australia (Plate XII. Vol. I. p. 441). *Casuarius* (9 sp.) inhabits the islands from Ceram to New Britain, with one species in North Australia; it is most abundant in the Papuan Islands.

**Family 128.—Apterygidae.** (1 Genus, 4 Species.)

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<th>Neotropical Sub-regions</th>
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The species of *Apteryx* are entirely confined to the two larger islands of New Zealand. They are supposed to have some remote affinity with *Ocydromus*, a genus of Rails peculiar to Australia and New Zealand; but they undoubtedly form one of the most remarkable groups of living birds (Plate XIII. Vol. I. p. 445).

**Struthious Birds recently extinct.**

A number of sub-fossil remains of birds, mostly large and some of gigantic size, having affinities to the *Apteryx* and, less closely, to the Cassowaries, have been discovered in New Zealand. These are all classed by Professor Owen in the genus *Dinornis* and family *Dinornithidae*; but Dr. Haast, from the study of the rich collections in the Canterbury (New Zealand) Museum, is convinced that they belong to two distinct families and several genera. His arrangement is as follows. (See *Ibis*, 1874, p. 209).

**Family 129.—Dinornithidae.** (2 Genera, 7 Species.)

*Dinornis* (5 sp.); *Meionornis* (2 sp.).

These had no hind toe, and include the largest species. Professor Newton thinks that they were absolutely wingless, being the only birds in which the fore limbs are entirely wanting.
Family 130.—Palapterygidae. (2 Genera, 4 Species.)

*Palapteryx* (2 sp.); *Euryapteryx* (2 sp.).
These had a well-developed hind toe, and rudimentary wings.

Family 131.—Epyornithidae. (1 Genus, 3 Species.)

A gigantic Struthious bird (*Epyornis*), belonging to a distinct family, inhabited Madagascar.

It was first made known by its enormous eggs, eight times the bulk of those of the ostrich, which were found in a subfossil condition. Considerable portions of skeletons have since been discovered, showing that these huge birds formed an altogether peculiar family of the order.

*General Remarks on the Distribution of the Struthiones.*

With the exception of the Ostrich, which has spread northward into the Palaearctic region, the Struthious birds, living and extinct, are confined to the Southern hemisphere, each continent having its peculiar forms. It is a remarkable fact that the two most nearly allied genera, *Struthio* and *Rhea*, should be found in Africa and South Temperate America respectively. Equally remarkable is the development of these large forms of wingless birds in Australia and the adjacent islands, and especially in New Zealand, where we have evidence which renders it probable that about 20 species recently coexisted. This points to the conclusion that New Zealand must, not long since, have formed a much more extensive land, and that the diminution of its area by subsidence has been one of the causes—and perhaps the main one—in bringing about the extinction of many of the larger species of these wingless birds.

The wide distribution of the Struthiones may, as we have already suggested (Vol. I., p. 287.), be best explained, by supposing them to represent a very ancient type of bird, developed at a time when the more specialized carnivorous mammalia had
not come into existence, and preserved only in those areas which were long free from the incursions of such dangerous enemies. The discovery of Struthious remains in Europe in the Lower Eocene only, supports this view; for at this time carnivora were few and of generalized type, and had probably not acquired sufficient speed and activity to enable them to exterminate powerful and quick-running terrestrial birds. It is, however, at a much more remote epoch that we may expect to find the remains of the earlier forms of this group; while these Eocene birds may perhaps represent that ancestral wide-spread type which, when isolated in remoter continents and islands, became modified into the American and African ostriches, the Emeus and Cassowaries of Australia, the Dinornis and Epyornis of New Zealand.
CHAPTER XIX.

THE DISTRIBUTION OF THE FAMILIES AND GENERA OF REPTILES AND AMPHIBIA.

REPTILIA.

Order I.—OPHIDIA.

Family 1.—TYPHLOPIDAE.—(4 Genera, 70 Species.)

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The Typhlopidae, or Blind Burrowing Snakes, are widely scattered over the warmer regions of the earth, but are most abundant in the Oriental and Australian regions, and least so in the Neotropical. They are absent from the Neartic region; and in the Palearctic are found only in south-eastern Europe and Japan.

The most extensive genus is Typhlops, comprising over 60 species, and having a range almost as extensive as the entire family. The other well characterised genera are:

Typhlina (1 sp.), ranging from Penang to Java and Hong Kong; Typhline (1 sp.), the Cape of Good Hope; Dibamus (1 sp.), New Guinea.
Family 2.—Tortricidæ. (3 Genera 5 Species.)

**General Distribution.**

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The Tortricidæ, or Short-tailed Burrowing Snakes, are a small family, one portion of which ranges from India to Cambodia, and through the Malay islands as far as Celebes and Timor; these form the genus Cylindrophis. Another portion inhabits America, and consists of:

Charina (1 sp.), found in California and British Columbia; and Tortrix (1 sp.), in Tropical America.

We have here a case of discontinuous distribution, indicating, either very imperfect knowledge of the group, or that it is the remnant of a once extensive family, on the road to extinction.

Family 3.—Xenopeltidæ. (1 Genus, 1 Species.)

**General Distribution.**

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The curious nocturnal carnivorous Snake, forming the genus Xenopeltis, and the sole representative of this family, ranges from Penang to Cambodja, and through the Malay Islands to Celebes.

Family 4.—Uropektidæ. (5 Genera, 18 Species.)

**General Distribution.**

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The Uropeltidae, or Rough-tailed Burrowing Snakes, are strictly confined to Ceylon and the adjacent parts of Southern India, and would almost alone serve to mark out our second Oriental sub-region. The genera are:

*Rhinophis* (7 sp.), Ceylon; *Uropeltis* (1 sp.), Ceylon; *Silybura* (8 sp.), Anamally Hills and Neilgherries; *Plecturus* (3 sp.), Neilgherries and Madras; and *Melanophidium* (1 sp.), the Wynand.

**Family 5.—Calamariidae.** (32 Genera, 75 Species.)

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The Calamariidae, or Dwarf Ground Snakes, are found in all warm parts of the globe, extending north into the United States as far as British Columbia and Lake Superior; but they are absent from the Palearctic region, with the exception of a species found in Persia. The species are in a very confused state. The best characterised genera are the following:

*Calamaria* (20 sp.), Persia, India to Java and the Philippine Islands, Celebes, and New Guinea; *Rhabdosoma* (18 sp.), Mexico and South America, and also the Malay Islands as far east as Amboyna, Timor, and New Guinea; *Typhlocalamus* (1 sp.), Borneo; *Macrocalamus* (1 sp.), India; *Aspidura* (3 sp.), India and Ceylon; *Haplocerus* (1 sp.), Ceylon; *Streptophorus* (3 sp.), Central and South America;—with a host of others of less importance or ill-defined.

**Family 6.—Oligodontidae.** (4 Genera, 40 Species.)

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The Oligodontidae are a small family of Ground Snakes which have been separated from the Calanariidae, and, with the exception of a few species, are confined to the Oriental region. The best characterised genera are:

*Oligodon* (12 sp.), India, Ceylon, and Philippines; and, *Simotes* (24 sp.), India to China and Borneo. In addition to these, *Achalinus* is founded on a single species from Japan; and *Teleolepis* consists of three species from North and South America.

**Family 7.—** COLUBRIDA.E. (50 Genera, 270 Species.)

**General Distribution.**

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The Colubrine Snakes are universally distributed over the globe, and they reach the extreme northern limits of the order. They are, however, almost absent from Australia, being there represented only by a few species of *Tropidonotus* and *Coronella* in the northern and eastern districts. This great family consists of four divisions or sub-families: the Coronellinae (20 genera, 100 species), the Colubrinae (16 genera, 70 species), the Dryadinae (7 genera, 50 species), and the Natricinae (7 genera, 50 species). The more important genera of Colubridae are the following:—

*Ablabes*, *Coronella*, *Ptyas*, *Coluber*, and *Tropidonotus*—all have a very wide distribution, but the two last are absent from South America, although *Tropidonotus* reaches Guatemala; *Tomodon*, *Xenodon*, *Liopis*, *Stenorrhina*, *Erythrolampus*, *Elapochrus*, *Callirhinus*, *Enophrys*, and *Dromicus*—are confined to the Neotropical region; *Hypsihynchus*, *Cryptodacus*, *Jaltris*, and *Coloragia*, are confined to the West Indian Islands; *Chilomeniscus*, *Conophis*, *Pituophis*, and *Ischcognathus*, to North America, the latter going as far south as Guatemala; *Compsosoma*, *Zamenis*, *Zaosys*, *Atretium*, *Xenochrophys*, and *Herpetoceras*, are peculiarly Oriental, but *Zamenis* extends into South Europe;
Lytorhynchus, Rhamnophis, Herpetothiopsis and Grayia, are Ethiopian; Rhinechis is peculiar to Europe; Megablabes to Celebes, and Styporhynchus to Gilolo; Cyclophis, is found in the Oriental region, Japan, and North America; Spilotes, in the Nearctic and Neotropical regions; Xenelaphis in the Oriental, Ethiopian, and Palearctic regions; Philodryas, Heterodon and Herpetodryas in America and Madagascar, the latter genus being also found in China.

**Family 8.—HOMALOPSIDÆ. (24 Genera, 50 Species.)**

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<th>Neotropical Sub-regions</th>
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</table>

The Homalopsidæ, or Fresh-water Snakes, have been separated from the Hydridæ by Dr. Günther, and they include some groups which have been usually classed with the Natricinæ. They are especially characteristic of the Oriental region, where considerably more than half the genera and species are found; next comes the Neotropical region which has 6 species; while none of the other regions have more than 4 or 5. It is to be observed that the Ethiopian species occur in West Africa only, and mostly constitute peculiar genera, so that in this family the separation of the Ethiopian and Oriental regions is very well marked. The best characterised genera of the family are the following:—

* Cantoria (10 sp.), ranging from Europe to Japan, the Philippines, and Timor, with one species in Guinea; Hypsirhina (6 sp.), Bengal, China, and Borneo; Fordonia (3 sp.), Rangoon to Borneo and Timor; Homalopsis (2 sp.), Cambodja to Java; Cerberus (2 sp.), Ceylon and Siam, the Malay Islands, New Guinea, and North Australia; Herpeton (1 sp.), Siam; Feraria (1 sp.), Bengal to Penang; Pythonopsis (1 sp.), Borneo; Myron (2 sp.), India and North Australia; Homalophis (1 sp.), Borneo; Hipistes (1 sp.), Penang; Xenodermus (1 sp.), Java; Neustero- phis and Limnophis, with one species each, are peculiar to West
Africa; *Helicops* (2 sp.), North and South America; *Farancia* and *Dimodes*, with one species each, are from New Orleans; and a few others imperfectly known from Tropical America.

**Family 9.—Psammophidæ.** (5 Genera, 20 Species.)

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<th>Neotropical Sub-regions</th>
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</table>

The Psammophidæ, or Desert Snakes, are a small group characteristic of the Ethiopian and Oriental regions, but more abundant in the former. The distribution of the genera is as follows:

*Psammophis* (16 sp.), ranges from West Africa to Persia and Calcutta; *Celopeltis* (1 sp.), North and West Africa; *Mimophis* (1 sp.), Madagascar; *Psammodynastes* (2 sp.), Sikhim to Cochin China, Borneo and the Philippine Islands; and *Dromophis* (1 sp.), Tropical Africa.

**Family 10.—Rachiodontidæ.** (1 Genus, 2 Species.)

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<tr>
<th>Neotropical Sub-regions</th>
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The Rachiodontidæ are a small and very isolated group of snakes of doubtful affinities. The only genus, *Dasypeltis* (2 sp.), is confined to West and South Africa.
Family 11.—Dendrophidæ. (7 Genera, 35 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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The Dendrophidæ, or Tree Snakes, are found in all the Tropical regions, but are most abundant in the Oriental. The genera are distributed as follows:—

Dendrophis ranges from India and Ceylon to the Pelew Islands and North Australia, and has one species in West Africa; Ahatulla is almost equally divided between Tropical Africa and Tropical America; Gonyosoma ranges from Persia to Java and the Philippines; Chrysopelea is found in India, Borneo, the Philippines, Amboyna, and Mysol; Hapsidrophis and Bucephalus are confined to Tropical Africa; and Ithycephalus (1 sp.), is peculiar to Madagascar.

Family 12.—Dryiophidæ. (5 Genera, 15 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Neartic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Dryiophidæ, or Whip Snakes, are a very well characterised family of slender, green-coloured, arboreal serpents, found in the three tropical regions but absent from Australia, although they just enter the Australian region in the island of Celebes. In Africa they are confined to the West Coast and Madagascar. The genera are:—

Dryiophis (4 sp.), Tropical America and West Africa; Tropidoceocye (1 sp.), Central India; Tragops (4 sp.), Bengal to China, the Philippines, Java, and Celebes; Passerita (2 sp.), Ceylon
and the Indian Peninsula; and Langaha (2 sp.), confined to Madagascar.

**Family 13.—Dipsadidae.** (11 Genera, 45 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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</table>

The Dipsadidae, or Nocturnal Tree Snakes, are distinguished from the last family by their dark colours and nocturnal habits. They are about equally abundant in the Oriental and Neotropical regions, less so in the Ethiopian, while only a single species extends to North Australia. The following are the best known genera:

*Dipsas*, comprising all the Oriental species with one in Asia-Minor, and a few from the Moluccas, New Guinea, North Australia, West Africa, and Tropical America; *Thamnodyastes, Tropidodipsas*, and several others, from Tropical America; *Dipso-doba*, from West Africa and Tropical America; *Leptodeira*, from Tropical and South Africa, South America, and Mexico; and *Pythonodipsas*, from Central Africa.

**Family 14.—Scytalidae.** (3 Genera, 10 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaeartic Sub-regions</th>
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It is doubtful how far the three genera which constitute this family form a natural assemblage. We can therefore draw no safe conclusions from the peculiarity of their distribution—*Scytalc* and *Oxyrhopus* being confined to Tropical America; while *Hologerrhum* inhabits the Philippine Islands.
FAMILY 15.—LYCODONTIDÆ. (11 Genera, 35 Species.)

**General Distribution.**

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<tr>
<th>Neotropical Sub-regions</th>
<th>Neartic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Lycodontidae, or Fanged Ground Snakes, are confined to the Ethiopian and Oriental regions, over the whole of which they range, except that they are absent from Madagascar and extend eastward to New Guinea. The genera have often a limited distribution:

*Lycodon* ranges from India and Ceylon to China, the Philippines, and New Guinea; *Tetragonosoma*, the Malay Peninsula and Islands; *Leptorhyton* and *Ophites*, India; *Cercaspis*, Ceylon; and *Cyclocorus*, the Philippines. The African genera are *Boaedon*, *Lycophidion*, *Holuropholis*, *Simocephalus*, and *Lampropelis*, the latter being found only in South Africa. The species are nearly equally abundant in both regions, but no genus is common to the two.

FAMILY 16.—AMBLYCEPHALIDÆ. (5 Genera, 12 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Amblycephalidae, or Blunt Heads, are very singularly distributed, being nearly equally divided between Tropical America and the eastern half of the Oriental region, as will be seen by the following statement of the distribution of the genera:

*Amblycephalus* (1 sp.), Malay Peninsula to Borneo and the Philippines; *Pareas* (3 sp.), Assam, China, Java, and Borneo;
Asthenodipsas (1 sp.), Malacca; Leptognathus (6 sp.), Central and South America; and Anoplodipsas (1 sp.), supposed to come from New Caledonia, and, if so, furnishing a link, though a very imperfect one, between the disconnected halves of the family.

**Family 17.—Pythonidæ.** (21 Genera, 46 Species.)

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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</table>

The Pythonidæ, comprising the Rock Snakes, Pythons, and Boas, are confined to the tropics, with the exception of one species in California. They are very abundant in the Neotropical region, where nearly half the known species occur; the Australian region comes next, while the Oriental is the least prolific in these large serpents. The genera which have been described are very numerous, but they are by no means well defined. The following are the most important:—

*Python* is confined to the Oriental region; *Morelia, Lialis,* and *Nardoa* are Australian and Papuan; *Enygrus* is found in the Moluccas, New Guinea and the Fiji Islands; *Hortulia* is African; *Sanzinia* is peculiar to Madagascar; *Boa, Epicrates, Corallus, Ungalia,* and *Eunectes* are Tropical American; *Chilabothrus* is peculiar to Jamaica and Mexico; and *Lichanotus* to California.

An extinct species belonging to this family has been found in the Brown-coal formation of Germany, of Miocene age.

**Family 18.—Erycidae.** (3 Genera, 6 Species.)

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palearctic Sub-regions</th>
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</table>
The Erycidae, or Land Snakes, form a small but natural family, chiefly found in the desert zone on the confines of the Palaearctic, Oriental, and Ethiopian regions. They range from South Europe to West Africa and to Sikhim. The three genera are distributed as follows:

*Cursoria* (1 sp.), Afghanistan; *Gongylolophis* (1 sp.), India and Sikhim; *Eryx* (4 sp.), has the range of the entire family.

**Family 19.—Acrochordidae.** (2 Genera, 3 Species)

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<tr>
<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Acrochordidae, or Wart Snakes, form a small and isolated group, found only in two sub-divisions of the Oriental region—the South Indian and the Malayan, and in New Guinea.

*Acrochordus*, inhabits Penang, Singapore, and Borneo; *Chersydus*, Southern India and the Malay Peninsula, with a species recently discovered in New Guinea.

**Family 20.—Elapidae.** (23 Genera, 100 Species)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palaearctic Sub-regions</th>
<th>Ethiopian Sub-regions</th>
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The Elapidae, or Terrestrial venomous Colubrine Snakes, are an extensive group, spread over the tropics of the whole world, but especially abundant in Australia, where half the known species occur, some of them being the most deadly of venomous serpents. In the Oriental region they are also abundant, containing amongst other forms, the well-known Cobras. The American species are almost equally numerous, but they all belong to one
genre, and they are annulated with rings of various colours in a manner quite distinct from any other members of this family. The genera, which are all very distinct, are distributed as follows:

Diemenia, Acanthophis, Hoplocephalus, Brachiurophis, Tropidechis, Pseudechis, Caecophis, Pseudonaje, Denisonia, and Vermicella, are Australian, the first two ranging to the Moluccas and New Guinea; Ogmodon occurs in the Fiji Islands; Naja, Bungarus, Ophiophagus, Pseudonaje, Xenurelaps, Doliophis, Megarophis, and Callophis are Oriental, one species of the latter genus being found in Japan, while an Ophiophagus has been discovered in New Guinea; Cyrtophis, Elapsoidea, and Pseilophis are African: Elaps is American, ranging as far north as South Carolina, but not to the West Indian Islands.

**Family 21.—DENDRASPIDIDÆ.** (1 Genus, 5 Species.)

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<th>Neotropical Sub-regions</th>
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The single genus Dendraspis, constituting the family, is confined to Tropical Africa.

**Family 22.—ATRACTASPIDIDÆ.** (1 Genus, 4 Species.)

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
<th>Palæarctic Sub-regions</th>
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This small family, consisting of the genus Atractaspis, is also confined to Africa, but has hitherto only been found in the West and South.
Family 23.—HydrophiDæ. (8 Genera, 50 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Neartic Sub-regions</th>
<th>Palæarctic Sub-regions</th>
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The HydrophiDæ, or Sea Snakes, are a group of small-sized marine serpents, abundant in the Indian and Australian seas, and extending as far west as Madagascar, and as far east as Panama. They are very poisonous, and it is probable that many species remain to be discovered. The genera are distributed as follows:

*Hydrophis* (37 sp.), ranging from India to Formosa and Australia; *Platurus* (2 sp.), from the Bay of Bengal to New Guinea and New Zealand; *Aipysurus* (3 sp.), Java to New Guinea and Australia; *Disteira* (1 sp.), unknown locality; *Acalyptus* (1 sp.), South-west Pacific; *Enhydrina* (1 sp.), Bay of Bengal to New Guinea; *Pelamis* (1 sp.), Madagascar to New Guinea, New Zealand, and Panama; *Emydocephalus* (1 sp.), Australian Seas.

Family 24.—Crotalidæ. (11 Genera, 40 Species.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Neartic Sub-regions</th>
<th>Palæarctic Sub-regions</th>
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The Crotalidæ, or Pit Vipers, including the deadly Rattlesnakes, form a well-marked family of fanged serpents, whose distribution is very interesting. They abound most in the Oriental region, at least 5 of the genera and 20 species being found within its limits, yet they are quite unknown in the Ethiopian region—a parallel case to that of the Bears and Deer. A few species are peculiar to the eastern portion of the Palæarctic region, while
the Nearctic is actually richer than the Neotropical region both in genera and species. This would point to the conclusion, that the group originated in the Indo-Chinese sub-region and spread thence north-east to North America, and so onward to South America, which, having been the last to receive the group, has not had time to develop it largely, notwithstanding its extreme adaptability to Reptilian life. The genera are divided among the several regions as follows:—

*Craspedocephalus* (7 sp.), Tropical America and the West Indian Islands; *Cenchris, Crotalophorus, Uropsophorus*, and *Crotalus*, inhabiting North America from Canada and British Columbia to Texas, one species (*Crotalus horridus*) extending into South America; *Trimeresurus* (16 sp.), all India from Ceylon to Assam, Formosa, the Philippines and Celebes; *Peltopelor* and *Hymnale* (1 sp. each), peculiar to India; *Calloselasma* (1 sp.), Siam; *Atropos* (1 sp.), Java and Borneo; *Halys* (3 sp.), peculiar to Tartary, Thibet, Japan, North China, and Formosa.

**Family 25.—VIPEIDÆ.** (3 Genera, 22 Species.)

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<th>NEOTROPICAL SUB-REGIONS</th>
<th>NEARCTIC SUB-REGIONS</th>
<th>PALEARCTIC SUB-REGIONS</th>
<th>ETHIOPIAN SUB-REGIONS</th>
<th>ORIENTAL SUB-REGIONS</th>
<th>AUSTRALIAN SUB-REGIONS</th>
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</table>

The Viperidae, or True Vipers, are especially characteristic of the Palæarctic and Ethiopian regions, only one species being found over a large part of the Oriental region, and another reaching Central India. They are especially abundant in Africa, and the Palæarctic confines in South-western Asia. The common Viper ranges across the whole Palæarctic region from Portugal to Saghalien Island, reaching to 67° North Latitude, in Scandinavia, and to 58° in Central Siberia. The genera, according to Dr. Strauch's synopsis, are distributed as follows:—

*Vipera* (17 sp.), which has the range of the family, extending over the whole of the Palæarctic and Ethiopian regions, except Madagascar, and as far as Ceylon, Siam, and Java, in the Oriental
region; *Echis* (2 sp.), inhabiting North Africa to Persia and to Continental India; and *Atheris* (3 sp.), confined to West Africa.

Remarks on the General Distribution of Ophidia.

The Ophidia, being preeminently a Tropical order—rapidly diminishing in numbers as we go north in the Temperate Zone, and wholly ceasing long before we reach the Arctic Circle—we cannot expect the two Northern regions to exhibit any great variety or peculiarity. Yet in their warmer portions they are tolerably rich; for, of the 25 families of snakes, 6 are found in the Nearctic region, 10 in the Palaeartic, 13 in the Australian, 16 in the Neotropical, 17 in the Ethiopian, and no less than 22 in the Oriental, which last is thus seen to be by far the richest of the great regions in the variety of its forms of Ophidian life. The only regions that possess altogether peculiar families of this order, are the Ethiopian (3), and the Oriental (2); the usually rich and peculiar Neotropical region not possessing exclusively, any family of snakes; and what is still more remarkable, the Neotropical and Australian regions together, do not possess a family peculiar to them. Every family inhabiting these two regions is found also in the Oriental; and this fact, taken in connection with the superior richness of the latter region both in families and genera, would indicate that the Ophidia had their origin in the northern hemisphere of the Old World (the ancient Palaeartic region) whence they spread on all sides, in successive waves of migration, to the other regions. The distribution of the genera peculiar to, or highly characteristic of, the several regions is as follows:—

The Nearctic possesses 9; four of these belong to the Colubridae, one to the Pythonidæ, and four to the Crotalidæ. The Palæartic region has only 2 peculiar genera, belonging to the Colubridæ and Crotalidæ. The Ethiopian has 25, belonging to 11 families; four to Colubridæ, five to Lycodontidæ, and three to Elapidæ. The Oriental has no less than 50, belonging to 15 families; five are Colubridæ, five Uropeltidæ, twelve Homalopsidæ, six Lycodontidæ, three Amblycephalidæ, eight Elapidæ, and four Crotal-
The Australian has 16, belonging to three families only; eleven being Elapidae, and four Pythonidae. The Neotropical has about 24, belonging to eight families; ten are Colubridae, six Pythonidae, and the rest Dipsadidae, Scytalidae, Amblycephalidae, Elapidae, and Crotalidae.

We find then, that in the Ophidia, the regions adopted in this work are remarkably distinct; and that, in the case of the Oriental and Ethiopian, the difference is strongly marked, a very large number of the genera being confined to each region. It is interesting to observe, that in many cases the affinity seems to be rather between the West Coast of Africa and the Oriental region, than between the East Coast and the plains of India; thus the Homalopsidae—a highly characteristic Oriental family—occur on the West Coast of Africa only; the Dryiophidae, which range over the whole Oriental region, only occur in Madagascar and West Africa in the Ethiopian; the genus Dipsas is found over all the Oriental region and again in West Africa. A cause for this peculiarity has been suggested in our sketch of the past history of the Ethiopian region, Vol. I. p. 288. In the Lycodontidae, which are strictly confined to these two regions, the genera are all distinct, and the same is the case with the more widely distributed Elapidae; and although a few desert forms, such as Echis and the Erycidae, are common to Africa and the dry plains of India, this is evidently due to favourable climatic conditions, and cannot neutralise the striking differences in the great mass of the family and generic forms which inhabit the two regions. The union of Madagascar with the South-western part of the Oriental region under the appellation Lemuria, finds no support in the distribution of Ophidia; which, however, strikingly accords with the views developed in the Third Part of this work, as to the great importance and high antiquity of the Euro-Asiatic continent, as the chief land-centre from which the higher organisms have spread over the globe.

Fossil Ophidia.—The oldest known remains of Ophidia occur in the Eocene formation in the Isle of Sheppey; others are found in the Miocene (Brown Coal) of Germany, and in some Tertiary beds in the United States. Most of these appear to have been
large species belonging to the Pythonidæ, so that we are evidently still very far from knowing anything of the earliest forms of this order. In some of the later Tertiary deposits the poison fangs of venomous species have been found; also a Colubrine snake from the Upper Miocene of the South of France.

Order II.—lacertilia.

Family 26.—TROGONOPHIDÆ. (1 Genus, 1 Species.)

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The single species of Trogonophis, forming this family, is found only in North Africa.

Family 27.—Chirotidæ. (1 Genus, 1 Species.)

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Chirotes, the genus which constitutes this family, inhabits Mexico, and has also been found in Missouri, one of the Southern United States.

Family 28.—Amphisbænidæ. (1 Genus, 13 Species.)

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The Amphisbænidae, which, in the opinion of Dr. Günther, are all comprised in the genus Amphisbæna, inhabit Spain and Asia Minor, North and Tropical Africa, South America as far as Buenos-Ayres and the West Indian Islands.

**Family 29.—LEPIDOSTERNIDÆ.** (3 Genera, 6 Species.)

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The small family of Lepidosternidae has nearly the same distribution as the last, indicating a curious relationship between the Tropical parts of Africa and America. Lepidosternon and Cephalopeltis are American genera, while Monotrophis is African.

**Family 30.—VARANIDÆ.** (3 Genera, 30 Species.)

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The Varanidae, or Water Lizards, are most abundant in the Oriental region, whence they extend into the Austro-Malay Islands as far as New Guinea, and into Australia. Several species are found in Africa. Psammosaurus (1 sp.), is found in North Africa and North-western India; Monitor (18 sp.), has the range of the family; while Hydrosaurus (8 sp.) ranges from Siam to the Philippines, New Guinea, and Australia.
Family 31.—HELODERMIDÆ. (1 Genus, 1 Species.)

**General Distribution.**

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The genus *Heloderma*, which constitutes this family, is found in Mexico.

Family 32.—TEIDÆ. (12 Genera, 74 Species.)

**General Distribution.**

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The Teidæ, or Teguexins—a group of Lizards allied to the European Lacertidæ, but with differently formed superciliary scales—are highly characteristic of the Neotropical region, abounding almost everywhere from Patagonia to the Antilles and Mexico, and extending northwards to California on the west and to Pennsylvania on the east. The most extensive genus is *Ameiva*, containing nearly 60 species and having the range of the entire family; *Teius* (3 sp.), inhabits Brazil and Mendoza; *Callotropis* (2 sp.), Chili; *Centropyx* (3 sp.), Paraguay to Alabama; *Dicrodon* (Peru); *Monoploca* (Western Ecuador); with *Acrantus, Acanthopyga, Emminia, Crocodilurus, Custa*, and *Ada*, which each consist of a single species, and all inhabit Tropical America.

Family 33.—LACERTIDÆ. (18 Genera, 80 Species.)

**General Distribution.**

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The Lacertidae, or Land Lizards, are small-sized, terrestrial, non-burrowing lizards, very characteristic of the Palæarctic region, which contains more than half the known species, and of the adjacent parts of the Oriental and Ethiopian regions, but extending also to South Africa, to Java, and even to Australia. The best-defined genera are the following:

*Lacerta* (10 sp.), ranging over all Central and South Europe to Poland, and farther north in Russia and Siberia, eastward to Persia, and southward to North and West Africa; *Zootoca* (8 sp.), has nearly the same range in Europe as the last genus, but has representatives in Madeira, South Africa, and Australia; *Tachydromus* (7 sp.) is widely scattered in Chinese Asia, Japan, Borneo, and West Africa; *Acanthodactylus* (10 sp.) is most abundant in North Africa, but has a species in South Africa, and two in Central India; *Eremias* (18 sp.) is found all over Africa, and also in the Crimea, Persia, Tartary and China; *Psammodromus* (2 sp.), is confined to Spain, France, and Italy; *Ophiops* (6 sp.), inhabits India, Persia, and Asia Minor to South Russia. Less strongly marked and perhaps less natural genera are the following:

*Thetia* (1 sp.), Algiers; *Teira* (1 sp.), Madeira; *Nucras* (4 sp.), Caucasus and South Africa; *Notopholis* (4 sp.), South Europe and South Africa; *Algira* (3 sp.), North and South Africa; *Scrapteira* (1 sp.), Nubia; *Aspidorhinus* (1 sp.), Caspian district; *Messalina* (4 sp.), North Africa, Persia, and North-west India; *Cabrita* (1 sp.), Central India; *Pachyrhynchus* (1 sp.), Benguela.

**Family 34.—**Zonuridæ. (15 Genera, 52 Species.)

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<th>Neotropical Sub-regions</th>
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The Zonuridæ, or Land Lizards, characterised by a longitudinal fold of skin on each side of the body, have a very remarkable

*Vol. II.*—26
distribution. Their head-quarters is the Ethiopian region, which contains more than half the known genera and species, most of which are found in South Africa and several in Madagasgar. Next to Africa the largest number of genera and species are found in Mexico and Central America, with a few in the Antilles, South America, and California, and even as far north as British Columbia. Three of the genera form a distinct sub-group—the Glass Snakes,—the four species composing it being located in North Africa, North America, South-eastern Europe, and the Khasya Hills.

The prominent fact in the distribution of this family is, that the mass of the genera and species form two groups, one in South Africa, the other in Mexico,—countries between which it would be difficult to imagine any means of communication. We have here, probably, an example of a once much more extensive group, widely distributed over the globe, and which has continued to maintain itself only in those districts especially adapted to its peculiar type of organization. This must undoubtedly have been the case with the genus Pseudopus, whose two species now inhabit South-eastern Europe and the Khasya Hills in Assam respectively.

The genera are,—Cordylus, Pseudocordylus, Platysaurus, Cordylosaurus, Pleurostrichus, and Saurophis, confined to South Africa; Zonurus, South and East Africa and Madagascar; Gerrhosaurus, ranges over the whole Ethiopian region; Cicigna is confined to Madagascar; Gerrhonotus (22 sp.), ranges from British Columbia, California, and Texas, to Cuba and South America, but is most abundant in Mexico and Central America; Abronia and Barissia, are two genera of doubtful distinctness, peculiar to Mexico; Ophisaurus (the Glass Snake) is found in the Southern United States as far as Virginia; the allied genus Hyalosaurus in North Africa; and Pseudopus, as above stated, in South-east Europe and the Khasya Hills.
Family 35.—Chalcidæ. (3 Genera, 8 Species.)

General Distribution.

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The Chalcidæ are a small group of Lizards characteristic of Tropical America, one species extending into the United States. The genera are Chalcis (6 sp.), ranging from Central America to Chili; two other species, which have been placed in distinct genera, inhabit North America and Peru.

Family 36.—Anadiadæ. (1 Genus, 1 Species.)

General Distribution.

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The single species of Anadia, constituting this family, inhabits Tropical America.

Family 37.—Chiocolidæ. (1 Genus, 2 Species.)

General Distribution.

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The genus Heterodactylus, which constitutes this family, inhabits Brazil.
**FAMILY 38.—IPHISADÆ.** (1 Genus, 1 Species.)

**General Distribution.**

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The single species of *Iphisa*, has been found only at Para in Equatorial America.

**FAMILY 39.—CERCOSAURIDÆ.** (1 Genus, 5 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The genus *Cercosaura*, is known only from Brazil and Ecuador.

**FAMILY 40.—CHAMÆSAURIDÆ.** (1 Genus, 1 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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This family, consisting of a single species of the genus *Chamaesaura*, is confined to South Africa.
CHAP. XIX.] REPTILES. 395

Family 41.—GYMNOPTHALMIDÆ. (3 Genera, 14 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The Gymnophthalmidæ, or Gape-eyed Scinks, so called from their rudimentary eyelids, form a small group, which is widely and somewhat erratically distributed, as will be seen by the following account of the distribution of the genera:

* Lerista* (1 sp.) and three other species for which Dr. Gray has established the genera—*Morethria* (1 sp.), and *Menetia* (2 sp.), are confined to Australia; *Cryptoblepharus* (4 sp.), is found in West Australia, Timor, New Guinea, the Fiji Islands, and Mauritius; *Ablepharus* (4 sp.), inhabits Eastern and South-eastern Europe, Persia, Siberia, West Africa, and the Bonin Islands; and *Gymnopthalmus* (3 sp.), is found in Brazil and the West Indies.

Family 42.—PYGOPODIDÆ. (2 Genera, 3 Species.)

**General Distribution.**

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This small family of two-legged Lizards, comprising the genera *Pygopus* and *Delma*, is found only in Australia proper and Tasmania.
### FAMILY 43.—APRASTIADÆ. (1 Genus, 2 Species.)

**General Distribution.**

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<th>Neotropical Sub-regions</th>
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The genus *Aprasia*, constituting this family, is found in West and South Australia.

### FAMILY 44.—LIALIDÆ. (1 Genus, 3 Species.)

**General Distribution.**

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This family is also confined to Australia, the single genus, *Lialis*, inhabiting the Western and Northern districts.

### FAMILY 45.—SCINCIDÆ. (60 Genera, 300 Species.)

**General Distribution.**

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The Scincidæ, or Scinks, are an extensive family of smooth-scaled lizards, frequenting dry and stony places, and almost universally distributed over the globe, being only absent from the cold northern and southern zones. The family itself is a very natural one, and it contains many natural genera; but a large number have been established which probably require careful revision. The following include the more important and the best established groups:
Scincus (2 sp.), North Africa and Arabia; Hinulia (20 sp.), most of the Australian and Oriental regions; Cyclodina (1 sp.), Hombronia (1 sp.), and Lygosomella (1 sp.), all from New Zealand; Keneuxia (1 sp.), Philippines, Moluccas, and Papuan Islands; Elania (1 sp.) New Guinea; Carlia (2 sp.), North Australia and New Guinea; Moeoa (16 sp.), Australia and New Zealand, with species in Borneo, West Africa, and Central America; Lipinia (3 sp.), Philippine Islands and New Guinea; Lygosoma (12 sp.), Australia, New Caledonia, Pelew and Philippine Islands; Tetradactylus (1 sp.), Hemierges (2 sp.), Chelomeles (2 sp.), Omolepida (1 sp.), Lissolepis (1 sp.), Siaphos (1 sp.), Rhodona (3 sp.) Anomalpus (1 sp.), Soridua (2 sp.), and Ophi- scincus (1 sp.) all confined to Australia; Cophoscincus (3 sp.), Philippine Islands, Celebes, and Queensland; Plestiodon (18 sp.), China and Japan, Africa, and America as far north as Pennsylvania and Nebraska; Eumeces (30 sp.), South Palaearctic, Oriental and Australian regions, to New Ireland and North Australia; Mabouya (20 sp.), Oriental region, Austro-Malaya, North Australia, the Neotropical region, and to Lat. 42° 30' in North America; Amphixestus (1 sp.), Borneo; Hagria (1 sp.), and Chiamela (1 sp.), India; Senira (1 sp.), Philippine Islands; Brachymeles (2 sp.). Philippine Islands and Australia; Ophiodes (1 sp.), Brazil; Anguis (3 sp.), West Palaearctic region and South Africa; Tribolontus (1 sp.), New Guinea; Tropido- phorus (2 sp.), Cochin-China and Philippine Islands; Norbea (2 sp.), Borneo and Australia; Trachydosaurus (1 sp.), Australia; Cyclodus (8 sp.), Australia, Aru Islands, and Ceram; Silubosaurus (2 sp.), Egerina (2 sp.), and Tropidolepisma (6 sp.), all peculiar to Australia; Heteropus (7 sp.), Australia, Austro-Malaya, and Bourbon; Pygomeles (1 sp.), Madagascar; Dasia (1 sp.), Malay; Euprepes (70 sp.), Ethiopian and Oriental regions, Austro-Malaya, South America (?); Celestus (9 sp.), peculiar to the Antilles, except a species in Costa Rica; Diploglossus (7 sp.), the Neotropical region;—with a number of other genera founded on single species from various parts of the world.
Family 46.—OPHIOMORIDÆ. (2 Genera, 2 Species.)

**General Distribution.**

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The snake-like Lizard constituting the genus *Ophiomorus*, is found in Southern Russia, Greece, and Algeria; while *Zygnopsis* having four weak limbs, has been recently discovered by Mr. Blanford in South Persia. The family is therefore confined to our Mediterranean sub-region.

Family 47.—SEPIDÆ. (7 Genera, 22 species.)

**General Distribution.**

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The Sepiæ, or Sand-Lizards, are a very natural group, almost confined to the Ethiopian region, but extending into the desert country on the borders of the Oriental region, and into the south of the Palæarctic region as far as Palestine, Madeira, Spain, Italy, and even the South of France. The genera are:—

*Seps* (10 sp.), South Europe, Madeira, Teneriffe, Palestine, North Africa, South Africa and Madagascar; *Sphenops* (2 sp.), North Africa, Syria, West Africa; *Scelotes* (3 sp.), Angola to South Africa, Madagascar; *Thyrus* (1 sp.), Bourbon and Mauritius; *Amphiglossus* (1 sp.), Madagascar; *Sphenocephalus* (1 sp.), Afghanistan; and *Sepsina* (4 sp.), South-west Africa.
FAMILY 48.—ACONTIADÆ. (3 Genera, 7 Species.)

This small family of snake-like Lizards has a very curious distribution, being found in South and West Africa, Madagascar, Ceylon, and Ternate in the Moluccas. *Acontias* (4 sp.), is found in the four first-named localities; *Nessia* (2 sp.), is confined to Ceylon; *Typhloscincus* (1 sp.), to Ternate.

FAMILY 49.—GECKOTIDÆ. (50 Genera, 200 Species.)

The Geckoes, or Wall-Lizards, form an extensive family, of almost universal distribution in the warmer parts of the globe; and they must have some exceptional means of dispersal, since they are found in many of the most remote islands of the great oceans,—as the Galapagos, the Sandwich Islands, Tahiti, New Zealand, the Loo-Choo and the Seychelle Islands, the Nicobar Islands, Mauritius, Ascension, Madeira, and many others. The following are the larger and more important genera:—

*Oëdura* (3 sp.), Australia; *Diplodactylus* (8 sp.), Australia, South Africa, and California; *Phylodactylus* (8 sp.), widely scattered in Tropical America, California, Madagascar, and Queensland; *Hemidactylus* (40 sp.), all tropical and warm countries; *Peropus* (12 sp.), the Oriental region, Papuan Islands, Mauritius, and Brazil; *Pentadactylus* (7 sp.), Oriental region and Australia; *Gecko* (12 sp.), Oriental region to New Guinea and
North Australia; Gehyra (5 sp.), Australia, New Guinea and Fiji Islands; Tarentola (7 sp.), North Africa, North America, Madeira, Borneo, South Africa; Phelsuma (6 sp.), Madagascar, Bourbon, and Andaman Islands; Pachydactylus (5 sp.), South and West Africa, and Ascension Island; Spherodactylus (5 sp.), the Neotropical region; Naultinus, (6 sp.), New Zealand; Goniodactylus (5 sp.), Australia, Timor, South America and Algiers; Heteronota (4 sp.), Australia, Fiji Islands, New Guinea and Borneo; Cubina (4 sp.), the Neotropical region; Gymnodactylus (16 sp.), all warm countries except Australia; Phyllurus (3 sp.), Australia; Stenodactylus (4 sp.), North and West Africa, and Rio Grande in North America.

The remaining genera mostly consist of single species, and are pretty equally distributed over the various parts of the world indicated in the preceding list. Madagascar, the Seychelle Islands, Chili, the Sandwich Islands, South Africa, Tahiti, the Philippine Islands, New Caledonia, and Australia—all have peculiar genera, while two new ones have recently been described from Persia.

**Family 50.—Iguanidae.** (56 Genera, 236 Species.)

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The extensive family of the Iguanas is highly characteristic of the Neotropical region, in every part of which the species abound, even as far as nearly 50° South Latitude in Patagonia. They also extend northwards into the warmer parts of the Nearctic region, as far as California, British Columbia, and Kansas on the west, and to 43° North Latitude in the Eastern States. A distinct genus occurs in the Fiji Islands, and one has been described as from Australia, and another from Madagascar, but there is some doubt about these. The most extensive genera are:

_Anolis_ (84 sp.), found in most parts of Tropical America and
north to California; *Tropidolepis* (15 sp.), which has nearly the same range; *Leiocephalus* (14 sp.), Antilles, Guayaquil, and Galapagos Islands; *Leiolamrus* (14 sp.), Peru to Patagonia; *Sceloporus* (9 sp.), from Brazil to California and British Columbia, and on the east to Florida; *Proctotretus* (6 sp.), Chili and Patagonia; *Phrynosoma* (8 sp.), New Mexico, California, Oregon and British Columbia, Arkansas and Florida; *Iguana* (5 sp.), Antilles and South America; *Cyclura* (4 sp.), Antilles, Honduras, and Mexico.

Among the host of smaller genera may be noted:—

*Brachylophus*, found in the Fiji Islands; *Trachycephalus* and *Oreocephalus*, peculiar to the Galapagos; *Oreodeira*, said to be from Australia; *Diplolamrus* and *Phymaturus*, found only in Chili and Patagonia; and *Callisaurus, Uta, Euphryne, Uma, and Holbrookia*, from New Mexico and California. All the other genera are from various parts of Tropical America.

**Family 51.—AGAMIDÆ.** (42 Genera, 156 Species.)

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The extensive family Agamidæ—the Eastern representative of the Iguanas—is highly characteristic of the Oriental region, which possesses about half the known genera and species. Of the remainder, the greater part inhabit the Australian region; others range over the deserts of Central and Western Asia and Northern Africa, as far as Greece and South Russia. One genus extends through Africa to the Cape of Good Hope, and there are three peculiar genera in Madagascar, but the family is very poorly represented in the Ethiopian region. Many of these creatures are adorned with beautifully varied and vivid colours, and the little “dragons” or flying-lizards are among the most interesting forms in the entire order. The larger genera are distributed as follows:—
Draco (18 sp.), the Oriental region, excluding Ceylon; Otocryptis (4 sp.), Ceylon, North India, Malaya; Ceratophora (3 sp.), Ceylon; Gonyocephalus (8 sp.), Papuan Islands, Java, Borneo, Pelew Islands; Dilophyris (7 sp.), Indo-Malaya and Siam; Japalura (6 sp.), Himalayas, Borneo, Formosa, and Loo Choo Islands; Sitana (2 sp.), Central and South India and Ceylon; Bronchocela (3 sp.), Indo-Malaya, Cambodja, and Celebes; Calotes (12 sp.), Continental India to China, Philippine Islands; Oriocalotes (2 sp.), Himalayas; Acanthosaura (5 sp.), Malacca and Siam; Tiaris (3 sp.), Andaman Islands, Borneo, Philippine and Papuan Islands; Physignathus (3 sp.), Cochin-China and Australia; Uromastix (5 sp.), South Russia, North Africa, Central India; Stellio (5 sp.), Caucasus and Greece to Arabia, High Himalayas and Central India; Trapelus (5 sp.), Tartary, Egypt, and Afghanistan; Phrynocephalus (10 sp.), Tartary and Mongolia, Persia and Afghanistan; Lophura (2 sp.), Amboyna and Pelew Islands; Grammatophorus (14 sp.), Australia and Tasmania; Agama (14 sp.), North Africa to the Punjaub, South Africa. The remaining genera each consist of a single species. Eight are peculiar to Australia, one to the Fiji Islands, one to the Aru Islands, three to Ceylon, five to other parts of the Oriental region, one to Persia, and one to South Russia.

Family 52.—CHAMAÉLEONIDÆ. (1 Genus, 30 Species.)

General Distribution.

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The Chamaeleons are an almost exclusively Ethiopian group, only one species, the common Chamaeleon, inhabiting North Africa and Western Asia as far as Central India and Ceylon. They abound all over Africa, and peculiar species are found in Madagascar and Bourbon, as well as in the Island of Fernando Po.
General Remarks on the Distribution of the Lacertilia.

The distribution of the Lacertilia is, in many particulars, strikingly opposed to that of the Ophidia. The Oriental, instead of being the richest is one of the poorest regions, both in the number of families and in the number of peculiar genera it contains; while in both these respects the Neotropical is by far the richest. The distribution of the families is as follows:—

The Nearctic region has 7 families, none of which are peculiar to it; but it has 3 peculiar genera—Chirotes, Ophisaurus, and Phrynosoma.

The Palaearctic region has 12 families, with two (Ophiomorphae and Trogonophidae, each consisting of a single species) peculiar; while it has 6 peculiar or very characteristic genera, Trogonophis in North Africa, Psammodromus in South Europe, Hyalosaurus in North Africa, Scincus in North Africa and Arabia, Ophiomorus in East Europe and North Africa, and Phrynocephalus in Siberia, Tartary, and Afghanistan. We have here a striking amount of diversity between the Nearctic and Palaearctic regions with hardly a single point of resemblance.

The Ethiopian region has 13 families, only one of which (the Chamæsauridae, consisting of a single species) is altogether peculiar; but it possesses 21 peculiar or characteristic genera, 9 belonging to the Zonuridae, 2 to the Sepidae, 7 to the Geckotidae, and 3 to the Agamidae.

The Oriental region has only 8 families, none of which are peculiar; but there are 28 peculiar genera, 6 belonging to the Scincidae, 1 to the Acontiidae, 5 to the Geckotidae, and 16 to the Agamidae. Many lizards being sand and desert-haunters, it is not surprising that a number of forms are common to the borderlands of the Oriental and Ethiopian regions; yet the Sepidae, so abundant in all Africa, do not range to the peninsula of India; and the equally Ethiopian Zonuridae have only one Oriental species, found, not in the peninsula but in the Khasya Hills. The Acontiidae alone offer some analogy to the distribution of the Lemurs, being found in Africa, Madagascar, Ceylon, and the Moluccas.

The Australian region has 11 families, 3 of which are pecu-
liar; and it has about 40 peculiar genera in ten families, about half of these genera belonging to the Scincidæ. Only 3 families of almost universal distribution are common to the Australian and Neotropical regions, with one species of the American Iguanidæ in the Fiji Islands, so that, as far as this order is concerned, these two regions have little resemblance.

The Neotropical region has 15 families, 6 of which are peculiar to it, and it possesses more than 50 peculiar genera. These are distributed among 12 families, but more than half belong to the Iguanidæ, and half the remainder to the Teidæ,—the two families especially characteristic of the Neotropical region. All the Ne-arctic families which are not of almost universal distribution are peculiarly Neotropical, showing that the Lacertilia of the former region have probably been derived almost exclusively from the latter.

On the whole the distribution of the Lacertilia shows a remarkable amount of specialization in each of the great tropical regions, whence we may infer that Southern Asia, Tropical Africa, Australia, and South America, each obtained their original stock of this order at very remote periods, and that there has since been little intercommunication between them. The peculiar affinities indicated by such cases as the Lepidosternidæ, found only in the tropics of Africa and South America, and Tachydromus in Eastern Asia and West Africa, may be the results either of once widely distributed families surviving only in isolated localities where the conditions are favourable,—or of some partial and temporary geographical connection, allowing of a limited degree of intermixture of faunas. The former appears to be the more probable and generally efficient cause, but the latter may have operated in exceptional cases.

Fossil Lacertilia.

These date back to the Triassic period, and they are found in most succeeding formations, but it is not till the Tertiary period that forms allied to existing genera occur. These are at present too rare and too ill-defined to throw much light on the geographical distribution of the order.
Order III.—**RHYNCOCEPHALINA**.

**Family 53.—RHYNCOCEPHALIDÆ.** (1 Genus, 1 Species.)

**General Distribution.**

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The singular and isolated genus *Hatteria*—the "Tuatara," or fringed lizard—which alone constitutes this family, has peculiarities of structure which separate it from both lizards and crocodiles, and mark it out as an ancestral type, as distinct from other living reptiles as the Marsupials are from other Mammalia. It is confined to New Zealand, and is chiefly found on small islands near the north-east coast, being very rare, if not extinct, on the mainland. A fossil reptile named *Hyperodapedon*, of Triassic age, has been found in Scotland and India, and is supposed by Professor Huxley to be more nearly allied to *Hatteria* than to any other living animal.

Order IV.—**CROCODILIA**.

**Family 54.—GAVIALIDÆ.** (2 Genera, 3 Species.)

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The Gavials are long-snouted Crocodiles with large front teeth, and canines fitting in notches of the upper jaw. They consist of two genera, *Gavialis* (1 sp.), inhabiting the Ganges; *Tomistoma* (2 sp.), found in the rivers of Borneo and North Australia.
FAMILY 55.—CROCODILIDÆ. (1 Genus, 12 Species.)

The true Crocodiles, which have the canines in notches, and the large front teeth in pits in the upper jaw, are widely distributed over the tropical regions of the globe, inhabiting all the rivers of Africa, the shores and estuaries of India, Siam, and eastward to North Australia. Other forms inhabit Cuba, Yucatan, and Guatemala, to Ecuador and the Orinooko. Four species are Asiatic, one exclusively Australian, three African, and four American. These have been placed in distinct groups, but Dr. Günther considers them all to form one genus, *Crocodilus*.

FAMILY 56.—ALLIGATORIDÆ. (1 Genus, 10 Species.)

The Alligators, which are distinguished by having both the large front teeth in pits of the upper jaw, are confined to the Neotropical, and the southern part of the Nearctic regions, from the lower Mississippi and Texas through all Tropical America, but they appear to be absent from the Antilles. They are all placed by Dr. Günther in the single genus, *Alligator*.

*General Remarks on the Distribution of Crocodilia.*

These animals, being few in number and wholly confined to the tropical and sub-tropical regions, are of comparatively
little interest as regards geographical distribution. America possesses both Crocodiles and Alligators; India, Crocodiles and Gavials; while Africa has Crocodiles only. Both Crocodiles and Gavials are found in the northern part of the Australian region, so that neither of the three families are restricted to a single region.

_Fossil Crocodilia._

The existing families of the order date back to the Eocene period in Europe, and the Cretaceous in North America. In the south of England, Alligators, Gavials and Crocodiles, all occur in Eocene beds, indicating that the present distribution of these families is the result of partial extinction, and a gradual restriction of their range—a most instructive fact, suggesting the true explanation of a large number of cases of discontinuous distribution which are sometimes held to prove the former union of lands now divided by the deepest oceans. In more ancient formations, a number of Crocodilian remains have been discovered which cannot be classed in any existing families, and which, therefore, throw no light on the existing distribution of the group.

_Order V._—CHELONIA.

**Family 57.—**TESTUDINIDÆ. (14 Genera, 126 Species.)

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The Testudinidæ, including the land and many fresh-water tortoises, are very widely distributed over the Old and New worlds, but are entirely absent from Australia. They are especially abundant in the Nearctic region, as far north as Canada and British Columbia, and almost equally so in the...
Neotropical and Oriental regions; in the Ethiopian there is a considerable diminution in the number of species, and in the Palaearctic they are still less numerous, being confined to the warmer parts of it, except one species which extends as far north as Hungary and Prussia. The genera are:

Testudo (25 sp.), most abundant in the Ethiopian region, but also extending over the Oriental region, into South Europe, and the Eastern States of North America; Emys (64 sp.), abundant in North America and over the whole Oriental region, less so in the Neotropical and the Palaearctic regions; Cinosternon (13 sp.), United States and California, and Tropical America; Aromochelys (4 sp.), confined to the Eastern States of North America; Staurotypus (2 sp.), Guatemala and Mexico; Chelydra (1 sp.), Canada to Louisiana; Claudius (1 sp.), Mexico; Dermatemys (3 sp.), South America, Guatemala, and Yucatan; Terrapene (4 sp.), Maine to Mexico, Sumatra to New Guinea, Shanghai and Formosa—a doubtfully natural group; Cinyx (3 sp.), Pyxis (1 sp.), Chersina (4 sp.), are all Ethiopian; Dumerilia (1 sp.), is from Madagascar only.

**Family 58.—CHELYDIDÆ. (10 Genera, 44 Species.)**

The Chelydidae, or fresh-water tortoises with imperfectly retractile heads, have a remarkable distribution in the three great southern continents of Africa, Australia, and South America; the largest number of species being found in the latter country. The genera are:

*Peltocephaulus* (1 sp.), *Podocnemis* (6 sp.), *Hydromedusa* (4 sp.), *Chelys* (1 sp.), and *Platemys* (16 sp.), inhabiting South America from the Orinooko to the La Plata, the latter genus occurring also in Australia and New Guinea; *Chelodina* (5 sp.), *Chelemys* (1 sp.), and *Elseya* (2 sp.) from Australia; while *Sternotheces*
(6 sp.), and *Pelomedusa* (3 sp.), inhabit Tropical and South Africa and Madagascar.

**Family 59.—TRIONYCHIDÆ.** (3 Genera, 25 Species.)

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The distribution of the Trionychidæ, or Soft Tortoises, is very different from that of the Chelydide, yet is equally interesting. They abound most in the Oriental region, extending beyond it to Northern China and Japan. In the Nearctic region they are only found in the Eastern States, corresponding curiously to the distribution of plants, in which the affinity of Japan to the Eastern States is greater than to California. The Trionychidæ are also found over the Ethiopian region, but not in Madagascar.

The genera are,—*Trionyx* (17 sp.), which extends over the whole area of the family as above indicated; *Cycloderma* (5 sp.), peculiar to Africa; *Emyda* (3 sp.), the peninsula of India, Ceylon, and Africa.

**Family 60.—CHELONIIDÆ.** (2 Genera, 5 Species.)

General Distribution.—All the warm and tropical Seas.

The Marine Turtles are almost universally distributed. *Dermatochelys* (1 sp.), is found in the temperate seas of both the Northern and Southern Hemispheres; *Chelone* (4 sp.), ranges over all the tropical seas—*C. viridis*, the epicureans' species, inhabiting the Atlantic, while *C. imbricata* which produces the "tortoiseshell" of commerce is found in the Indian and Pacific oceans.
Remarks on the Distribution of the Chelonia.

The four families into which the Chelonia are classed have all of them a wide distribution, though none are universal. The Ethiopian region seems to be the richest, as it possesses 3 of the four families, while no other region has more than 2; and it also possesses 7 peculiar genera. Next comes the Neotropical region with 2 families and 6 peculiar genera; the Australian with 3, and the Nearctic with 2 peculiar genera; while the Oriental and Palaearctic regions possess none that are peculiar. There are about 30 genera and 200 species in the whole order.

Fossil Chelonia.—The earliest undoubted remains of this order occur in the Upper Oolite. These belong to the Cheloniidae and Emydidae, which are also found in the Chalk. In the Tertiary beds Chelonia are more abundant, and the Trionychidae now appear. The Testudinidae are first met with in the Miocene formation of Europe and the Eocene of North America, the most remarkable being the gigantic Colossochelys Atlas of the Siwalik Hills. It appears, therefore, that the families of the order Chelonia were already specialised in the Secondary period, a fact which, together with their more or less aquatic habits, sufficiently accounts for their generally wide distribution. Species of Testudo, Emys, and Trionyx, are found in the Upper Miocene of the south of France.
AMPHIBIA.

Order I.—PSEUDOPHIDIA.

Family 1.—CÆCILIADÆ. (4 Genera, 10 Species.)

The Cæciliadæ are a curious group of worm-like Amphibia sparingly scattered over the three great tropical regions. The genera are,—Cæcilia, which inhabits West Africa, Malabar and South America; Siphonopsis, peculiar to Brazil and Mexico; Ichthyopsis, from Ceylon and the Khasya Mountains; and Rhinatrema from Cayenne.

Order II.—URODELA.

Family 2.—SIRENIDÆ. (1 Genus, 3 Species.)

The genus Siren, consisting of eel-like Batrachians with two anterior feet and permanent branchiæ, inhabits the South-Eastern States of North America from Texas to Carolina.
FAMILY 3.—PROTEIDÆ. (2 Genera, 4 Species.)

The Proteidæ have four feet and persistent external branchiae. The two genera are,—Proteus (1 sp.), found only in caverns of Central Europe; and Menobranchus, which are like newts in form, and inhabit the Eastern States of North America.

FAMILY 4.—AMPHIUMIDÆ. (1 Genus, 2 Species.)

The genus Amphiuma, or Muranopsis, consists of slender eel-like creatures with four rudimentary feet, and no external branchiae. The species inhabit the Southern United States from New Orleans to Carolina.

FAMILY 5.—MENOPOMIDÆ. (2 Genera, 4 Species.)

There are large Salamanders of repulsive appearance, found only in Eastern Asia and the Eastern United States. The genera are,—Sięboldia (2 sp.), Japan and north-west China; Menopoma = Protonopsis (2 sp.), Ohio and Alleghany rivers.
Family 6.—SALAMANDRIDÆ. (20 Genera, 85 Species.)

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The Salamandridæ, of which our common Newts are characteristic examples, form an extensive family highly characteristic of the North Temperate regions, a few species only extending into the Neotropical region along the Andes to near Bogota, and one into the Oriental region in Western China. The genera, as arranged by Dr. Strauch, are as follows:

*Salamandra* (2 sp.), Central and South Europe and North Africa; *Pleurodeles* (1 sp.), Spain, Portugal, and Morocco; *Bradybates* (1 sp.), Spain; *Triton* (16 sp.), all Europe except the extreme north, Algeria, North China and Japan, Eastern States of North America, California and Oregon; *Chioglossa* (2 sp.), Portugal and South Europe; *Salamandrina* (1 sp.), Italy to Dalmatia; *Ellipsoglossa* (2 sp.), Japan; *Isodactylus* (2 sp.), East Siberia; *Onychocephalus* (1 sp.), Japan; *Amblystoma* (21 sp.), Nearctic region from Canada and Oregon to Mexico, most abundant in Eastern States; *Ranodon* (1 sp.), Tartary and North-east China; *Dicamptodon* (1 sp.), California; *Plethodon* (5 sp.), Massachusetts to Louisiana, and Vancouver's Island to California; *Desmognathus* (4 sp.), Eastern United States south of latitude 43°; * Anaides* (1 sp.), Oregon and Northern California; *Hemidactylus* (2 sp.), South-eastern United States and Southern California; *Heredia* (1 sp.), Oregon and California; *Spelerpes* (18 sp.), Eastern United States from Massachusetts to Mexico, Guatemala, Costa Rica and Andes of Bogota, with a species in South Europe; *Batrachoscopus* (2 sp.), South-eastern United States and California; *Tylotriton* (1 sp.), Yunan in West China.
Order III.—Anura.

Family 7.—Rhinophrynidae. (1 Genus, 1 Species.)

General Distribution.

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The Rhinophrynidae are Toads with imperfect ears and a tongue which is free in front. The single species of *Rhinophrynus*, is a native of Mexico.

Family 8.—Phryniscidae. (5 Genera, 13 Species.)

General Distribution.

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The Phryniscidae, or Toads with imperfect ears and tongue fixed in front, are widely distributed over the warmer regions of the earth, but are most abundant in the Neotropical region and Australia, while only single species occur in the Old World. The genera are:

*Phryniscus* (7 sp.), from Costa Rica to Chili and Monte Video; *Brachycephalus* (1 sp.), Brazil; *Pseudophryne* (3 sp.), Australia and Tasmania; *Hemisus* (1 sp.), Tropical Africa; *Micryla* (1 sp.), Java.

Family 9.—Hylaplesidæ. (1 Genus, 5 Species.)

General Distribution.

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The Hylaplesidæ are Toads with perfect ears, and they seem to be confined to the Neotropical region. The only genus, *Hylaplesia* (5 sp.), inhabits Brazil, Chili, and the Island of Hayti.

**Family 10.—**BUFONIDÆ. (6 Genera, 64 Species.)

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The rather extensive family of the Bufonidæ, which includes our common Toad, and is characterised by prominent neck glands and tongue fixed in front, is almost universally distributed, but is very rare in the Australian region; one species being found in Celebes and one in Australia. The genera are:—

*Kalophrynus* (2 sp.), Borneo; *Bufo* (58 sp.), has the range of the entire family, except Australia; *Otilophus* (1 sp.), South America; *Peltophryne* (1 sp.), Porto Rico; *Pseudobufo* (1 sp.), Malay Peninsula; *Schismaderma* (1 sp.), Natal; *Notaden* (1 sp.), East Central Australia.

**Family 11.—**XENORHINIDÆ. (1 Genus, 1 Species.)

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The Xenorhinidæ may be characterised as Toads with perfect ears and tongue free in front. The only species of *Xenorhina* is a native of New Guinea.
Family 12.—Engystomidae. (15 Genera, 31 Species.)

General Distribution.

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The Engystomidae are Toads without neck-glands and with the tongue tied in front. They are most abundant in the Oriental and Neotropical regions, especially in the latter, which contains about half the known species, with isolated species in Australia, Africa, and the Southern States of North America. They appear to be the remnant of a once extensive and universally distributed group, which has maintained itself in two remote regions, but is dying out everywhere else. The genera are:

*Engystoma* (9 sp.), Carolina to La Plata, with one species in South China; *Diplohelma* (3 sp.), South India to China and Java; *Cacopus* (2 sp.), Central India; *Glyphoglossus* (1 sp.), Pegu; *Callula* (4 sp.), Sikhim, Ceylon, China, and Borneo; *Brachymerus* (1 sp.), South Africa; *Adenomera* (1 sp.), Brazil; *Pachybatrachus* (1 sp.), Australia; *Brevicps* (2 sp.), South and West Africa; *Chelydribatrachus* (1 sp.), West Australia; *Hypopachus* (1 sp.), Costa Rica; *Rhinoderma* (1 sp.), Chili; *Atelopus* (1 sp.), Cayenne and Peru; *Copea* (1 sp.), South America; *Paludicola* (1 sp.), New Granada.

Family 13.—Bombinatoridae. (8 Genera, 9 Species.)

General Distribution.

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The Bombinatoridae are a family of Frogs which have imperfect ears and no neck-glands, and they have a very peculiar and
interesting distribution, being confined to Central and South Europe, the southern part of South America, and New Zealand. They consist of many isolated groups forming five separate sub-families. The genera are:

*Boninotor*, Central Europe and Italy; *Pelobates* and *Didocus*, Central Europe and Spain; *Telmatobius* (2 sp.), Peru and Brazil; *Alsodes*, Chonos Archipelago; *Cacotus*, Chili; *Liopelma*, New Zealand; *Nannophryne*, Straits of Magellan.

**Family 14.—PLECTROMANTIDÆ.** (1 Genus, 1 Species.)

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The Plectromantidæ, which are Frogs with neck-glands, and the toes but not the fingers dilated, consists of a single species of the genus *Plectromantis*. It inhabits the region west of the Andes, and south of the Equator.

**Family 15.—ALYTIDÆ.** (5 Genera, 37 Species.)

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The Alytidae are Frogs with neck-glands and undilated toes. They are most abundant in the Ethiopian region, with a few species in the Nearctic and Australian regions, and one in Europe and Brazil respectively. The genera are:

*Allytes* (1 sp.), Central Europe; *Scaphiopus* (5 sp.), California to Mexico and the Eastern States; *Hyperolius* (29 sp.), all Africa, and two in New Guinea and North Australia; *Helioporus* (1 sp.), in Australia; *Nattereria* (1 sp.), Brazil.
FAMILY 16.—PELODRIYADÆ. (3 Genera, 7 Species.)

General Distribution.

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The Pelodryadæ are Tree Frogs with neck-glands, and are confined to the Australian and Neotropical regions. The genera are:

Phylloodusa (3 sp.), South America to Paraguay; Chirodryas, Australia; and Pelodryas (3 sp.), Moluccas, New Guinea and Australia.

FAMILY 17.—HYLIDÆ. (11 Genera, 94 Species.)

General Distribution.

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The Hylidæ are glandless Tree Frogs with a broadened sacrum. They are most abundant in the Neotropical region, which contains more than two-thirds of the species; about twenty species are Australian; six or seven are Nearctic, reaching northward to Great Bear Lake; while one only is European, and one Oriental. The genera are:

Hyla (62 sp.), having the range of the whole family; Hylella (1 sp.), Olohygon (1 sp.), Pohlia (2 sp.), Triprion (1 sp.), Opisthodelphys (1 sp.), and Nototrema (4 sp.), are South American; while Trachycephalus (8 sp.), is peculiar to the Antilles, except one South American species; Pseudacris (1 sp.), ranges from Georgia, United States, to Great Bear Lake; Litoria (7 sp.), is Australian and Papuan, except one species in Paraguay; Ceratohyla (4 sp.), is only known from Ecuador.
**FAMILY 18.—POLYPEDATIDÆ.** (24 Genera, 124 Species.)

**General Distribution.**

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The Polypedatidæ, or glandless Tree Frogs with narrowed sacrum, are almost equally numerous in the Oriental and Neotropical regions, more than forty species inhabiting each, while in the Ethiopian there are about half this number, and the remainder are scattered over the other three regions, as shown in the enumeration of the genera:—

*Ixalus* (16 sp.), Oriental, except one in Japan, and one in Western Polynesia; *Rhadophorus* (7 sp.), and *Theloderma* (1 sp.), are Oriental; *Hylarana* (10 sp.), Oriental, to the Solomon Islands and Tartary, Nicobar Islands, West Africa, and Madagascar; *Megalixalus* (1 sp.), Seychelle Islands; *Leptomantis* (1 sp.), Philippines; *Platymantis* (5 sp.), New Guinea, Philippines, and Fiji Islands; *Cornufer* (2 sp.), Java and New Guinea; *Polypedates* (19 sp.), mostly Oriental, but two species in West Africa, one Madagascar, two Japan, one Loo-Choo Islands, and one Hong Kong; *Hylambates* (3 sp.), *Hemimantis* (1 sp.), and *Chiromantis* (1 sp.), are Ethiopian; *Rappia* (13 sp.), is Ethiopian, and extends to Madagascar and the Seychelle Islands; *Acris* (2 sp.), is North American; *Elosia* (1 sp.), *Epirhixis* (1 sp.), *Phyllobates* (9 sp.), *Hylodes* (26 sp.), *Hyloclalus* (1 sp.), *Pristimantis* (1 sp.), *Crosso-daectylus* (1 sp.), *Calostethus* (1 sp.), *Strabomantis* (1 sp.), and *Leiyla* (1 sp.), are Neotropical, the last two being Central American, while species of *Hylodes* and *Phyllobates* are found in the West Indian Islands.
Family 19.—Ranidæ. (26 Genera, 150 Species.)

General Distribution.

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The Ranidæ, or true Frogs, are characterised by having simple undilated toes, but neither neck-glands nor dilated sacrum. They are almost cosmopolitan, extending to the extreme north and south from the North Cape to Patagonia, and they are equally at home in the tropics. They are perhaps most abundant in South America, where a large number of the genera and species are found; the Ethiopian region comes next, while they are rather less abundant in the Oriental and Australian regions; the Nearctic region has much less (about 12 species), while the Palæarctic has only five, and these two northern regions only possess the single genus Rana. The genera are distributed as follows:—

Rana (60 sp.), ranges all over the world, except Australia and South America, although it extends into New Guinea and into Mexico and Central America; it is most abundant in Africa. Pseudechus (7 sp.), extends over the whole Ethiopian region, Hindostan, the Himalayas, and Japan; Cystignathus (22 sp.), is mainly Neotropical, but has three species Ethiopian. All the other genera are confined to single regions. The Neotropical genera are:—Odontophrynus (1 sp.), Pseudis (1 sp.), Pithocopsis (1 sp.), Ensophleus (1 sp.), Limnocharis (1 sp.), Hemiphractus (1 sp.), all Tropical South American east of Andes; Ceratophrys (5 sp.), Panama to La Plata; Cycloramus (1 sp.), West Ecuador and Chili; Pleurodema (6 sp.), Venezuela to Patagonia; Leiuperus (12 sp.), Mexico and St. Domingo to Patagonia; Hylorhina (1 sp.), Chiloe. The Australian genera are:—Myxophyse (1 sp.), Queensland; Platyplectrum (2 sp.), Queensland and West Australia; Neobatrachus (1 sp.), South Australia; Limnodynastes 7 sp.), and Crinia (11 sp.), Australia and Tasmanian. The
Oriental genera are:—*Dicroglossus* (1 sp.), Western Himalayas; *Oxyglossus* (2 sp.), Siam to Java, Philippines and China; *Hoplobatrachus* (1 sp.), Ceylon; *Phrynoglossus* (1 sp.), Siam. The Ethiopian genera are:—*Phrynobatrachus* (1 sp.), *Stenorhynchos* (1 sp.), both from Natal.

**Family 20.—Discoglossidae.** (14 Genera, 18 Species.)

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The Discoglossidae, or Frogs with a dilated sacrum, are remarkable for the number of generic forms scattered over a large part of the globe, being only absent from the Nearctic and the northern half of the Neotropical regions, and also from Hindostan and East Africa. The genera are:—

*Chiroleptes* (4 sp.), Australia; *Calyplocephalus* (1 sp.), allied to the preceding, from Chili; *Cryptotis* (1 sp.), Australia; *Asterophys* (2 sp.), New Guinea and Aru Islands; *Xenophrys* (1 sp.), Eastern Himalayas; *Megalophrys* (2 sp.), Ceylon and the Malay Islands; *Nannophrys* (1 sp.), Ceylon; *Pelodytes* (1 sp.), France only; *Leptobrachium* (1 sp.), Java; *Discoglossus* (1 sp.), Vienna to Algiers; *Laprisa* (1 sp.), *Latonia* (1 sp.), Palaearctic region; *Arthroleptis* (2 sp.), West Africa and the Cape; *Grypisca* (1 sp.), South Brazil.

**Family 21.—Pipidae.** (1 Genus, 1 Species.)

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The Pipidae are toads without a tongue or maxillary teeth, and with enormously dilated sacrum. The only species of *Pipa* is a native of Guiana.

**Family 22.—Dactylethridæ.** (1 Genus, 2 Species.)

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The Dactylethridae are Toads with maxillary teeth but no tongue, and with enormously dilated sacrum. The species of *Dactylethra* are natives of West, East, and South Africa.

*General Remarks on the Distribution of the Amphibia.*

The Amphibia, as here enumerated, consist of 22 families, 152 genera, and nearly 700 species. Many of the families have a very limited range, only two (Ranidae and Polypedatidae) being nearly universal; five more extend each into five regions, while no less than thirteen of the families are confined to one, two, or three regions each. By far the richest region is the Neotropical, possessing 16 families (four of them peculiar) and about 50 peculiar or very characteristic genera. Next comes the Australian, with 11 families (one of which is peculiar) and 16 peculiar genera. The Nearctic region has no less than 9 of the families (two of them peculiar to it) and 15 peculiar genera, 13 of which are tailed Batrachians which have here their metropolis. The other three regions have 9 families each; the Palaearctic has no peculiar family but no less than 15 peculiar genera; the Ethiopian 1 family and 12 genera peculiar to it; and the Oriental, 19 genera but no family confined to it.

It is evident, therefore, that each of the regions is well characterised by its peculiar forms of Amphibia, there being only a few genera, such as *Hyla, Rana,* and *Bufo* which have a wide range. The connection of the Australian and Neotropical
regions is well shown in this group, by the Phryniscidae, Hylidae, and Discoglossidae, which present allied forms in both; as well as by the genus Liopelma of New Zealand, allied to the Bombinatoridae of South America, and the absence of the otherwise cosmopolitan genus Rana from both continents. The affinity of the Nearctic and Palearctic regions is shown by the Proteidae, which are confined to them, as well as by the genus Triton and almost the whole of the extensive family of the Salamandridae. The other regions are also well differentiated, and there is no sign of a special Ethiopian Amphibian fauna extending over the peninsula of India, or of the Oriental and Palearctic regions merging into each other, except by means of genera of universal distribution.

Fossil Amphibia.—The extinct Labyrinthodontia form a separate order, which existed from the Carboniferous to the Triassic period. No other remains of this class are found till we reach the Tertiary formation, when Newts and Salamanders as well as Frogs and Toads occur, most frequently in the Miocene deposits. The most remarkable is the Andrias scheuchzeri from the Miocene of Oeningen, which is allied to Sieboldia maxima the great salamander of Japan.

Vol. II.—28
CHAPTER XX.

THE DISTRIBUTION OF THE FAMILIES OF FISHES, WITH THE RANGE OF SUCH GENERA AS INHABIT FRESH WATER.

Sub-class I.—Teleostei.

Order I.—ACANTHOPTERYGI.

Family 1.—GASTEROSTEIDÆ. (1 Genus, 11 Species.)

"Fresh-water or marine scaleless fishes, with elongate compressed bodies and with isolated spines before the dorsal fin."

Distribution.—Palaearctic and Nearctic regions.

The species of Gasterosteus, commonly called Sticklebacks, are found in rivers, lakes, estuaries, and seas, as far south as Italy and Ohio. Four species occur in Britain.

Family 2.—BERYCIDÆ. (10 Genera, 55 Species.)

"Marine fishes, with elevated compressed bodies covered with toothed scales, and large eyes."

Distribution.—Tropical and temperate seas of both hemispheres.

Their northern limit is the Mediterranean and Japan. Most abundant in the Malayan seas.
FAMILY 3.—PERCIDÆ. (61 Genera, 476 Species.)

"Marine or fresh-water carnivorous fishes, with oblong bodies covered with toothed scales."

DISTRIBUTION.—Seas, rivers and lakes, of all regions.

The genera which inhabit fresh-waters are the following:—

**Perea** (3 sp.), inhabits the Neartic and Palaearctic regions as far south as Ohio and Switzerland; one species, the common perch, is British. **Percichthys** (5 sp.), Chili and Patagonia, with one species in Java; **Paralabrax** (2 sp.), California; **Labrax** (8 sp.), six species are marine, inhabiting the shores of Europe and North America, one being British, two species inhabit the rivers of the northern United States; **Lates** (2 sp.), Nile and large rivers of India and China; **Acerina** (3 sp.), Europe, from England to Russia and Siberia; **Percaria** (1 sp.), River Dniester; **Lucioperea** (6 sp.), North America and Europe; **Pileoma** (2 sp.), North America, Texas to Lake Erie; **Boleosoma** (3 sp.), Texas to Lake Superior; **Aspro** (2 sp.), Central Europe; **Huro** (1 sp.), Lake Huron; **Percilia**, (1 sp.), Rio de Maypu in Chili; **Centrarchus** (10 sp.), North America and Cuba; **Brytus** (8 sp.), South Carolina to Texas; **Pomotis** (8 sp.), North America, Lake Erie to Texas.

Of the exclusively marine genera a species of **Polyprion** and one of **Serranus** are British. The latter genus has nearly 150 species spread over the globe, but is most abundant in the Tropics. **Mesoprion** is another extensive genus confined to the Tropics. **Apogon** abounds from the Red Sea to the Pacific, but has one species in the Mediterranean and one in the coast of Brazil.

FAMILY 4.—APHREDODERIDÆ. (1 Genus, 1 Species.)

"Fresh-water fish, with oblong body covered with toothed scales, and wide cleft mouth."

DISTRIBUTION.—Atlantic States of North America.
Family 5.—Pristipomatidæ. (25 Genera, 206 Species.)

"Marine carnivorous fishes, with compressed oblong bodies, and without molar or cutting teeth."

Distribution.—Seas of temperate and tropical regions, a few only entering fresh water.

Of the more extensive genera, nine, comprising more than half the species, are confined to the Indian and Australian seas, while only one large genus (Haemulon) is found in the Atlantic on the coast of Tropical America. The extensive Pacific genus, Diagramma, has one species in the Mediterranean. One genus is confined to the Macquarie River in Australia. A species of Dentex has occurred on the English coast, and this seems to be the extreme northern range of the family, which does not regularly extend beyond the coast of Portugal, and in the East to Japan. Australia seems to form the southern limit.

Family 6.—Mullidæ. (5 Genera, 34 Species.)

"Marine fishes, with elongate slightly compressed bodies covered with large scales, and two dorsal fins at a distance from each other."

Distribution.—All tropical seas, except the West Coast of America, extending into temperate regions as far as the Baltic, Japan, and New Zealand.

Two species of Mullus (Mullets) are British, and these are the only European fish belonging to the family.

Family 7.—Sparidæ. (22 Genera, 117 Species.)

"Herbivorous or carnivorous marine fishes, with oblong compressed bodies covered with minutely serrated scales, and with one dorsal fin."

Distribution.—Seas of temperate and tropical regions, a few entering rivers.
Cantliarus, Pagellus, and Chrysophrys, have occurred on the English Coast. Haplopectylus is confined to the West Coast of South America, and Australia; Sargus to the temperate and warm parts of the Atlantic and the shores of East Africa; Pagellus to the western coasts of Europe and Africa.

The other large genera have a wider distribution.

**Family 8.—Squamipennes. (12 Genera, 124 Species.)**

"Carnivorous marine fishes, with compressed and elevated bodies, and scaly vertical fins."

**DISTRIBUTION.**—The seas between the tropics, most abundant in the Oriental and Australian regions, a few entering rivers or extending beyond the tropics.

The extensive genus Chetodon (67 sp.), ranges from the Red Sea to the Sandwich Islands, and from Japan to Western Australia, while two species are found in the West Indies. Holacanthus (36 sp.), has a similar distribution, one species only occurring in the West Indies and on the coast of South America. Only one genus (Pomacanthus), with a single species, is confined to the West Atlantic.

**Family 9.—Cirrhitidæ. (8 Genera, 34 Species.)**

"Carnivorous marine fishes, with a compressed oblong body, covered with cycloid scales."

**DISTRIBUTION.**—The tropical and south temperate waters of the Indian and Pacific oceans, from Eastern Africa to Western America. Absent from the Atlantic.

**Family 10.—Triglidae. (50 Genera, 259 Species.)**

"Carnivorous, mostly marine fishes, with oblong compressed or subcylindrical bodies, and wide cleft mouths. They live at the bottom of the water."

**DISTRIBUTION.**—All seas, some entering fresh water, and a few inhabiting exclusively the fresh waters of the Arctic regions.
They are divided by Dr. Günther into four groups. The Heterolepidina (comprising 4 genera and 12 species) are confined to the North Pacific. The Scorpaenina (23 genera 113 species) have an almost universal distribution, but the genera are each restricted to one or other of the great oceans. Sebastes has occurred on the English coast. The Cottina (28 genera 110 species) have also a universal distribution; the numerous species of Cottus are found either in the seas or fresh waters of Europe and North America; four species are British, as well as seven species of the wide-spread genus Trigla. Ptyonotus (1 sp.) is confined to Lake Ontario. The Cataphracti (5 genera, 23 species) have also a wide range; one genus, Agonus, is found in the British seas, and also in Kamschatka and on the coast of Chili. Peristethus is also British.

Family 11.—Trachinidae. (24 Genera, 90 Species.)

"Carnivorous marine fishes, with elongate bodies, living at the bottom, near the shore."

Distribution.—Almost or quite universal.

Trachinus is a British genus. A species of Aphritis inhabits the fresh waters of Tasmania, while its two allies are found on the coasts of Patagonia.

Family 12. Sciaenidae. (13 Genera, 102 Species.)

"Marine or fresh-water fishes, with compressed and rather elongate bodies, covered with toothed scales."

Distribution.—Temperate and tropical regions, but absent from Australia.

Larimus is found in the Atlantic, and in African and American rivers. Corvina, Sciaena, and Otilothus are also marine and freshwater, both in the Atlantic and Pacific. The other genera are of small extent and more restricted range. Umbrina and Sciaena have occurred in British seas.
Family 13. — Polynemidæ. (3 Genera, 23 Species.)

"Marine or fresh-water fishes, with compressed oblong bodies and entire or ciliated scales."

Distribution. — Tropical seas and rivers of both the great oceans, but most abundant in the Pacific.

Family 14. — Sphyrenidæ. (1 Genus, 15 Species.)

"Carnivorous marine fishes, with elongate sub-cylindrical bodies covered with small cycloid scales."

Distribution. — The warm and tropical seas of the globe.

Family 15. — Trichiuridæ. (7 Genera, 18 Species.)

"Marine fishes, with elongate compressed bodies covered with minute scales or naked."

Distribution. — All the tropical and sub-tropical seas.

Family 16. — Scobridæ. (20 Genera, 108 Species.)

"Marine fishes, with elongate compressed bodies, scaled or naked."

Distribution. — All the temperate and tropical oceans. Mostly inhabiting the open seas.

Scomber, (the Mackerel) Thynnus, Nauocrates, Zeus, Centrolophus, Brama, and Lampris, are genera which have occurred in the British seas.

Family 17. — Carangidæ. (27 Genera, 171 Species.)

"Marine fishes, with compressed oblong or elevated bodies covered with small scales or naked."

Distribution. — All temperate and tropical seas; some species occur in both the great oceans, ranging from New York to Australia.

Trachurus and Capros are genera which occur in British seas.
Family 18.—Xiphiiidae. (2 Genera, 8 Species.)

"Marine fishes, with elongate compressed body and a produced sword-shaped upper jaw."

Distribution.—Mediterranean, and open seas between or near the Tropics.

Xiphias (the Sword-fish) has occurred on the English coast.

Family 19.—Gobiidae. (24 Genera, 294 Species.)

"Carnivorous fishes, with elongate low, naked, or scaly bodies, living at the bottom of the shallow seas or fresh waters of temperate or tropical regions. Individuals of the same species often differ in inhabiting exclusively fresh or salt water.

Distribution.—All temperate and tropical regions, from Scotland and Japan to New Zealand. Species of Gobius, Latrunculus, and Callionymus occur in Britain. Several genera are confined to the East Indian seas and rivers, but none seem peculiar to America. The genus Periophthalmus consists of the curious, large-headed, projecting-eyed fishes, so abundant on the muddy shores of African and Eastern tidal rivers, and which seem to spend most of their time out of water, hunting after insects, &c.

Family 20.—Discoibli. (2 Genera, 11 Species.)

"Carnivorous fishes, with oblong naked or tubercular bodies, living at the bottom of shallow seas, and attaching themselves to rocks by means of a ventral disc.

Distribution.—All northern seas, as far south as Belgium, England, and San Francisco.

Species of both genera (Cyclopterus and Liparis) occur in British seas.
Family 21.—*Oxudercidae*. (1 Genus, 1 Species.)

"A marine fish, with an elongate sub-cylindrical body and no ventral fins."

**Distribution.**—Macao, China.

Family 22.—*Batrachidae*. (3 Genera, 12 Species.)

"Marine fishes, with sub-cylindrical body and broad depressed head."

**Distribution.**—The coasts of nearly all tropical and south temperate regions, ranging from New York and Portugal to Chili and Tasmania.

Family 23.—*Pediculati*. (8 Genera, 40 Species.)

"Marine carnivorous fishes, with very large heads and without scales."

**Distribution.**—Seas of all temperate and tropical regions, extending south to New Zealand and north to Greenland.

A species of *Lophius* (the Fishing-frog or Sea-Devil) is found in British seas. The genus *Antennarius*, comprising two-thirds of the species, is wholly tropical.

Family 24.—*Blennidae*. (33 Genera, 201 Species.)

"Carnivorous fishes, with long sub-cylindrical naked bodies, living at the bottom of shallow water in seas, or tidal rivers."

**Distribution.**—All seas from the Arctic regions to New Zealand, Chili, and the Cape of Good Hope.

Species of *Anarrhichas, Blennius, Blenniops, Centronotus* and *Zoarces* occur in British seas. *Chasmodes* (3 sp.) is confined to the Atlantic coasts of Temperate North America; *Petroscirtes* (26 sp.) to the tropical parts of the Indian and Pacific Oceans; and *Stichæus* (9 sp.) to the Arctic Seas.
Family 25.—Acanthoclinidae. (1 Genus, 1 Species.)

"A carnivorous marine fish, with long flat body and very long dorsal fin."

Distribution.—Coasts of New Zealand.

Family 26.—Comophoridae. (1 Genus, 1 Species.)

"An elongate, naked, large-headed fish, with two dorsal fins."

Distribution.—Lake Baikal.

Dr. Günther remarks, that this fish approaches the Scombrina (Mackerel) in several characters. These are exclusively marine fishes, while Lake Baikal is fresh-water, and is situated among mountains, at an elevation of nearly 2000 feet, and more than a thousand miles from the ocean!

Family 27.—Trachypteridae. (3 Genera, 16 Species.)

"Deep sea fishes, with elongate, much compressed, naked bodies."

Distribution.—Europe, East Indies, West Coast of South America, New Zealand. Dr. Günther remarks, that little is known of these fishes, from their being so seldom thrown on shore, and then rapidly decomposing. The Ribbon-fish (Regalecus banksii) has occurred frequently on our shores. They have soft bones and muscles, small mouths, and weak dentition.

Family 28.—Lophotidae. (1 Genus, 1 Species.)

"A marine fish, with elongate compressed naked body, and high crested head."

Distribution.—Mediterranean Sea and Japan.
FAMILY 29.—TEUTHIDIDÆ. (1 Genus, 29 Species.)

"Marine, herbivorous fishes, with compressed, oblong, small-scaled bodies."

Distribution.—Eastern tropical seas, from Bourbon and the Red Sea to the Marianne and Fiji Islands.

FAMILY 30.—ACRONURIDÆ. (5 Genera, 64 Species.)

"Marine, herbivorous fishes, with compressed, minutely-scaled bodies."

Distribution.—All tropical seas, but most abundant in the Malay region, and extending to Japan and New Zealand.

FAMILY 31.—HOPLEGNATHIDÆ. (1 Genus, 3 Species.)

"Marine fishes, with compressed elevated bodies, covered with very small toothed scales."

Distribution.—Seas of Australia, China, and Japan.

FAMILY 32.—MALACANTHIDÆ. (1 Genus, 3 Species.)

"Marine fishes, with elongate bodies covered with very small scales, and with very long dorsal and anal fins."

Distribution.—Atlantic coasts of Tropical America, Mauritius, and New Guinea.

FAMILY 33.—NANDIDÆ. (6 Genera, 14 Species.)

"Marine or fresh-water carnivorous fishes, with oblong, compressed, scaly bodies."

Distribution.—From the Red Sea to the coasts of China and Australia; and the fresh waters of the Neotropical and Oriental regions. Badis, Nandus, and Catopra inhabit the
rivers of India and the Malay Islands; *Acharnes* the rivers of British Guiana.

**Family 34.—Polycentridae.** (2 Genera, 3 Species.)

"Fresh-water carnivorous fishes, with compressed elevated scaly bodies, and many-spined dorsal and anal fins."

**Distribution.**—Rivers of Tropical America.

**Family 35.—Labyrinthici.** (9 Genera, 25 Species.)

"Fresh-water fishes, with compressed oblong bodies, and capable of living for some time out of water or in dried mud."

**Distribution.**—Freshwaters of South Africa and the East Indies from the Mauritius to China, the Philippines, Celebes, and Amboyna.

**Family 36.—Luciocephalidae.** (1 Genus, 1 Species.)

"Fresh-water fish, with elongate scaled body, and a dilated branchial membrane."

**Distribution.**—Rivers of Borneo, Biliton, and Banca.

**Family 37.—Atherinidae.** (3 Genera, 39 Species.)

"Marine or fresh-water carnivorous fishes, with subcylindrical scaled bodies, and feeble dentition."

**Distribution.**—All temperate and tropical seas, from Scotland and New York to the Straits of Magellan and Tasmania.

*Atherina presbyter* occurs in British seas. Species of *Atherina* and *Atherinichthys* are found in fresh-water lakes and rivers in Europe, America, and Australia.
FAMILY 38.—MUGILIDÆ. (3 Genera, 78 Species.)

"Fresh-water and marine fishes, with oblong compressed bodies, cycloid scales, and small mouths, often without teeth."

**Distribution.**—Coasts and fresh waters of all temperate and tropical regions.

*Mugil* (66 sp.) is mostly marine, and is very widely distributed; several species (Grey Mullets) occur on the British coasts. *Agonostoma* (9 sp.) is confined to the fresh waters of the West Indies, Central America, New Zealand, Australia, Celebes, and the Comoro Islands. *Myxus* (3 sp.) is marine, and occurs both in the Atlantic and Pacific.

FAMILY 39.—OPHIOCEPHALIDÆ. (2 Genera, 26 Species.)

"Fresh-water fishes, with elongate subcylindrical scaled bodies; often leaving the water for a considerable time."

**Distribution.**—Rivers of the Oriental region:—India, Ceylon, China, Malay Islands to Philippines and Borneo.

FAMILY 40.—TRICHONOTIDÆ. (2 Genera, 2 Species.)

"Marine carnivorous fishes, with elongate subcylindrical bodies, cycloid scales, and eyes directed upwards."

**Distribution.**—Coasts of Celebes, Ceram, and New Zealand.

FAMILY 41.—CEPOLIDÆ. (1 Genus, 7 Species.)

"Marine fishes, with very long, compressed, band-like bodies, covered with small cycloid scales."

**Distribution.**—Temperate seas of Western Europe and Eastern Asia, and one species in the Malayan Seas.

*Cepola rubescens* (the Band fish) ranges from Scotland to the Mediterranean. All the other species but one are from Japan.
Family 42.—Gobiesocidae. (9 Genera, 21 Species.)

"Carnivorous marine fishes, elongate, anteriorly depressed and scaleless, with dorsal fin on the tail."

Distribution.—Temperate and tropical seas; Scandinavia to the Cape, California to Chili, West Indies, Red Sea, Australia, New Zealand, and Fiji Islands.

Three species of Lepadogaster have occurred in the English Channel.

Family 43.—Psychrolutidae. (1 Genus, 1 Species.)

"A large-headed, elongate, naked marine fish, with small teeth, and dorsal fin on the tail."

Distribution.—West Coast of North America (Vancouver's Island.)

Family 44.—Centriscidae. (2 Genera, 7 Species.)

"Marine fishes, with compressed, oblong or elevated bodies, elongate tubular mouth and no teeth."

Distribution.—West Coast of Europe and Africa, Mediterranean, Indian Ocean to Java, Philippines, and Japan.

A species of Centriscus has occurred on the South Coast of England, and another species is found both at Madeira and Japan.

Family 45.—Fistularidae. (2 Genera, 4 Species.)

"Marine fishes, very elongate, with long tubular mouth and small teeth."

Distribution.—Tropical seas, both in the Atlantic and Indian Ocean, and as far east as the New Hebrides.
FAMILY 46.—MASTACEMBELIDÆ. (2 Genera, 9 Species.)

"Fresh-water fishes, with eel-like bodies and very long dorsal fin."

DISTRIBUTION.—Rivers of the Oriental region, one species from Ceram (?).

FAMILY 47.—NOTACANTHI. (1 Genus, 5 Species.)

"Marine fishes, with elongate bodies covered with very small scales, and snout protruding beyond the mouth."

DISTRIBUTION.—Greenland, Mediterranean, and West Australia.

Order II.—ACANTHOPTERYGII PHARYNGOGNATHI.

FAMILY 48.—POMACENTRIDÆ. (3 Genera, 143 Species.)

"Marine fishes, with short compressed bodies covered with toothed scales, and with feeble dentition."

DISTRIBUTION.—Tropical parts of Pacific and Indian Ocean, less numerous in Tropical Atlantic, a few reaching the Mediterranean, Japan, and South Australia. Pomacentrus, Glyphidodon, and Heliastes are Atlantic genera.

FAMILY 49.—LABRIDÆ. (46 Genera, 396 Species.)

"Herbivorous or carnivorous marine fishes, with elongate bodies covered with cycloid scales, and teeth adapted for crushing the shells of mollusca."

DISTRIBUTION.—Temperate and tropical regions of all parts of the globe.

The genera Labrus, Crenilabrus, Ctenolabrus, Acantholabrus, Centrolabrus, and Coris, have occurred in British seas, and all of
these, except the last, are confined to the Mediterranean and the
Atlantic as far as Madeira. Eight other genera are characteristic
of the Atlantic, most of them being West Indian, but one from
the coasts of North America. Seven genera are common to all
the great oceans; the remainder being confined to the Indian
and Pacific Oceans, ranging from Japan to New Zealand, but
being far more abundant between the Tropics.

Family 50.—Embrotocidae. (2 Genera, 17 Species.)

"Marine viviparous fishes, with compressed elevated bodies
covered with cycloid scales, and with small teeth."

Distribution.—Pacific Ocean from Japan and California
northwards. One species enters the fresh waters of California.

Family 51.—Gerridae. (1 Genus, 28 Species.)

"Marine fishes, with compressed oblong bodies covered with
minutely serrated scales, and with small teeth."

Distribution.—Tropical seas; ranging south as far as the
Cape of Good Hope and Australia, and north to Japan and
(one species) to New Jersey, U.S.

Family 52.—Chromididae. (19 Genera, 100 Species.)

"Fresh-water herbivorous or carnivorous fishes, with elevated
or elongate scaly bodies, and small teeth."

Distribution.—The Oriental, Ethiopian, and Neotropical re-

gions.

Eutroplus (2 sp.) is from the rivers of Southern India and
Ceylon; Chromis (15 sp.), Sarotherodon (2 sp.), and Hemi-
chronis (4 sp.), are from the rivers and lakes of Africa, ex-
tending to the Sahara and Palestine. The remaining 15 genera
are American, and several of them have a restricted distribution.
Acara (17 sp.) inhabits Tropical South America and the
Antilles; Theraps (1 sp.), Guatemala; Heros (26 sp.), Texas and
Mexico to La Plata; *Mesonauta* (1 sp.), Brazil; *Ptenia* (1 sp.), Lake Peten, Guatemala; *Uaru* (2 sp.), Brazil; *Hygrogonus* (1 sp.), Brazil; *Cichla* (4 sp.), Equatorial America; *Crucicichla* (9 sp.), Brazil and Guiana; *Chatobranchus* (3 sp.), Brazil and Guiana; *Mesops* (2 sp.), Brazil; *Satanoperca* (7 sp.), Amazon Valley and Guiana; *Geophagus* (1 sp.), North Brazil and Guiana; *Symphysodon* (1 sp.), Lower Amazon; *Pterophyllum* (1 sp.), Lower Amazon.

**Order III.—ANACANTHINI.**

**Family 53.—GADOPSIDÆ.** (1 Genus, 1 Species.)

"Fresh-water fish, with rather elongate body covered with very small scales, the upper jaw overhanging the lower, forming an obtuse snout."

**Distribution.**—Rivers of Australia and Tasmania.

**Family 53a.—LYCODIDÆ.** (3 Genera, 14 Species.)

"Marine fishes, with elongate bodies, and the dorsal united with the anal fin."

**Distribution.**—Arctic seas of America and Greenland, and Antarctic seas about the Falkland Islands and Chiloe Island.

**Family 54.—GADIDÆ.** (21 Genera, 58 Species.)

"Marine fishes, with more or less elongate bodies covered with small smooth scales."

**Distribution.**—Cold and temperate regions of both hemispheres; in the North extending as far south as the Mediterranean, Canary Islands, New York and Japan (and one species to the Philippines and Bay of Bengal), and in the South to Chili and New Zealand.

FAMILY 55.—OPHIDIIDÆ. (16 Genera, 43 Species.)

"Marine fishes, with more or less elongate bodies, the dorsal and anal fins united, and the ventral fins rudimentary or absent."

**Distribution.**—Almost universal; from Greenland to New Zealand, but most abundant in the Tropics.

*Ophidium* and *Ammodytes* occur in British seas; *Lucifuga* inhabits subterranean fresh waters in Cuba.

FAMILY 56.—MACROURIDÆ. (3 Genera, 21 Species.)

"Marine fishes, with the body terminating in a long, compressed tapering tail, and covered with spiny, keeled or striated scales."

**Distribution.**—North Atlantic from Greenland to Madeira and the Canary Islands, Mediterranean, Japanese and Australian seas.

None of these fishes have occurred in the British seas.

FAMILY 57.—ATELEOPODIDÆ. (1 Genus, 1 Species.)

"Marine fishes, with the naked body terminating in a long compressed, tapering tail."

**Distribution.**—Japan.

FAMILY 58.—PLEURONECTIDÆ. (34 Genera, 185 Species.)

"Marine carnivorous fishes, with strongly compressed flat bodies, one side of which is colourless, and eyes unsymmetrically placed, both on the coloured side. They inhabit the sandy bottoms of shallow seas, and often ascend rivers."

**Distribution.**—Universal, on Arctic, Temperate, and Tropical coasts.
Seven genera occur in British seas, viz.: *Hippoglossus, Hippoglossoides, Rhombus, Phrynornarbombus, Arnoglossus, Pleuronectes* (Turbot), and *Solea* (Sole). There are 13 genera in the Atlantic and 23 in the Pacific, 4 being common to both; and 2 found only in the Mediterranean. A Pacific genus, *Synaptura*, has one species in the Mediterranean.

Order IV.—**PHYSOSTOMI.**

**Family** 59.—**SILURIIDÆ.** (114 Genera, 547 Species.)

"Fresh-water or marine, scaleless fishes, often with bony shields, and the head always furnished with barbels."

**Distribution.—** The fresh waters of all the temperate and tropical regions, those which enter the salt water keeping near the coast.

This extensive family is divided by Dr. Günther into eight sub-families and seventeen groups, the distribution of which is as follows:—

Sub-family 1 (*SILURIIDÆ Homalopteræ*) is confined to the Old World. It consists of three groups: Clarina (2 genera, *Clarias* and *Heterobranchus*) ranges over the whole area of the Ethiopian and Oriental regions, to which it appears to be strictly confined; Plotosina (3 genera, *Plotosus, Copidoglanis*, and *Cnido- glanis*) ranges from the eastern coasts of Africa to Japan, Polynesia, and Australia, in seas and rivers; Chacina (1 genus, *Chaca*) ranges from India to Borneo.

Sub-family 2 (*SILURIIDÆ Heteropteræ*) is also confined to the Old World; it consists of one group,—Silurina, containing 19 genera, viz.:—*Saccobranchus* (4 sp.), India to Cochin China and Ceylon; *Silurus* (5 sp.), Palæarctic region from Central Europe to Japan, China, and Afghanistan, and a species in Cochin China; *Silurichthys* (3 sp.), Cashmere, Java, and Borneo; *Wallago* (2 sp.), Hindostan, Sumatra, and Borneo; *Belodontichthys* (1 sp.), Sumatra and Borneo; *Eutropiichthys* (1 sp.), Bengal; *Cryptopterus*
GEOGRAPHICAL ZOOLOGY. [Part IV.

(15 sp.), Java, Sumatra, and Borneo, with a species in the Ganges, in Siam, and (?) in Amboyna; Calliechrous (10 sp.), Afghanistan to Borneo and Java; Schilbe (5 sp.), Tropical Africa; Eutropius (6 sp.), Tropical Africa and Central India; Hemisilurus (2 sp.), Java and Sumatra; Silvanodon (1 sp.), Nile; Ailia (2 sp.), Bengal; Schillichthys (1 sp.), Bengal; Laüs (1 sp.), Java, Sumatra, Borneo; Pseudeutropius (6 sp.), India and Sumatra; Pangasius (7 sp.), Ganges, Sumatra, Java, Borneo; Helicophagus (2 sp.), Sumatra; Silondia (1 sp.), Ganges.

Sub-family 3 (Siluridae Anomalopterae) is confined to Equatorial America; it consists of the group Hypothalmina, containing 2 genera: Helogenes (1 sp.), Hypothalmus (4 sp.), from the country north of the Amazon, Surinam, and the Rio Negro.

Sub-family 4 (Siluridae Proteropterae) ranges over all the tropical and most of the temperate parts of the globe, except Europe and Australia. It consists of four groups: Bagrina (16 genera), ranging over most of the Old World and North America; Pimelodina (15 genera), confined to Tropical America, except one genus which is African; Ariina (10 genera), all Tropical regions; and Bagarina (3 genera), Oriental region. The distribution of the genera is as follows:

Bagrus (2 sp.), Nile; Chrysichthys (5 sp.), Tropical Africa; Clarotes (1 sp.), Upper Nile; Macrones (19 sp.), India, Ceylon to Borneo, and one species in Asia Minor; Pseudobagrus (4 sp.), Japan, China, and Cochin China; Liocassis (5 sp.), Japan, China, Java, Sumatra, and Borneo; Bagroides (3 sp.), Sumatra and Borneo; Bagrichthys (1 sp.), Sumatra and Borneo; Rita (5 sp.), Continental India and Manilla; Acrochordonichthys (6 sp.), Java and Sumatra; Akysis (3 sp.), Java and Sumatra; Olyra (1 sp.), Khasya; Branchiosteus (1 sp.), Khasya; Amiurus (13 sp.), Nearctic region to Guatemala and China; Hopladelus (1 sp.), North America; Noturus (4 sp.), North America; Sorubim (1 sp.), Amazon; Platystoma (11 sp.), Tropical South America; Hemisorubim (1 sp.) Rio Negro, Brazil; Platistomatichthys (1 sp.), Rio Branco, Brazil; Phraeoccephalus (1 sp.), Amazon; Piramutana (2 sp.), Equatorial America; Platynematichthys
(1 sp.), northern and southern tributaries of Amazon; *Piratinga* (3 sp.), Amazon Valley; *Sciades* (2 sp.), Amazon; *Pimelodus* (42 sp.), Mexico to La Plata, single aberrant species from West Africa, Java and the Sandwich Islands; *Pirinampus* (1 sp.), Brazil; *Conorhynchus* (1 sp.), Brazil; *Notoglanis* (1 sp.), Madeira, Amazon Valley; *Callophysus* (3 sp.), Tropical South America; *Auchenaspis* (1 sp.), Tropical Africa; *Arius* (68 sp.), all Tropical regions; *Galeichthys* (1 sp.), Cape of Good Hope; *Genidens* (1 sp.), Brazil; *Hemipimelodus* (3 sp.), India, Sumatra, and Borneo; *Kotingus* (1 sp.), Sunda Islands; *Ælurichthys* (4 sp.), Eastern United States to Guiana; *Paradiplomystax* (1 sp.), Brazil; *Diplomystax* (1 sp.), Chili; *Osteogeniouis* (3 sp.), India to Java; *Batrachocephalus* (1 sp.), Java and Sumatra; *Bagarius* (1 sp.), India to Java; *Eulyptosternum* (1 sp.), India; *Glyptosternum* (8 sp.), Himalayas, Central India, Java, and Sumatra; *Hara* (3 sp.), Continental India; *Amblyiceps* (3 sp.), Continental India.

Sub-family 5 (*Silurideæ* Stenobranchiæ) is confined to South America and Africa, with one genus and species in the Ganges. It consists of three groups: *Doradina* (12 genera), South America and Africa; *Rhinoglanina* (3 genera), Central Africa and the Ganges; *Malapterururina* (1 genus), Tropical Africa. The distribution of the genera is as follows:—

*Ageniosus* (4 sp.), Surinam to La Plata; *Tetranematieichthys* (1 sp.), Central Brazil, Rio Guaporé; *Euanemus* (1 sp.), Surinam and Brazil; *Auchenipterus* (9 sp.), Equatorial America; *Centromochlus* (2 sp.), Equatorial America; *Trachelyopterus* (2 sp.), Equatorial America; *Cetopsis* (3 sp.), Brazil; *Asterophysus* (1 sp.), Rio Negro, North Brazil; *Doras* (13 sp.), Tropical South America east of Andes; *Oxydoras* (7 sp.), Amazon Valley and Guiana; *Rhinodoras* (3 sp.), Tropical South America east of Andes; *Synodontis* (12 sp.), Tropical Africa; *Rhinoglanis* (1 sp.), Upper Nile; *Mochocerus* (1 sp.), Nile; *Callomystax* (1 sp.), Nile; *Malapterurus* (3 sp.), Tropical Africa.

Sub-family 6 (*Silurideæ* Proteropodes) inhabits Tropical America and Northern India as far as Tenasserim. It consists of two groups: the Hypostomatina (17 genera), with the same distribution as the sub-family, and the Asprediniina (3 genera),
confined to Equatorial America. The distribution of the genera is as follows:

*Arges* (2 sp.), Andes of Peru and Ecuador; *Stygogenes* (2 sp.), Andes; *Brontes* (1 sp.), Andes; *Astroblepus* (1 sp.), Popayan; *Callichthys* (11 sp.), Tropical South America east of Andes, and Trinidad; *Plecostomus* (15 sp.), Tropical South America east of Andes, and Trinidad; *Liposarcus* (3 sp.), Surinam and Brazil; *Chaetostomus* (25 sp.), Tropical America, Trinidad, and Porto Rico; *Pterygoplichthys* (4 sp.), Brazil; *Rhinelepis* (1 sp.), Brazil; *Acanthicus* (2 sp.), Equatorial America; *Loricaria* (17 sp.), Tropical South America east of Andes; *Acestra* (4 sp.), Brazil and Guiana; *Sisor* (1 sp.), Northern Bengal; *Erethistes* (1 sp.), Assam; *Pseudecheneis* (1 sp.), Khasya Hills; *Exostoma* (2 sp.), Assam and Tenasserim; *Bunocephalus* (2 sp.), Guiana; *Bunoocephalichthys* (1 sp.), Rio Branco, North Brazil; *Aspredo* (6 sp.), Guiana.

Sub-family 7 (Siluridae Opisthopterae) consists of two groups: *Nematogenyina* (2 genera), and *Trichomycterina* (3 genera), and is confined to South America. The distribution of the genera is as follows:

*Heptapterus* (2 sp.), South America; *Nematogenys* (1 sp.), Chili; *Trichomycterus* (7 sp.), South America to 15,000 feet elevation; *Eremophilus* (1 sp.), Andes of Bogota; *Pariodon* (1 sp.), Amazon.

Sub-family 8 (Siluridae Branchiocolæ) is confined to Tropical South America. It consists of one group, *Stegophilina*, and 2 genera: *Stegophilus* (1 sp.), Brazil; and *Vandellia* (2 sp.), Amazon Valley.

**Family 60. Characinidae.** (47 Genera, 230 Species.)

"Fresh-water fishes, with scaly bodies and without barbels."

**Distribution.**—The Neotropical and Ethiopian regions.

This extensive family is divided by Dr. Günther into 10 groups, viz.: *Erythrinina* (5 genera), South America; *Curumatina*
(6 genera), South America; Citharinina (1 genus), Tropical Africa; Anostomatina (3 genera), South America; Tetragonopterina (16 genera), South America and Tropical Africa; Hydrocyonina (9 genera), Tropical America and Tropical Africa; Distichodontina (1 genus), Tropical Africa; Icthyborina (1 genus), Africa; Crenuchina (1 genus), Equatorial America; Serrasalmonina (4 genera), South America.

The following is the distribution of the genera:—

**Macrodon** (4 sp.), Tropical America; *Erythrinus* (5 sp.), Brazil and Guiana; *Lebiasina* (1 sp.), West Equatorial America; *Pyrrhulina* (1 sp.), Guiana; *Corynopoma* (4 sp.), Trinidad only; *Curimatus* (15 sp.), Tropical South America and Trinidad; *Prochilodus* (12 sp.), South America to the La Plata; *Coprropus* (2 sp.), East Equatorial America; *Hemiodus* (8 sp.), Equatorial America east of Andes; *Saccodon* (1 sp.), Ecuador; *Parodon* (1 sp.), Brazil; *Citharinus* (2 sp.), Tropical Africa; *Anostomus* (8 sp.), Tropical America; *Rhytiodus* (2 sp.), Equatorial America; *Leporinus* (14 sp.), South America East of Andes; *Piabucina* (2 sp.), Guiana; *Alestes* (4 sp.), Tropical Africa; *Brachyalestes* (5 sp.), Tropical Africa; *Tetragonopterus* (32 sp.), Tropical America; *Scissor* (1 sp.), South America; *Pseudochaleucus* (1 sp.), West Ecuador; *Chirodon* (2 sp.), Chili; *Chalceus* (1 sp.), Guiana; *Brycon* (10 sp.), South America east of Andes; *Chalceinus* (4 sp.), Central America and Ecuador; *Bryconops* (2 sp.), Tropical America; *Creagrus* (1 sp.), Western Ecuador; *Chalceinus* (4 sp.), Tropical South America; *Gastroplecus* (8 sp.), Tropical South America; *Piabuca* (2 sp.), Equatorial America; *Agonistes* (1 sp.), Guiana; *Anacervus* (7 sp.), Central and South America; *Hystricodon* (1 sp.), Equatorial America; *Salminus* (3 sp.), South America; *Hydrocyon* (3 sp.), Tropical Africa; *Sarcodactylus* (1 sp.), West Africa; *Oligosarcus* (1 sp.), Brazil; *Xiphoramphus* (7 sp.), South America east of Andes; *Xiphostoma* (5 sp.), Equatorial America east of Andes; *Cynodon* (3 sp.), Tropical America East of Andes; *Distichodus* (7 sp.), Tropical Africa; *Icthyoborus* (3 sp.), Nile; *Crenuchus* (1 sp.), Guiana; *Mylestes* (1 sp.), Equatorial America; *Serrasalmo* (13 sp.), Tropical South America east of Andes; *Myletes* (18 sp.),
Tropical South America east of Andes; Catoprion (1 sp.), Brazil and Guiana.

**Family 61.—Haplochitonidae.** (2 Genera, 3 Species.)

"Fresh-water fishes, with naked or scaly bodies and without barbels."

**Distribution.**—Temperate South America and South Australia.

The genera are, Haplochiton (2 sp.), Tierra del Fuego and the Falkland Islands; Prototroctes (2 sp.), Southern Australia and New Zealand.

**Family 62.—Sternoptychidae.** (6 Genera, 12 Species.)

"Marine fishes, with very thin deciduous scales or none, and with a row of phosphorescent spots or organs on the under surface of the body."

**Distribution.**—Mediterranean and Atlantic.

These are deep-sea fishes found in the Mediterranean sea, and in the deep Atlantic from the coasts of Norway to the Azores and the Tropics.

**Family 63.—Scopelidæ.** (11 Genera, 47 Species.)

"Marine fishes, somewhat resembling the fresh-water Siluridae."

**Distribution.**—Almost universal, but most abundant in warm and tropical seas.

These are deep-sea fishes, abounding in the Mediterranean and the great oceans, a few extending north to near Greenland and south to Tasmania.
FAMILY 64.—STOMIATIDÆ. (4 Genera, 8 Species.)

"Small marine fishes, naked or with very fine scales."

**Distribution.**—The Mediterranean and Atlantic.

These are deep-sea fishes, ranging from Greenland to beyond the Equator.

FAMILY 65.—SALMONIDÆ. (15 Genera, 157 Species.)

"Fresh-water fishes, many species periodically descending to the sea and a few altogether marine:—Salmon and Trout."

**Distribution.**—The Palaearctic and Nearctic Regions, and one genus and species in New Zealand. A considerable number of species are confined to single lakes or rivers, others have a wide distribution.

The genera are distributed as follows:—

*Salmo* (83 sp.), rivers and lakes of the Palaearctic and Nearctic Regions, as far south as Algeria, Asia Minor, the Hindoo-Koosh and Kamschatka, and to about 38° North Latitude in North America, many of the species migratory; *Onchorhynchus* (8 sp.), American and Asiatic rivers entering the Pacific, as far south as San Francisco and the Amur; *Brachymystax* (1 sp.), Siberian rivers, from Lake Baikal and the Altai Mountains northwards; *Luciotrutta* (2 sp.), Caspian Sea and Volga; *Plecoglossus* (1 sp.), Japan and Formosa; *Osmerus* (3 sp.), rivers of temperate Europe and North America entering the Atlantic, and one species in California; *Thaleichthys* (1 sp.), Columbia River, Vancouver's Island; *Hypomesus* (1 sp.), coasts of California, Vancouver's Island, and North-eastern Asia; *Mallotus* (1 sp.), coasts of Arctic America from Greenland to Kamschatka; *Retropinna* (1 sp.), fresh waters of New Zealand; *Coregonus* (41 sp.), fresh waters of northern parts of temperate Europe, Asia and North America, many of the species migratory; *Thymallus* (6 sp.), fresh waters of temperate parts of
Europe, Asia, and North America; *Argentina* (4 sp.), Mediterranean and deep seas of Western Europe; *Microstoma* (2 sp.), Mediterranean, and seas of Greenland; *Salarix* (2 sp.), China and Japan, in seas and rivers. *Salmo, Osmerus, Coregonus*, and *Thymallus*, are British genera.

**Family 66.—PERCOPSIDÆ.** (1 Genus, 1 Species.)

"A fresh-water fish covered with toothed scales."

**Distribution.**—Lake Superior, North America.

**Family 67.—GALAXIDÆ.** (1 Genus, 12 Species.)

"Fresh-water fishes, with neither scales nor barbels."

**Distribution.**—The temperate zone of the Southern Hemisphere.

The only genus, *Galaxias*, is found in New Zealand, Tasmania, and Tierra del Fuego, ranging north as far as Queensland and Chili; and one of the species is absolutely identical in the two regions.

**Family 68.—MORMYRIDÆ.** (3 Genera, 25 Species.)

"Fresh-water fishes, with scales on the body and tail but not on the head, and no barbels."

**Distribution.**—The Ethiopian Region.

Most abundant in the Nile, a few from the Gambia, the Congo, and Rovuma. The genera are:—

*Mormyrus* (1 sp.), Nile, Gambia, West Africa, Mozambique, Rovuma; *Hyperopsius* (2 sp.), Nile and West Africa; *Mormyrops* (4 sp.), Nile, West Africa and Mozambique.
FAMILY 69.—GYMNARCHIDÆ. (1 Genus, 1 Species.)

"Fresh-water fishes, resembling the Mormyridæ, but with tapering finless tail, and neither anal nor ventral fins."

Distribution.—Ethiopian region.

The only genus, Gymnarchus, inhabits the Nile and the rivers of West Africa.

FAMILY 70.—ESOCIDÆ. (1 Genus, 7 Species.)

"Fresh-water fishes, with scaly bodies, no barbels, and dorsal fins situated towards the tail."

Distribution.—The Nearctic and Palaearctic regions.

One species, the Pike (Esox lucius) ranges from Lapland to Turkey, and in America from the Arctic regions to the Albany river; the remainder are American species extending South as far as New Orleans.

FAMILY 71.—UMBRIIDÆ. (1 Genus, 2 Species.)

"Small fresh-water scaly fishes, without barbels or adipose fin."

Distribution.—Central Europe and Temperate North America.

FAMILY 72.—SCOMBRESOCIDÆ. (5 Genera, 136 Species.)

"Marine or fresh-water fishes, with scaly bodies and a series of keeled scales along each side of the belly."

Distribution.—Temperate and tropical regions.

All the genera have a wide distribution. A species of Belone and one of Scombrusox are found on the British coast. The Flying fishes (Exocoetus, 44 sp.), belong to this family. They abound in all tropical seas and extend as far as the Mediterranean and Australia. None of the genera are exclusively fresh-water,
but a few species of Belone and Hemiramphus are found in rivers in various parts of the world.

**Family 73.—Cyprinodontidae.** (20 Genera, 106 Species.)

“Fresh-water fishes, covered with scales, the sexes frequently differing, mostly viviparous.”

**Distribution.**—Southern Europe, Asia, Africa and North America, but most abundant in Tropical America.

The distribution of the genera is as follows:—

*Cyprinodon* (11 sp.), Italy, North Africa and Western Asia to Persia, also North America from Texas to New York; *Fitzroya* (1 sp.), Montevideo; *Characodon* (1 sp.), Central America; *Tellia* (1 sp.), Alpine pools of the Atlas; *Limnurgus* (1 sp.), Mexican plateau; *Lucania* (1 sp.), Texas; *Haplochilus* (18 sp.), India, Java, Japan, Tropical Africa, Madagascar, and the Seychelles Islands, Carolina to Brazil, Jamaica; *Fundulus* (17 sp.), North and Central America and Ecuador, Spain and East Africa; *Rivulus* (3 sp.), Tropical America, Cuba and Trinidad; *Orestias* (6 sp.), Lake Titicaca, Andes; *Jenynsia* (1 sp.), Rio Plata; *Pseudocichphorus* (2 sp.), Central America; *Belonesox* (1 sp.), Central America; *Gambusia* (8 sp.), Antilles, Central America and Texas; *Anableps* (3 sp.), Central and Equatorial America; *Pecilia* (16 sp.), Antilles, Central and South America; *Mollucensia* (4 sp.), Louisiana to Mexico; *Platypoecilus* (1 sp.), Mexico; *Girardinus* (10 sp.), Antilles and South Carolina to Uruguay; *Lepistes* (1 sp.), Barbados.

**Family 74.—Heteropygii.** (2 Genera, 2 Species.)

“Fresh-water fishes, with posterior dorsal fin, and very small scales.”

**Distribution.**—Fresh waters of the United States.

*Amblyopsis* (1 sp.) is a blind fish found in the caverns of Kentucky; while *Chologastes* (1 sp.), which only differs from it in having perfect eyes, is found in ditches in South Carolina.
FAMILY 75.—CYPRINIDÆ. (109 Genera, 790 Species.)

"Fresh-water fishes, generally scaly, with no adipose fin, and pharyngeal teeth only, the mouth being toothless."

Distribution.—Fresh waters of the Old World and North America, but absent from Australia and South America.

This enormous family is divided by Dr. Günther into fourteen groups, the distribution of which is as follows:—

Catostomina (4 genera), North America and North-east Asia; Cyprinina (39 genera), same range as the family; Rohiteichthyina (1 genus), Malay Archipelago; Leptobarbina (1 genus), Malay Archipelago; Rasborina (5 genera), East Africa to China and Borneo; Semiplotina (2 genera), Western Asia; Xenocypridina (3 genera), Eastern Asia; Leuciscina (10 genera), Palæarctic and Nearctic regions; Rhodeina (3 genera), Palæarctic region; Danionina (9 genera), India to China and Japan; Hypophthalmichthyina (1 genus), China; Abramidina (16 genera), same range as the family; Homalopterina (2 genera), India to Java; Cobitidina (10 genera), Palæarctic and Oriental regions.

The following is the distribution of the genera:—

Catostomus (16 sp.), Nearctic region and Eastern Siberia; Moxostoma (2 sp.), Eastern United States; Sclerognathus (5 sp.), Temperate North America to Guatemala, also Northern China; Carpiodes (1 sp.), United States; Cyprinus (2 sp.), Temperate parts of Palæarctic region (1 sp. British); Carassius (3 sp.), Temperate Palæarctic region (1 sp. British); Catla (1 sp.), Continental India; Cirrhina (5 sp.), Continental India to China; Dangila (6 sp.), Java, Sumatra, Borneo; Osteochilus (14 sp.), Siam to Java and Sumatra; Labeo (27 sp.), Tropical Africa and Oriental region; Tylognathus (10 sp.), Syria, India to Java; Abrostomus (2 sp.), South Africa; Discognathus (4 sp.), Syria to India and Java, mostly in mountain streams; Crossochilus (9 sp.), India to Sumatra and Java; Gymnostenos (7 sp.), Continental India; Epalzeorhynchus (1 sp.), Sumatra and Borneo; Capoeta (13 sp.), Western Asia; Barbus (163 sp.), Temperate or Tropical...
parts of Europe, Asia, and Africa (1 sp. British); *Thynnichthys* (2 sp.), Pegu, Borneo, and Sumatra; *Barbichthys* (1 sp.), Java, Sumatra, and Borneo; *Amblyrynchichthys* (1 sp.), Sumatra and Borneo; *Albulichthys* (1 sp.), Sumatra and Borneo; *Oreinus* (3 sp.), Himalayan region; *Schizothorax* (13 sp.), Himalayan region and west to Afghanistan and Persia; *Ptychoharbus* (1 sp.), Tibet; *Gymnocypris* (1 sp.), loc. unknown; *Schizopygopsis* (1 sp.), Tibet; *Diptychus* (1 sp.), Himalayas and Tibet; *Aulopogon* (1 sp.), Western Asia; *Qohio* (2 sp.), Temperate Europe (1 sp. British); *Pseudogobio* (4 sp.), China, Japan, and Formosa; *Ceratichthys* (9 sp.), Temperate North America; *Bungia* (1 sp.), Western Asia, Herat; *Pimephales* (2 sp.), Eastern United States; *Hyborhynchus* (3 sp.), Eastern United States; *Eriemba* (1 sp.), United States; *Pseudorasbora* (1 sp.), Japan, China; *Cochlognathtis* (1 sp.), Texas; *Ecoglossum* (2 sp.), United States; *Rhinichthys* (6 sp.), Eastern United States; *Rohtechthys* (1 sp.), Borneo and Sumatra; *Lepto-barbina* (1 sp.), Sumatra and Borneo; *Rasbora* (12 sp.), East Coast of Africa, India, to Java and Borneo; *Luciosma* (3 sp.), Java, Sumatra, and Borneo; *Nuria* (2 sp.), India, Tenasserim, and Ceylon; *Aphyocypris* (1 sp.), North China; *Amblypharyngodon* (3 sp.), India to Tenasserim; *Cyprinion* (3 sp.), Syria and Persia; *Semiplogen* (1 sp.), Assam; *Xenocypris* (1 sp.), China; *Paracanthobrama* (1 sp.), China; *Mystacoleucus* (1 sp.), Sumatra; *Leuciscus* (84 sp.), Nearctic and Palaearctic regions (5 sp. are British); *Ctenopharyngodon* (1 sp.), China; *Mylopharodon* (1 sp.), California; *Paraphoxinus* (2 sp.), South-eastern Europe; *Meda* (1 sp.), River Gila; *Tinca* (1 sp.), Europe (Britain to Constantinople); *Leucosomus* (8 sp.), Nearctic region; *Chondrostoma* (7 sp.), Europe and Western Asia; *Orthodon* (1 sp.), California; *Acrochilus* (1 sp.), Columbia River; *Achilognathus* (6 sp.), China, Japan, and Formosa; *Rhodeus* (3 sp.), Central Europe and China; *Pseudoperilampus* (1 sp.), Japan; *Danio* (8 sp.), India and Ceylon; *Pterosarion* (2 sp.), Central India and Assam; *Aspidoparia* (3 sp.), Continental India; *Barilius* (15 sp.), East Africa and Continental India; *Bola* (1 sp.), Ganges to Bramahputra; *Schaera* (1 sp.), Bengal; *Opsariichthys* (5 sp.), Japan and Formosa; *Squaliobarbus* (1 sp.), China; *Ochotobius* (1 sp.), North China;
Hypophthalmichthys (2 sp.), China; Abramis (16 sp.), North America, Central Europe, and Western Asia (1 sp. is British); Aspius (3 sp.), East Europe, Western Asia, China; Alburnus (15 sp.), Europe and Western Asia (1 British sp.); Rasborichthys (1 sp.), Borneo; Elopichthys (1 sp.), China; Pelotrophus (2 sp.), East Africa; Acanthobrama (3 sp.), Western Asia; Osteobrama (5 sp.), Continental India; Chanodichthys (6 sp.), China and Formosa; Smiliogaster (1 sp.), Bengal; Culter (2 sp.), China; Pelocus (1 sp.), Eastern Europe; Eustira (1 sp.), Ceylon; Chela (16 sp.), India to Siam, Java and Borneo; Pseudolabuca (1 sp.), China; Cachius (1 sp.), Continental India; Homaloptera (8 sp.), India to Cochin China, Java, and Sumatra; Psilorhynchus (2 sp.), North-eastern India; Misgurnus (5 sp.), Europe to India, China, and Japan; Nemachilus (37 sp.), Europe and Asia; Cobitis (3 sp.), Europe, India, Japan; Lepidocephalichthys (3 sp.), India, Ceylon, and Java; Acanthopsis (2 sp.), Tenasserim, Sumatra, Java, and Borneo; Botia (7 sp.), India to Japan and Sunda Isles; Oreonectes (1 sp.), China; Lepidocephalus (1 sp.), Java and Sumatra; Acanthophthalmus (2 sp.), Java and Sumatra; Apua (1 sp.), Tenasserim; Kneria (2 sp.), Tropical Africa.

FAMILY 76.—GONORHYNCHIDÆ. (1 Genus, 1 Species.)

"A marine fish with spiny scales, mouth with barbels, and with short dorsal fin opposite the ventrals."

DISTRIBUTION.—Temperate parts of Southern Oceans, and Japan.

FAMILY 77.—HYODONTIDÆ. (1 Genus, 1 Species.)

"A fresh-water fish with cycloid scales and posterior dorsal fin."

DISTRIBUTION.—Fresh waters of North America.
Family 78.—OSTEOGLOSSIDÆ. (3 Genera, 5 Species.)
"Fresh-water fishes, with large hard scales, and dorsal fin opposite and equal to the anal fin."

Distribution.—Tropical rivers.

The genera are:—Osteoglossum (3 sp.), Eastern South America, Sunda Islands, and Queensland; Arapaima (1 sp.), Eastern South America—the "Pirarucú" of the Amazon; Heterotis (1 sp.), Tropical Africa.

Family 79.—CLUPEIDÆ. (18 Genera, 161 Species.)
"Marine scaly fishes, without barbels, and with the abdomen often compressed and serrated."

Distribution.—Seas of the whole globe, many species entering rivers. They are most abundant in the Indian seas, less so in America, scarce in Africa, while they are almost absent from Australia. The Herring, Sprat, Shad, and Pilchard, are British species of Clupea, a genus which contains 61 species and ranges all over the world.

Family 80.—CHIROCENTRIDÆ. (1 Genus, 1 Species.)
"A marine fish, with thin deciduous scales, no barbels, and posterior dorsal fin."

Distribution.—The Eastern seas from Africa to China.

Family 81.—ALEPOCEPHALIDÆ. (1 Genus, 1 Species.)
"A marine fish, covered with thin cycloid scales, no barbels, and posterior dorsal fin."

Distribution.—Deep waters of the Mediterranean.
FAMILY 82.—NOTOPTERIDÆ. (1 Genus, 5 Species.)

“Fresh-water fishes, without barbels, head and body scaly, long tapering tail, and short posterior dorsal fin.”

**Distribution.**—Rivers of India, Siam, the Sunda Islands, and West Africa.

FAMILY 83.—HALOSAURIDÆ. (1 Genus, 1 Species.)

“Marine fishes, with cycloid scales, a short median dorsal fin, and no barbels.”

**Distribution.**—Deep waters of the Atlantic, Madeira.

FAMILY 84.—GYMNOTIDÆ. (5 Genera, 20 Species.)

“Fresh-water fishes, with elongate bodies, pointed tail, and no dorsal fin.”

**Distribution.**—Tropical America from Trinidad to the River Parana.

The genera are distributed as follows:—

*Sternarchus* (8 sp.), Guiana and Brazil; *Rhamphichthys* (6 sp.), Guiana and Brazil; *Sternophygus* (4 sp.), Tropical America; *Carapus* (1 sp.), Trinidad to Brazil; *Gymnotus*, (1 sp. —the Electric eel), Tropical South America.

FAMILY 85.—SYMBRANCHIDÆ. (4 Genera, 6 Species.)

“Marine and fresh-water fishes, having elongate bodies without fins, and very minute scales or none.”

**Distribution.**—Fresh waters and coasts of Western Australia and Tasmania.

The genera are:—

*Amphipnous* (1 sp.), Bengal; *Monopterus* (1 sp.), Siam to Northern China and Sunda Islands; *Symbranchus* (3 sp.), Tropical
America, and India to Australia; *Chilobranchus* (1 sp.), Australia and Tasmania.

**Family 86.**—**Murènidae.** (26 Genera, 230 Species.)

"Marine or fresh-water fishes, with cylindrical or band-like bodies and no ventral fins."

**Distribution.**—The seas and fresh waters of temperate and tropical regions. This family is divided by Dr. Günther into two sub-families and nine sections. The genus *Anguilla*, comprising our common Eel and a number of species from all parts of the world, is the only one which is found in fresh water, though even here most of the species are marine. *Anguilla* and *Conger* are the only British genera.

**Family 87.**—**Pegasidae.** (1 Genus, 4 Species.)

"Small marine fishes, covered with bony plates, and short opposite dorsal and anal fins."

**Distribution.**—Indian Ocean and seas of China and Australia.

**Order V.**—**Lophobranchii.**

"Fish with a segmented bony covering, long snout, and small toothless mouth."

**Family 88.**—**Solenostomidae.** (1 Genus, 3 Species.)

"Marine Lophobranchii, with wide gill openings and two dorsal fins."

**Distribution.**—Indian Ocean, from Zanzibar to China and the Moluccas.
Family 89.—Syngnathideæ. (15 Genera, 112 Species.)

"Marine Lophobranchii, with very small gill opening and one soft dorsal fin."

Distribution.—All the tropical and temperate seas. Some species of Syngnathus, Doryichthys, and Celonotus enter fresh water, and a few live in it exclusively. Siphonostoma, Syngnathus, Nerophis, and Hippocampus are British genera. The Hippocampina (5 genera, 25 sp.), or Sea-horses, are peculiar to the Indian and Pacific Oceans, except three or four species of Hippocampus in the Atlantic and Mediterranean.

Order VI.—Plectognathi.

"Fishes covered with rough scales or shields, having a narrow mouth, and soft posterior dorsal fin."

Family 90.—Sclerodermi. (7 Genera, 95 Species.)

"Marine Plectognathi, with toothed jaws."

Distribution.—Temperate and Tropical seas, but much more abundant in the Tropics.

Family 91.—Gymnodontes. (10 Genera, 82 Species.)

"Marine or fresh-water Plectognathi, with jaws modified into a beak."

Distribution.—Temperate and tropical regions.

Some species of Tetrodon are found in the rivers of Tropical America, Africa, and Asia. Species of Tetrodon and Orthagariscus have been found on the British coasts.
SUB-CLASS II.—DIPNOI.

FAMILY 92.—SIRENOIDEI. (3 Genera, 3 Species.)

"Eel-shaped fresh-water fishes, covered with cycloid scales; the vertical fins forming a continuous border to the compressed tapering tail."

DISTRIBUTION.—Rivers of Tropical Africa, South America, and Australia.

The genera are:—*Protopterus* (1 sp.), Tropical Africa; *Lepidosiren* (1 sp.), Amazon Valley; *Ceratodus* (1 sp.), Queensland.

SUB-CLASS III.—GANOIDEI.

ORDER I.—HOLOSTEI.

"Body covered with scales."

FAMILY 93.—AMIIDÆ. (1 Genus, 1 Species.)

"A fresh-water fish, with cycloid scales and a long soft dorsal fin."

DISTRIBUTION.—United States.

FAMILY 94.—POLYPTERIDÆ. (2 Genera, 2 Species.)

"Fresh-water fishes, with ganoid scales and dorsal spines."

DISTRIBUTION.—Central and Western Africa.

The genera are:—
*Polypterus* (1 sp.), the Nile and rivers of West Africa; *Calamoichthys* (1 sp.), Old Calabar.
Family 95.—LEPIDOSTEIDÆ. (1 Genus, 3 Species.)

“Fresh-water fishes, with ganoid scales, and dorsal and anal fins composed of articulated rays.”

Distribution.—The genus *Lepidosteus*, the Garfishes or Bony Pikes, inhabits North America to Mexico and Cuba.

Order II.—CHONDROSTEI.

“Sub-cartilaginous scaleless fishes with heterocercal tail, the skin with osseous bucklers or naked.”

Family 96.—ACCIPENSERIDÆ. (2 Genera, 20 Species.)

“Marine or fresh-water fishes with osseous bucklers and inferior mouth.”

Distribution.—Temperate and Arctic regions of the northern hemisphere. *Acipenser* (19 sp.), comprising the Sturgeons, has the distribution of the family; most of the species are marine, but some are confined to the Caspian and Black Seas and the great American lakes with the rivers flowing into them, while the Danube, Mississippi, and Columbia River have peculiar species. The other genus, *Scaphirhynchus* (1 sp.), is confined to the Mississippi and its tributaries.

Family 97.—POLYDONTIDÆ. (1 Genus, 2 Species.)

“Fresh-water fishes, with wide lateral mouth and naked skin.”

Distribution.—The Mississippi and Yang-tse-kiang rivers.
Sub-class IV.—Chondropterygii. (Sharks and Rays.)

Order I.—Holocephala. (Chimaeras.)

Family 98.—Chimaeridae. (2 Genera, 4 Species.)

“Shark-like marine fishes, snout of the male with a prehensile organ.”

Distribution.—Northern and Southern temperate seas. Chimaera is British.

Order II.—Plagiostomata.

Sub-order.—Selachioidea. (Sharks.)

Family 99.—Carcharidæ. (11 Genera, 59 Species.)

“Sharks with two dorsals and a nictitating membrane.”

Distribution.—Seas of the Arctic, temperate, and tropical regions. Species of Galeus and Mustelus have occurred on our coasts.

Family 100.—Lamnidae. (5 Genera, 7 Species.)

“Sharks with two dorsals and no nictitating membrane.”

Distribution.—Temperate and tropical seas. Species of Lamna, Alopecias, and Selache have occurred in British seas.
**Family 101.—Rhinodontidae.** (1 Genus, 1 Species.)

"Sharks with two dorsal fins, the second small, and no nictitating membrane."

**Distribution.**—South and East Africa.

**Family 102.—Notidanidae.** (1 Genus, 4 Species.)

"Sharks with one dorsal fin and no nictitating membrane."

**Distribution.**—Temperate and tropical seas, from the North Atlantic to the Cape of Good Hope and California. One species has occurred on our southern coasts.

**Family 103.—Scylliidae.** (7 Genera, 25 Species.)

"Sharks with one dorsal fin and no nictitating membrane."

**Distribution.**—All temperate and tropical seas. Species of Scyllium and Pristiurus are British.

**Family 104.—Cestraciontidae.** (1 Genus, 4 Species.)

"Sharks with two dorsal fins and no nictitating membrane."

**Distribution.**—Pacific Ocean from Japan to New Zealand, Moluccan Sea.

**Family 105.—Spinacidae.** (10 Genera, 21 Species.)

"Sharks with two dorsal fins and no nictitating membrane, no anal fin."

**Distribution.**—Arctic, temperate, and tropical seas. Species of Acanthias, Lamarchus, and Eckinorhinus have occurred on our coasts.
Family 106.—Rhinidae. (1 Genus, 1 Species.)

"Sharks with depressed flat body and large expanded pectoral fins."

Distribution.—Temperate and tropical seas, from Britain to California and Australia.

Family 107.—Pristiophoridae. (1 Genus, 4 Species.)

"Sharks with produced flat snout, armed with teeth on each edge."

Distribution.—Seas of Japan and Australia.

Sub-order Batoidei. (Rays.)

Family 108.—Pristidae. (1 Genus, 5 Species.)

"Rays with produced snout and lateral saw-like teeth."

Distribution.—Seas of tropical and sub-tropical regions.

Family 109.—Rhinobatidae. (3 Genera, 15 Species.)

"Rays with long and strong tail, having a caudal and two dorsal fins."

Distribution.—Tropical and sub-tropical seas.

Family 110.—Torpedinidae. (6 Genera, 15 Species.)

"Rays with broad smooth disc, and an electric organ."

Distribution.—Tropical and temperate seas, from Britain to Tasmania.

Family 111.—Raieae. (4 Genera, 29 Species.)

"Rays with broad rhombic disc and no serrated caudal spine."

Distribution.—All temperate and tropical seas. Several species of Raia are found on our coasts.
Family 112.—Trygonidae. (6 Genera, 43 Species.)

"Rays with the pectoral fins extending to end of snout."

Distribution.—Seas of all temperate and tropical regions, and rivers of Tropical America. A species of Trygon has occurred on our Southern coast. Ellipesurus and Teaniura are found in the fresh waters of the interior of South America, while the latter genus occurs also in the Indian seas, but not in the Atlantic.

Family 113.—Mylobatidae. (5 Genera, 22 Species.)

"Rays with very broad pectoral fins not extending to end of snout."

Distribution.—Temperate and tropical seas. A species of Myliobatis is British, but most of the species and genera are confined to tropical seas. Dicerobatis and Ceratoptera are very large Rays, commonly called Sea-devils.

Sub-class V.—Cyclostomata.

"Cartilaginous fishes, with suckorial mouths and without lateral fins."

Family 114.—Petromyzontidae. (4 Genera, 12 Species.)

"Marine or fresh-water eel-like fishes, with suckorial mouths and without barbels."

Distribution.—Coasts and fresh waters of temperate regions of both hemispheres. Three species of Petromyzon (Lampreys), are British.
Family 115.—Myxinidae. (2 Genera, 5 Species.)

"Marine eel-like fishes, with four pairs of barbels."

Distribution.—Seas of the temperate regions of both hemispheres.

Sub-class VI.—Leptocardii.

Family 116.—Cirrhostomi. (1 Genus, 1 Species.)

"A small marine fish with no jaws or fins, and with rudimentary eyes."

Distribution.—The only species, the Lancelet, is the lowest form of living vertebrate. It is found in the temperate regions of both hemispheres, and has occurred on our southern coast.

Remarks on the Distribution of Fishes.

Marine Fish.—There are about 80 families of marine fishes, and of these no less than 50 are universally, or almost universally, distributed over the seas and oceans of the globe. Of the remainder many are widely distributed, some species even ranging from the North Atlantic to Australia. Six families are confined to the Northern Seas, but four of these consist of single species only, the other two being the Discoboli (2 genera, 11 sp.), and the Accipenseridæ (2 genera and 20 sp.). Only one family (Acanthoclinidæ) is confined to the Southern oceans, and that consists of but a single species. Four families (Sternoptychidæ), Stomiatidæ, Alepocephalidæ and Halosauridæ) are confined to the Atlantic Ocean, while 13 are found only in the Pacific; and of the remainder several are more abundant in the Pacific than the Atlantic. Two families (Lycodidæ and Gadidæ) are found in the Arctic and Antarctic seas only, though the
latter family has a single species in the Indian seas. Among the curiosities of distribution are,—the extensive genus *Diagramma*, confined to the Pacific with the exception of one species in the Mediterranean; the single species constituting the family Lophotidae, found only in the Mediterranean and Japan; the small family of Notacanthi, confined to Greenland, the Mediterranean, and West Australia; and the four families, Sternopthyidae, Stomiidae, Alepocephalidae, and Halosauridae, which are believed to inhabit exclusively the depths of the ocean, and are therefore very rarely obtained.

**Fresh-water Fish.**—There are 36 families of fishes which inhabit fresh water exclusively, and 5 others, which are both marine and fresh-water. These present many interesting peculiarities of distribution. The Neotropical region is the richest in families, and probably also in genera and species. No less than 22 families inhabit it, and of these 6 are altogether peculiar. The Ethiopian and Nearctic regions each have 18 families, the former with 3, and the latter with 5 peculiar. Several isolated forms, requiring to be placed in distinct families, inhabit the great American lakes; and, no doubt, when the African lakes are equally well known, they will be found also to possess many peculiar forms. The Oriental region comes next, with 17 families, of which 3 are peculiar. The Palæarctic has 12, and the Australian 11 families, each with only 1 altogether peculiar to it.

If we take those regions which are sometimes supposed to be so nearly related that they should be combined, we shall find the fresh-water fishes in most cases markedly distinct. The Nearctic and Palæarctic regions, for example, together contain 20 families, but only 11 of these occur in both, and only 5 are exclusive inhabitants of these two regions. This shows an amount of diversity that would not, perhaps, be exhibited by any other class of animals. The Ethiopian and Oriental regions together possess 24 families, only 11 of which are found in both, and only 1 exclusively characteristic of the two. The Australian and Neotropical regions possess together 27 families, of which 7 are found in both, and 3 are exclusively characteristic of the two. This last fact is very interesting: the marine family of
Trachinidæ possesses a fresh-water genus, *Aphritis*, one species of which inhabits Tasmania, and two others Patagonia; the Haplochitonidæ (2 genera, 3 sp.) are found only in Tierra del Fuego, the Falkland Islands, and South Australia; and the Galaxidæ (1 genus, 12 sp.) inhabit the same regions, but extend to Chili, to New Zealand and to Queensland. We have here an illustration of that connection between South America and Australia which is so strongly manifested in plants, but of which there are only scattered indications in most classes of animals. The dividing line across the Malay Archipelago, separating the Oriental from the Australian regions, and which is so strikingly marked in mammalia and birds, is equally so in fresh-water fishes. No less than six families have their eastern limits in Java and Borneo; while the extensive family of Cyprinidæ has no less than 23 genera in Java and Borneo, but not a single species has been found in Celebes or the Moluccas.

The distribution of fresh-water fishes lends no support to the view that the peninsula of India belongs to the Ethiopian region. A large proportion of the Oriental families are common to the whole region; while there is hardly a single example, of a characteristic Ethiopian family or genus extending into the peninsula of India and no further.

Among the special peculiarities of distribution, is the curious fish, forming the family Comephoridae, which is confined to Lake Baikal, among the mountains of Central Asia, 2,000 feet above the sea, and a thousand miles distant from the ocean; yet having its nearest allies in the exclusively oceanic family of the mackerels (Scomberidæ). The Characinidæ are confined to Africa and South America, distinct genera inhabiting each region. The Salmonidæ are confined to the two northern regions, except a single species of a peculiar genus in New Zealand. The genus *Osteoglossum* has a species in South America, another in the Sunda Islands, and a third in Queensland; while the curious Sirenoidei are represented by single species of peculiar genera in Tropical America, Tropical Africa, and Tropical Australia.

Fossil Fishes.—Fishes have existed from a very remote era, and it is remarkable that the first whose remains have been dis-
covered belong to the Ganoidei, a highly developed group which has continued to exist down to our times, and of which the sturgeon is the best known example. We may therefore be sure that the Upper Silurian rocks in which these are found, although so very far back in geological history, do not by any means lead us to the time when the primitive fish-type appeared upon the earth. In the Carboniferous and Permian formations numerous remains of fishes are found, allied to the *Lepidosteus* or Gar-pike of North America. The next group in order of appearance, are the Plagiostomata, containing the existing Sharks and Rays. Traces of these are found in the highest Silurian beds, and become plentiful in the Devonian and Carboniferous formations and in all succeeding ages, being especially abundant in Cretaceous and Eocene strata. The Holoccephali appear first in the Oolitic period, and are represented by the living Chimaeridae. The Dipnoi, to which belong the *Lepidosiren* and *Ceratodus*, are believed to have existed in the Triassic period, from the evidence of teeth almost identical with those of the existing Australian fish. All the ancient fossil fishes belong to the above-mentioned groups, and many of them have little resemblance to existing forms. The Teleostean fishes, which form the great bulk of those now living, cannot be traced back further than the Cretaceous period, while by far the larger number first appear in the Tertiary beds. The Salmonidae, Scopelidae, Percidae, Clupeidae, Scrombresocidae, Mugilidae, and Siluridae, or forms closely allied to them, are found in the Cretaceous formation. In the Eocene beds we first meet with Squammipennes, Cyprinidae, Pleuronectidae, Characinidae, Murænidæ, Gadidae, Pediculari, Syngnathidae, and Hippocampidae.

Most of these fossils represent marine fishes, those of fresh-water origin being rare, and of little importance as an aid in determining the causes of the distribution of living forms. To understand this we must look to the various changes of the land surface which have led to the existing distribution of all the higher vertebrates, and to those special means of dispersal which Mr. Darwin has shown to be possessed by all fresh-water productions.
CHAPTER XXI.

THE DISTRIBUTION OF SOME OF THE MORE IMPORTANT FAMILIES AND GENERA OF INSECTS.

Although insects are, for the most part, truly terrestrial animals, and illustrate in a very striking manner the characteristic phenomena of distribution, it is impossible here to treat of them in much detail. This arises chiefly from their excessive numbers, but also from the minuteness and obscurity of many of the groups, and our imperfect knowledge of all but the European species. The number of described species of insects is uncertain, as no complete enumeration of them has ever been made; but it probably exceeds 100,000, and these may belong to somewhere about 10,000 genera—many times more than all vertebrate animals together. Of the eight Orders into which Insects are usually divided, only two—the Coleoptera and Lepidoptera—have been so thoroughly collected in all parts of the globe that they can be used, with any safety, to compare their distribution with that of vertebrate animals; and even of these it is only certain favourite groups which have been so collected. Among Lepidoptera, for example, although the extensive group of Butterflies may be said, in a general sense, to be thoroughly well known—every spot visited by civilized man having furnished its quota to our collections—yet the minute Tineidæ, or even the larger but obscure Noctuidæ, have scarcely been collected at all in tropical countries, and any attempt to study their geographical distribution would certainly lead to erroneous results. The same thing occurs, though perhaps in a less degree, among the Coleoptera. While the Carabidæ, Buprestidæ, and
Longicorns of the Tropics, are almost as well known as those of the Temperate Zones, the Staphylinidae, the smaller Elateridae, and many other obscure and minute groups, are very imperfectly represented from extra-European countries. I therefore propose to examine with some care the distribution of the Butterflies, and the Sphingina among Lepidoptera, and the following large and well-known families of Coleoptera:—Cicindelidae, Carabidae, Lucanidae, Cetoniidae, Buprestidae, and the three families of Longicorns. These families together contain over 30,000 species, classed in nearly 3,000 genera, and comprise a large proportion of the best known and most carefully studied groups. We may therefore consider, that a detailed examination of their distribution will lead us to results which cannot be invalidated by any number of isolated facts drawn from the less known members of the class.

Range of Insects in Time.—In considering how much weight is to be given to facts in insect distribution, and what interpretation is to be put upon the anomalies or exceptional cases that may be met with, it is important to have some idea of the antiquity of the existing groups, and of the rate at which the forms of insect life have undergone modification. The geological record, if imperfect in the case of the higher animals, is fragmentary in the extreme as regards indications of former insect life; yet the positive facts that it does disclose are of great interest, and have an important bearing on our subject. These facts and the conclusions they lead to have been discussed in our first volume (p. 166), and they must be carefully weighed in all cases of apparent conflict or incongruity between the distribution of insects and that of the higher animals.
Order—LEPIDOPTERA.

Sub-order—Lepidoptera Rhopalocera, or Butterflies.

Family 1.—DANAIDÆ. (24 Genera, 530 Species.)

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The Danaidæ are now held to comprehend, not only the whole of the group so named by Doubleday, but a large portion of the Heliconidæ of that author. Their range is thus extended over the whole of the tropical regions. A few species spread northwards into the Palæarctic and Nearctic regions, but these are only stragglers, and hardly diminish the exclusively tropical character of the group. The more remarkable genera are,—Hestia (10 sp.), and Ideopsis (6 sp.), confined to the Malayan and Moluccan districts; Danais (50 sp.), which has the range of the whole family; Euploea (140 sp.), confined to the Oriental and Australian regions, but especially abundant in the Malayan and Moluccan districts; Hamadryas (4 sp.), Australian region only. The remaining genera constitute the Danaiid Heliconidæ, and are strictly confined to Tropical America, except a few species which extend into the southern parts of the Nearctic region. The chief of these genera are:—

Ithomia (160 sp.), Melinaea (18 sp.), Napeogenes (20 sp.), Mechanitis (4 sp.), Cretina (32 sp.), Dirceina (10 sp.), and Lycorea (4 sp.). Florida, Louisiana, and Southern California, mark the northern extent of these insects.
INSECTS.

FAMILY 2.—SATYRIDÆ. (60 Genera, 835 Species.)

General Distribution.

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This family has an absolutely universal distribution, extending even into the Arctic and Antarctic regions. Many of the genera are, however, restricted in their range.

Hætera, Lymanopoda, Calisto, Corades, Taygetis, Pronophila, Euptrychia, and some allied forms (25 genera in all) are Neotropical, the last named extending north to Canada; Debis, Melanitis, Mycalesis and Ypthima, are mostly Oriental, but extending also into the Australian and the Ethiopian regions; Gnaphodes, Leptoneuræ, and a few other small genera, are exclusively Ethiopian; Xenica, Hypocista, and Heteronympha, are Australian; Erebia, Satyrus, Hipparchia, Cœnonympha, and allies, are mostly Palearctic, but some species are Ethiopian, and others Nearctic; Chionabas, is characteristic of the whole Arctic regions, but is also found in Chili and the Western Himalayas. The peculiar genera in each region are,—Neotropical, 25; Australian, 7; Oriental, 11; Ethiopian, 5; Palearctic, 3; Nearctic, 0.

FAMILY 3.—ELYMNIIIDÆ. (1 Genus, 28 Species.)

General Distribution.

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The genus *Elymnias*, which constitutes this family, is characteristic of the Malayan and Moluccan districts, with some species in Northern India and one in Ashanti. It thus agrees with several groups of Vertebrata, in showing the resemblance

Vol. II.—31
of Malaya with West Africa independently of the Peninsula of India.

**Family 4. Morphidae.** (10 Genera, 106 Species.)

**General Distribution.**

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The Morphidae are a group of generally large-sized butterflies, especially characteristic of the Malayan and Moluccan districts, and of Tropical America; with a few species extending to the Himalayas on the west, and to Polynesia on the east. The genera are:

Amathusia (6 sp.), Northern India to Java; Zeuxidia (9 sp.), the Malay district; Discophora (7 sp.), Northern India to Philippines, Java and Timor; Enispe (3 sp.), Northern India; Hyades (15 sp.), Moluccan and Polynesian districts, except one species in Java; Clerome (11 sp.), Northern India to Philippines and Celebes; Aemona (1 sp.), Sikhim; Hyantis (1 sp.), Waigiu; Thaumantis (10 sp.), Indo-Chinese and Malayan districts; Morpho (40 sp.), Neotropical region, Brazilian and Central American sub-regions.

**Family 5. Brassolidae.** (7 Genera, 62 Species.)

**General Distribution.**

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The Brassolidae have the same distribution as the genus Morpho. The genera are:

Brassolis (5 sp.); Opsiphanes (17 sp.); Dynastor (2 sp.); Pencetes (1 sp.); Caligo (21 sp.); Nurope (5 sp.); and Dasyopthalmia (3 sp.)
### FAMILY 6.—ACRAEIDÆ. (1 Genus, 90 Species.)

**General Distribution.**

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The genus *Acraea* is especially abundant in the Ethiopian region, which contains two-thirds of all the known species; 3 or 4 species only, range over the whole Oriental, and most of the Australian regions; while all the rest inhabit the same districts of the Neotropical region as the Brassolidae.

### FAMILY 7.—HELICONIDÆ. (2 Genera, 114 Species.)

**General Distribution.**

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The true Heliconidae are very characteristic of the Neotropical region; one species only extending into the Southern States of North America as far as Florida. The genus *Heliconius* (83 sp.), has the range of the family; while *Eucides* (19 sp.), is confined to the Brazilian and Central American sub-regions.

### FAMILY 8.—NYMPHALIDÆ. (113 Genera, 1490 Species.)

**General Distribution.**

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This is the largest and most universally distributed family of butterflies, and is well illustrated by our common Fritillaries,
Tortoise-shell, Peacock, Painted Lady, and Purple Emperor butterflies. They are found wherever butterfly-life can exist, and some single species—like the Painted Lady (Pyrameis cardui)—range almost over the globe. A few of the more extensive and remarkable genera only, can be here noticed:

Colcaenis, Agraulis, Eresia, Synchloc, Epicalia, Eunica, Eubagis, Catagramma, Callitheca, Agemonia, Timetes, Heterochroa, Prepona, Hypma, Paphia, and Siderone, are wholly Neotropical, as well as many others which have a smaller number of species. Euryphene, Romaleosoma, Aterica, and Harma, are exclusively Ethiopian. Terinos, Athyma, Adolias, and Tanacia, are Oriental, but they mostly extend into the Moluccan region; the last however is strictly Malayan, and Adolias only reaches Celebes. Mynes alone, is exclusively Australian, but Prothoe is almost so, having only one outlying species in Java. Eurytela and Ergolis are confined to the Oriental and Ethiopian regions, but the latter reaches the Moluccas. Cethosia, Cirrhochroa, Messaras, and Symphaedra, are both Oriental and Australian; while Junonia, Cyrestis, Diadema, Neptis, and Nymphalis, are common to the three tropical regions of the Eastern Hemisphere, the latter extending into the Mediterranean district, while Junonia occurs also in South America and the Southern United States.

The most cosmopolitan genus is Pyrameis, which has representatives in every region and every district. Apatura is found in all but the Ethiopian and the Australian, although it just enters the confines of the latter region in Celebes; Limenitis is abundant in the Oriental region, but extends eastward to Celebes and westward into Europe, North America, and even into South America. Argynnis, Melitæa, and Vanessa, are almost confined to the Palaearctic and Nearctic regions; the former however occurs in the Himalayas and in the mountains of Java, and also in Chili and in Jamaica. Two genera—Dicerorrhagia and Helcyra—have both one species in North India and another in the island of Ceram. The number of genera peculiar to each region is as follows:—Neotropical, 50; Australian, 2; Oriental 15; Ethiopian, 14; Palaearctic, 1; Nearctic, 0.
FAMILY 9.—LIBYTHEIDÆ. (1 Genus, 10 Species.)

General Distribution.

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The genus *Libythea*, which constitutes this family, appears to have its head-quarters in the Oriental region, but extends on all sides in an erratic manner, into various remote and disconnected portions of the globe, as indicated above.

FAMILY 10.—NEMEOBIIDÆ. (12 Genera, 145 Species.)

General Distribution.

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This group has been separated from the Erycinidæ of the older authors, and contains all the non-American genera and species. Half the genera and nearly four-fifths of the species of this group are, however, Neotropical; one is European; two or three African; and twenty-six Oriental and Australian. The genera are:

*Nemoebius* (1 sp.), Europe; *Dodona* (6 sp.), North India; *Zemeros* (2 sp.), North India and Malaya; *Abisara* (11 sp.), North India, Malayan and Moluccan districts, Madagascar and West Africa; *Taxila* (8 sp.), North India and Malaya; *Dicallanura* (2 sp.), Moluccan district; *Alesa* (6 sp.), *Eunogyrva* (2 sp.), *Cremna* (7 sp.), *Bootis* (3 sp.), are all from the Brazilian sub-region; *Eurybia* (10 sp.), *Mesosemia* (80 sp.), inhabit both the Brazilian and Mexican sub-regions.
Family 11.—Eurygonidae. (2 Genera, 78 Species.)

General Distribution.

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This small family, separated from the true Erycinidae by Mr. Bates, is confined to the tropical forest-districts of continental America. The genera are:—

Eurygona (71 sp.); Methonella (1 sp.); the latter found in Equatorial South America.

Family 12.—Erycinidae. (59 Genera, 560 Species.)

General Distribution.

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This extensive family of small, but exquisitely beautiful butterflies, is especially characteristic of the virgin forests of the Neotropical region, only a few species of three genera extending into the Nearctic region. The more important genera, and those which have an exceptional distribution, can alone be here noticed. Charis extends from Brazil to New York; Apodemia from Brazil to California, Utah, and Oregon; Amarynthis inhabits the Brazilian and Antillean sub-regions; Lepicorinis and Metaphes are small genera found only in the Mexican sub-region; Lymnas, Neeyria, Ancyluris, Diorthina, Esthemopsis, Anteros, Emesis, Symmachia, Cricosoma, Calydna, Lemonias, Nymphidium, Theope, and Aricoris are common to the Brazilian and Mexican sub-regions. All the other genera (40 in number) are only known from the Brazilian sub-region, and of these a considerable proportion are confined to the damp equatorial forests of the Amazon Valley.
Family 13.—Lycænidae. (39 Genera, 1,220 Species.)

General Distribution.

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The Lycænidae—of the variety and beauty of which in tropical regions our own "Blues" and "Coppers" give but a faint idea—are a group of universal distribution. We shall therefore indicate those genera which are restricted to one or more regions, or are nearly cosmopolitan. The large genus Polyommatus (containing 325 species) has the same universal distribution as the entire family. Our common "Blues" well represent this genus. Lycæna (comprising the "Coppers") is more especially characteristic of the Palæarctic and Nearctic regions, but straggling species occur also in North India, South Africa, Chili, and New Zealand. Thecla is especially characteristic of the Neotropical region, where there are about 370 species; in the Nearctic region, 36; in the Palæarctic 13; and in the Ethiopian 3. Miletus, Lucia, Hypolycaena, Myrina, and Deudorix are common to the three tropical regions of the Eastern Hemisphere—the Ethiopian, Oriental, and Australian. Aphnæus and Iolaus are common to the Ethiopian and Oriental regions, the latter extending to Celebes. Ialmenus, Pseudodipsas, Curetis, and Amblypodia are common to the Oriental and Australian regions, but the first-named is found also in Madagascar. Zephyrus is found only in the Nearctic and Palæarctic, Eumæus in the Nearctic and Neotropical regions. The Nearctic region has one peculiar genus (Fenisca); the Palæarctic has two—Thestor and Lacosopsis; the Ethiopian has nine—Pentila, Liptana, D'Urbania, Axioercés, Capys, Phytala, Epitola, Hewitsonia, and Deloneura; the Oriental has five—Allotinus, Ilerda, Portia, Camena, and Liphyra; the Australian has three—Hypochrysops, Utica, and Ogyris; and the Neotropical also three—Lamprospilus, Theorema, and Trichonis.
Family 14.—PIERIDÆ. (35 Genera, 817 Species.)

General Distribution.

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The Pieridæ are distributed almost, if not quite, as widely over the globe as the last family, and we shall group the genera in the same manner. *Pieris* (130 sp.) is cosmopolitan; *Terias* and *Callidryas* are found in all the four tropical regions, and as far north as Pennsylvania in the Nearctic region; *Pontia, Tachyris, Eronia,* and *Thestias* are common to the Ethiopian, Oriental, and Australian regions, the last-named, however, only extending as far as Timor; *Colias* is pre-eminently Palaearctic and Nearctic, with a few Ethiopian species, one Indian, two in Chili, and one in the Sandwich Islands; *Anthocharis* is wholly Palaearctic and Nearctic; *Midea* has two species Nearctic, and one in Japan; *Gonepteryx* is Palaearctic and Neotropical, extending into Texas; *Idmais* and *Callosune* are Ethiopian and Oriental; *Thyca* and *Iphias* are Oriental and Australian; *Meganostoma* is Nearctic and Neotropical; *Nathalis* and *Kricogonia* are Neotropical, ranging into Florida, Texas, and Colorado.

The peculiar genera are pretty equally distributed. The Neotropical region has ten, two being confined to Chili; *Euterpe* and *Leptalis* are the most remarkable, the latter containing a number of forms mimicking the Heliconidæ and Danaidæ. The Oriental region has two, *Prioneris* and *Dercas*; the Australian one, *Elodina*; the Ethiopian two, *Teracolus* and *Pseudopontia*; the Palaearctic two, *Leucophasia* and *Zegris*; the Nearctic one, *Neophasia.*
The Papilionidae, comprising many of the noblest and richest-coloured butterflies, and long placed at the head of the group, are almost as universally distributed as the Pieridae, but they do not extend to so many remote islands nor so far into the Arctic and Antarctic regions. Nine-tenths of the species belong to the genus *Papilio*, and these are especially abundant in tropical regions, although species occur in every region and every sub-region. Well-marked sub-divisions of this large genus are characteristic of each great region—as the "Æneas" group in the Neotropical, the "Paris" group in the Oriental, the "Ægeus" group in the Australian, the "Zenobius" group in the Ethiopian, and many others. The few species of the Palaearctic region belong, on the other hand, to a group of universal distribution, and the Nearctic has a good number of species allied to Neotropical forms.

The other genera have mostly a very restricted range. *Parnassius* is an Alpine genus, confined to the Palaearctic and Nearctic regions. The Palaearctic region further possesses 5 peculiar genera—*Mesapia, Hypermnestra, Doritis, Sericinus, and Thais*; the Oriental has 4, *Calinaga, Teinopalpus, Bhutanitis, and Leptocircus*, the latter going as far as Celebes; the Australian has 1, *Eurycus*; and the Neotropical 1, *Euryades*, confined to the Chilian sub-region. The Ethiopian and the Nearctic regions have no peculiar genera.
Family 16.—HESPERIDÆ. (52 Genera (?) 1,200 Species.)

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The Hesperidæ, or Skippers, are an immense group of mostly small obscurely coloured butterflies, universally distributed, and of which hosts of species still remain to be discovered and described. As the grouping of these into genera is not yet satisfactorily accomplished, only the more extensive and best known groups will be here noticed. *Pamphila* and *Hesperia* are universally distributed; *Nisoniades* seems to be only absent from the Australian region. The Neotropical region is pre-eminently rich in Hesperidæ, 33 genera being found there, of which 20 are peculiar to it; the Australian region has 12 genera, only 1 (*Euschemon*) being peculiar; the Oriental has 18, with 3 peculiar; the Ethiopian, 13, with 3 peculiar; the Palæartic 6, with 1 (*Erynnis*) almost peculiar, a species occurring in Mexico; the Neartic 9, with none peculiar, 4 being found also in the Neotropical region, 2 in the Palæartic, and the rest being of wide distribution. Many new genera have, however, been recently described in the United States, but it is impossible yet to determine how many, if any, of these are peculiar. More than 100 species of the family are included in Mr. Edwards' "Synopsis of North American Butterflies,"—a very large number considering that Europe possesses only about 30.
Sub-order—Lepidoptera Heterocera, or Moths.

The Lepidoptera Heterocera, or Moths, are of such immense extent, and are, besides, so imperfectly known compared with the Butterflies, that it would serve no purpose to go into the details of their distribution; especially as most of the families and a considerable number of the genera are cosmopolitan. We propose therefore to notice only the Sphingina, which, being generally of large size and finely marked or coloured, and many of them day-fliers, have been extensively collected; and whose numbers are more manageable than the succeeding groups.

Group I.—Sphingina.

Family 17.—Zygænidæ (46 Genera, about 530 Species).

The Zygænidæ are universally distributed, but many of the genera are restricted in their range. Zygæna (85 sp.) is mainly Palæarctic, but 2 species are South African, and 1 North American; Procris (22 sp.) has a scattered distribution, from the Palæarctic region to South America, South Africa and North India; Heterogynis (3 sp.) and Dysauxis (3 sp.) are European; Pollanisus (3 sp.) is Australian; Glaucopis (120 sp.) is mainly Neotropical, with a few Oriental; Syntomis (94 sp.) is found in all the Old-World regions; and Euchromia (150 sp.) is found in all warm countries, though especially abundant in South America.

Family 18.—Castnidiæ (7 Genera, 63 Species).

The Castnidiæ have an interesting distribution, being mainly Neotropical, with four genera in Australia and New Guinea. Castnia, Coronis, and Gazera, with 51 species, are Neotropical; Synemon, Euschemon, Damias and Coeytia, with 12 species, are Australian, the latter being found only in the Papuan Islands.
FAMILY 19.—AGARISTIDÆ (13 Genera, 76 Species).

The Agaristidæ are beautiful diurnal moths, allied to the Castniidæ, but almost confined to the Australian and Oriental regions, with a few in the Ethiopian. The most important genera are,—Agarista (21 sp.), Australia and New Guinea; Eusemia (31 sp.), Ægocera (7 sp.), Oriental and Ethiopian regions; the other genera being confined to the islands from Java to New Guinea.

FAMILY 20.—URANIIDÆ (2 Genera, 12 Species).

These magnificent insects have a singular distribution. The gold-spangled Urania (6 sp.) is characteristic of Tropical America, but a single species of great magnificence occurs in Madagascar. The large but sober-tinted Nyctalemon (6 sp.) is found in the Neotropical, Oriental, and Australian regions.

FAMILY 21.—STYGIIDÆ. (3 Genera, 14 Species.)

These insects are confined to the Palæarctic and Neotropical regions, 2 genera in the former, 1 in the latter.

FAMILY 22.—ÆGERIIDÆ. (24 Genera, 215 Species.)

This family is found in all parts of the world except Australia. Ægeria is most abundant in Europe, but is found also in North and South America.

FAMILY 23.—SPHINGIDÆ. (40 Genera, 345 Species.)

The Sphinx Moths are cosmopolitan. The most important genera are,—MacroGLOSSA (26 sp.), Chacrocampa (46 sp.), and Macrosila (21 sp.), all cosmopolitan; Sesia (12 sp.), Europe, Asia, and North America; Deilephila (19 sp.), Palæarctic and Oriental regions, Nearctic region, and Chili; Sphinx (21 sp.), Europe,
North and South America; *Smerinthus* (29 sp.), all regions except Australia. Our Death's Head Moth (*Acherontia atropos*) ranges to Sierra Leone and the Philippine Islands.

**General Remarks on the Distribution of the Diurnal Lepidoptera and Sphingidea.**

The Diurnal Lepidoptera or Butterflies, comprehend 431 genera and 7,740 species, arranged in 16 families, according to Mr. Kirby's Catalogue published in 1871. The Sphingidea consist of 135 genera and 1,255 species, arranged in 7 families, according to the British Museum Catalogue dated 1864; and as this includes all Mr. Bates' collections in America and my own in the East, it is probable that no very large additions have since been made.

The distribution of the families and genera of Butterflies corresponds generally with that of Birds—and more especially with that of the Passerine birds—in showing a primary division of the earth into Eastern and Western, rather than into Northern and Southern lands. The Neotropical region is by far the richest and most peculiar. It possesses 15 families of butterflies, whereas the other regions have only from 8, in the Palaearctic, to 12 in the Ethiopian and Oriental regions; and as none of the Old World regions possess any peculiar families, the New World has a very clear superiority. In genera the preponderance is still greater, since the Neotropical region possesses about 200 altogether peculiar to it, out of a total of 431 genera, many of which are cosmopolitan. Comparing, now, the Eastern regions with the Western, we have two peculiar families in the former to 4 in the latter; while the Southern regions (Australian and Neotropical) possess not a single peculiar family in common.

In the Sphingidea the same general features recur in a less marked degree, the Neotropical being the richest region; but here we have one family (Castniidae) which appears to be confined to the two southern regions,—the Australian and Neotropical.

The distribution of the genera affords us some facts of special interest, which must be briefly noticed. There are several
genera typically characteristic of the North Temperate regions which have a few species widely scattered on mountains, or in the temperate parts of the Southern Hemisphere. Chili possesses representatives of four of these genera—Argynnis, Lycæna, Colias, and Deilephila; and this has been thought by some naturalists to be of such importance as to outweigh the purely Neotropical character of a large portion of the Chilian fauna, and to render it advisable to join it on, as an outlying portion of a great North Temperate zoological region. But when we remember that Argynnis occurs also in Java, and Lycæna in New Zealand, while Colias ranges to Southern Africa, Malabar, and the Sandwich Islands, we can hardly admit the argument to be a sound one. For a fuller discussion of this question see Vol. II., pp. 43—47. The remarkable fact of the existence of the otherwise purely Neotropical genus, Urania, in Madagascar is even more striking, supported as it is by the Antillean, Solenodon, belonging to a family of Mammalia otherwise confined to Madagascar, and by one or two Coleopterous genera, to be noticed farther on as common to the two countries. Our view as to the true explanation of this and analogous phenomena will be found at Vol. I., p. 284.

The division of the Castniidae (a family almost confined to the Tropics), between the Neotropical and Australian regions, is also a very curious and important phenomenon, because it seems to point to a more remote connection between the two countries than that indicated by the resemblance between the productions of South Temperate America with those of Australia and New Zealand; but we have already shown that the facts may be explained in another way. (See Vol. I., pp. 398 and 404).

The division of the Malay Archipelago between the Oriental and Australian regions is clearly marked in the Lepidoptera, and it is very curious that it should be so, for in this, if in any group of animals, we should expect an almost complete fusion to have been effected. Lepidoptera fly readily across wide tracts of sea, and there is absolutely no climatal difference to interfere with their free migration from island to island. Yet we find no less than 10 genera abundant in the Indo-Malayan
sub-region which never cross the narrow seas to the east of them; 6 others which only pass to Celebes; and 2 more which have extended from Java along the closely connected line of islands eastwards to Timor. On the other side, we find 5 strictly Austro-Malayan genera, and 2 others which have a single representative in Java. The following is a list of these genera:—

**Indo-Malayan Genera:**—Amathusia, Thaumantis, Tanaceia, Eurytelia, Ilerda, Zemeros, Taxila, Aphneus, Prioneris, Dercas, Clerome, Adolias, Apatura, Limenitis, Iolaus, Leptocircus, (the last six reach Celebes); Discophora, Thestias; (the last two reach Timor.)

**Austro-Malayan Genera:**—Hamadryas, Hypocista, Mynes, Dicallancrea, Elodina, Hyades, Prothoë (the last two reach Java).

The most characteristic groups, which range over the whole Archipelago and give it a homogeneous character, are the various genera of Danaidæ, the genus Elymnias, and Amblypodia with a few other Lycaenidæ. These are all abundant and conspicuous groups, but they are nevertheless exceptions to the general rule of limitation to one or other of the regions. The cause of this phenomenon is probably to be found in the limitation of the larvae of many Lepidoptera to definite species, genera, and families of plants; and we shall perhaps find, when the subject is carefully investigated, that the groups which range over the whole Archipelago feed on genera of plants which have an equally wide range, while those which are limited to one region or the other, have food-plants belonging to genera which are similarly limited. It is known that the vegetation of the two regions differs largely in a botanical sense, although its general aspect is almost identical; and this may be the reason why the proportion of wide-ranging genera is greater among such insects as feed upon dead wood, than among those which derive their support from the juices of the living foliage. This subject will be again discussed under the various families of Coleoptera, and it will be well to bear in mind the striking facts of generic limitation which have been here brought forward.
Fossil Butterflies, apparently of existing genera, occur in the Miocene and Eocene formations, and an extinct form in the Lower Oolite; but these cannot be held to give any adequate idea of the antiquity of so highly specialised a group, which, in all probability, dates back to Palæozoic times, since one of the Bombycidae,—a group almost as highly-organised—has been discovered in the coal formation of Belgium. (See Vol. I. p. 168.)

Order—COLEOPTERA.

GEODEPHAGA, or CARNIVOROUS GROUND BEETLES.

The Geodephaga consist of two families, Cicindelidae and Carabidae, differing in their form and habits no less than in their numbers and distribution. The former, comprising about 800 species, are far more abundant and varied in Tropical regions; the latter, more than ten times as numerous, are highly characteristic of the North Temperate zone, where fully half of all the known species occur.

CICINDELIDÆ. (35 Genera, 803 Species.)

The Cicindelidae, or Tiger Beetles, are a moderately extensive group, spread over the whole globe, but much more abundant in tropical than in temperate or cold countries. More than half of the species (418) belong to the single genus Cicindela, the only one which is cosmopolitan. The other large genera are,—Collyris (81 sp.), wholly Oriental; Odontochila (57 sp.), South American, with species in Java and Celebes; Tetracha (46 sp.), mostly South American, but with species in South Europe, North America, and Australia; Tricondyla (31 sp.), characteristic of the Oriental region, but extending eastward to New Guinea; Ctenostoma (26 sp.), wholly Neotropical; Dromica (24 sp.), wholly African, south of Lake Ngami and Mozambique; Therates (18 sp.), wholly Malayan, from Singapore to New Guinea.

The genera are distributed in the several regions as follows:—the Nearctic region has 5 genera, 3 of which are peculiar to it; the
Palæarctic has 2, but none peculiar; the Ethiopian 13, with 11 peculiar; the Oriental 8, with 3 peculiar; the Australian 9, with 2 peculiar; and the Neotropical 15, with 10 peculiar. The connection between South America and Australia is shown by the latter country possessing 9 species of the characteristic South American genus *Tetracha*, as well as one of *Megacephala*. The small number of peculiar genera in the Oriental and Australian regions is partly owing to the circumstance that two otherwise peculiar Oriental genera have spread eastward to the Moluccas and New Guinea, a fact to be easily explained by the great facilities such creatures have for passing narrow straits, and by the almost identical physical conditions in the Malayan portion of the two regions. The insects of Indo-Malaya were better adapted to live in the Austro-Malay Islands than those of Australia itself, and the latter group of islands have thus acquired an Oriental aspect in their entomology, though not without indications of the presence of an aboriginal insect-fauna of a strictly Australian type. The relation of the Australian and Neotropical regions is exhibited by this family in an unusually distinct manner. *Tetracha*, a genus which ranges from Mexico to La Plata, has 9 species in Australia; while *Megacephala* has 2 American and 1 Australian species. Another curious, and more obscure relation, is that between the faunas of Tropical America and Tropical Africa. This is also illustrated by the genus *Megacephala*, which has 4 African species as well as 2 South American; and we have also the genus *Perilestesia*, which has 2 species in South America and 2 in Madagascar.

Several of the sub-regions are also well characterised by peculiar genera; as *Amblychila* and *Omus* confined to California and the Rocky Mountains; *Manticora*, *Ophryodera*, *Platychile* and *Dromica*, characteristic of South Africa; *Megalomma* and *Pogonostoma* peculiar to the Mascarene Islands; and *Caledonica* to the islands east of New Guinea. The extensive and elegant genus *Collyris* is highly characteristic of the Oriental region, over the whole of which it extends, only just passing the limits into Celebes and Timor.

The Cicindelidæ, therefore, fully conform to those divisions of Vol. II.—32
the earth which have been found best to represent the facts of distribution in the higher animals.

CARABIDÆ. (620 Genera, 8500 Species.)

The enormous extent of this family, necessitates a somewhat general treatment. It has been very extensively collected, while its classification has been most carefully worked out, and a detailed exposition of its geographical distribution by a competent entomologist would be of the greatest interest. A careful study of Gemminger and Harold's Catalogue, however, enables me to sketch out the main features of its distribution, and to detail many of its peculiarities with considerable accuracy.

The Carabidae are remarkable among insects, and perhaps among all terrestrial animals, as being a wonderfully numerous, varied, conspicuous, and beautiful group, which is pre-eminently characteristic of the palearctic region. So strikingly and unmistakably is this the case, that it must be held completely to justify the keeping that region distinct from those to which it has at various times been proposed to join it. Although the Carabidae are thoroughly well represented by hosts of peculiar genera and abundant species in every part of the world without exception, yet the palearctic region alone contains fully one-third, or perhaps nearer two-fifths, of the whole. It may also be said, that the group is a temperate as compared with a tropical one; so that probably half the species are to be found in the temperate and cold regions of the globe, leaving about an equal number in the much more extensive tropical and warm regions. But, among the cold regions, the palearctic is pre-eminent. North America is also rich, but it contains, by far, fewer genera and fewer species.

The magnificent genus Carabus, with its allies Procerus and Procrustes, containing about 300 species, all of large size, is almost wholly confined to the palearctic region, only 10 species inhabiting North America, and 11 Temperate South America, with one on the African mountain of Kilimandjaro. Twelve large genera, containing together more than 2000 species, are truly cosmopolitan, inhabiting both temperate and tropical
countries all over the globe; but many of these are more abundant in the Palaearctic region than elsewhere. Such are Scarites, Calosoma, Brachinus, Cynindis, Lebia, Chlanius, Platynus, Harpalus, Bembricidium, Psectorus, and Argutor. Of tropical cosmopolites, or genera found in all the tropical regions, but not in the temperate zones, there seem to be only four,—Catascopus, Coptodera, Colopodes, and Caasnonia. Pheropsophus is confined to the tropics of the Old World; while Drimostoma, though widely scattered, is characteristic of the Southern Hemisphere.

The Palaearctic region has about 50 genera of Carabidae which are strictly confined to it, the most important being,—Leistus (30 sp.), Procerus (5 sp.), Procrustes, (17 sp.), Zarbus (60 sp.), Pristonychus (42 sp.), and Ophonius (60 sp.); but it possesses a large number in common with the Nearctic region. The more remarkable of these are,—Carabus, Nebria, Amara, Cytonotus, Bradyellus, Anopthalmus, Celia, Cyclus, Patrobus, Elaphrus, Nolitophilus, Bradytus, Callisthenus, Blethisa, and several others. Many too, though not strictly confined to the North Temperate regions, are very abundant there, with a few species isolated in remote countries, or widely scattered, often in an eccentric manner. Among these may be mentioned, Trechus (120 sp.), all North Temperate but 8, which are scattered in Java, New Caledonia and South America; Dyschirus (127 sp.), North Temperate, with 3 or 4 species in Australia, China and La Plata; Omaseus, (88 sp.), Steropus (90 sp.), Platysoma (114 sp.), and Pterostichus (138 sp.), are mostly North Temperate, but each has a few species in the South Temperate zone, New Zealand, Australia, Chili, and the Cape of Good Hope. Dromius (54 sp.), is about two-thirds Palaearctic, the rest of the species being scattered over the world, in Chili, North and South America, South Africa, Burmah, Ceylon, and New Zealand. The North Temperate genera Calathus and Olisthopus, have each one species in New Zealand; Percus has most of its species in South Europe, but 3 in Australia; Abax is confined to the north temperate zone, but with one species in Madagascar while Lemosthenes is said to have a species identically the same in South Europe and Chili. Some of these apparent anomalies may be due to wrong
determination of the genera, but there can be little doubt that most of them represent important facts in distribution.

The Nearctic region is comparatively poor in Carabidæ. Its more important peculiar genera are,—Diccelus (22 sp.), Pasimachus (17 sp.), Eurytrichus (9 sp.), Sphæroderus (7 sp.), Pinacodera (6 sp.), and others of smaller extent, about 30 in all. It also possesses representatives of a considerable number of Palaearctic genera, as already indicated; and a few of South American genera, of which Heliomorpha and Galerita are the most important.

The Neotropical region is very rich in peculiar forms of Carabidæ, as in almost all other great groups. It possesses more than 100 peculiar genera, but about 30 of these are confined to the South Temperate sub-region. The more important peculiar genera of Tropical America are,—Agra (144 sp.), Ardistomus (44 sp.), Schizogenius (25 sp.), Peleciium (24 sp.), Calophena (22 sp.), Ctenodactyla (7 sp.). Among the Chilian and South Temperate peculiar forms are,—Antarctia (29 sp.), Scolodontis (10 sp.), Tropidopterus (4 sp.). Among the Neotropical genera with outlying species are,—Pachyteles (50 sp.), one of which is West African; Selenophorus (70 sp.), with 4 African, 4 Oriental, and 1 from New Caledonia; Ega (11 sp.), with one in the East Indies, and one in New Caledonia; Galerita, with 36 American species, 8 African, and 3 Indian; Callida and Tetragonoderus, mostly American, but with a few African, Oriental and Australian species; and Pseudomorpha, common to America and Oceania.

The Australian region is almost equally rich, possessing about 95 peculiar genera of Carabidæ, no less than 20 of which are confined to New Zealand. The most important are, Carenetum, Promecoderus, Searaphites, Notonomus, Ænigma, Sphælomorpha, Silphonomorpha, and Adelotopus. The gigantic Catadromus has 4 Australian species and 1 in Java; Homalosoma has 31 species in Australia and New Zealand, and 1 in Madagascar. Celebes and New Guinea have each peculiar genera, and one is common to Australia and the Cape of Good Hope.

The Oriental region possesses 80 peculiar genera, 10 of which are confined to Ceylon. The more important are,—Pericallus, Planetes, and Mormolyce. Distrigus is also characteristic of this
region, with one species in Madagascar; while it has Orthogonius, Hexagonia, Macrochilus, and Thyreopter us in common with the Ethiopian region, and is rich in the fine tropical genus, Catascopus.

The Ethiopian region has 75 peculiar genera, 8 of which are confined to Madagascar. The more important are,—Polyhirma, Graphipterus, and Piezia. Anthia is chiefly African, with a few species in India; Abacetus is wholly African, except a species in Java, and another in South Europe; and Hypolithus is typically African, but with 7 species in South America and 1 in Java.

The facts of distribution presented by this important family, looked at broadly, do not support any other division of the earth into primary regions than that deduced from a study of the higher animals. The amount of speciality in each of these regions is so great, that no two of them can be properly united; and in this respect the Carabidae accord wonderfully with the Vertebrates. In the details of distribution there occur many singular anomalies; but these are not to be wondered at, if we take into consideration the immense antiquity of Coleopterous insects—which existed under specialised forms so far back as the Carboniferous epoch,—the ease with which they may be dispersed as compared with larger animals, and the facilities afforded by their small size, habits of concealment, and often nocturnal habits, for adaptation to the most varied conditions, and for surviving great changes of surface and of the surrounding organic forms. The wonder rather is, not that there are so many, but so few cases of exceptional and anomalous distribution; and the fact that these creatures, so widely different from Vertebrates in organisation and mode of life, are yet on the whole subject to the same limitations of range as were found to occur among the higher animals, affords a satisfactory proof that the principles on which our six primary regions are founded, are sound; and that they are well adapted to exhibit the most interesting facts of geographical distribution, among all classes of animals.

Much stress has been laid on the fact of a few species of such typical European genera as Carabus, Dromius, and others, being
found in Chili and Temperate South America; and it has been thought, that in a system of Entomological regions this part of the world must be united to the Northern Hemisphere. But these writers omit to take into account, either the large numbers of isolated and peculiar forms characteristic of South Temperate America, or the indications of affinity with Tropical America and Australia, both of which are really more important than the connection with Europe. The three important Chilian genera, *Cascelius, Barypus, and Cardiopthalmus*, are closely allied to the Australian *Promecoderus*; others, as *Omostenus and Plagiotelium*, are quite isolated; while *Antarctica* and *Metius*, according to Lacordaire, form a distinct division of the family. Chili, too, has many species of *Pachytele, Coptodera*, and other South American genera; and this affinity is far stronger in many other families than in the Carabidae. The existence of representatives of typical northern forms in Chili, is a fact of great interest, and may be accounted for in a variety of ways; (see Vol. II. p. 44) but it is not of such a magnitude as to be of primary importance in geographical distribution, and it can only be estimated at its fair value, by taking into account the affinities of all the groups inhabiting that part of the world.

**LUCANIDÆ.** (45 Genera, 529 Species.)

Passing over a number of obscure families, we come to the remarkable group of the Lucanidæ, or Stag-beetles, which, being almost all of large size, and many of them of the most striking forms, have been very thoroughly collected and assiduously studied.

The most curious feature of their general distribution, is their scarcity in Tropical South America, and their complete absence from Tropical North America and the West Indian Islands, though they appear again in Temperate North America. In the New World they may, in fact, be looked upon as a temperate group characteristic of the extra-tropical regions and the highlands; while in the Old World, where they are far more abundant, they are distinctly tropical, being especially numerous
in the Oriental and Australian regions. No genus has the range of the whole family, *Dorcus* and *Lucanus* being absent from Africa, while *Cladognathus* is unknown in the New World and on the continent of Australia. The Oriental region is the richest in peculiar forms, possessing 16 genera, 7 of which are wholly confined to it, while 3 others only just range beyond it to North China on the one side, or to the Austro-Malayan islands on the other. The Australian region comes next, with 15 genera, of which 7 are wholly peculiar. South America has 12 genera, 10 of which are peculiar. The Ethiopian region has 10 genera, 7 of which are peculiar, and 2 of these are confined to the island of Bourbon. The Palearctic region has 8 genera, and the Nearctic 5; one genus being peculiar to Europe, and two confined to Europe and North America. The Ethiopian and Oriental regions have 3 genera in common and peculiar to them; the Oriental and Australian 3; while the Australian and Neotropical have 1 in common, to which may be added *Streptocerus*, which represents in Chili the Australian *Lamprima*.

Among the special features presented by the distribution of the Lucanidae, may be mentioned—the remarkable group of genera, *Pholidotus*, *Chiasognathus*, and *Sphenognathus*, confined to Temperate South America, the Andes, and mountains of Brazil; *Lucanus* (19 sp.), almost confined to the Oriental and Palearctic regions, three species only inhabiting North America; *Odontolabris* (29 sp.), wholly Oriental, with 2 sp. in Celebes; *Nigidius* (11 sp.), Ethiopian, but with species in Formosa, the Philippines, and Malacca; *Syndesus* (11 sp.), common to Australia, New Caledonia, and South America; *Figuilus* (20 sp.), divided between Africa and Madagascar on the one hand, and Australia, with the Malay and Pacific Islands, on the other.

The facts of distribution here sketched out are in perfect accordance with those of many groups of Vertebrates. The regions are sharply contrasted by their peculiar and characteristic genera; the several relations of those regions are truly indicated; while there is a comparatively small proportion of cases of anomalous or eccentric distribution.
CETONIIDÆ. (120 Genera, 970 Species.)

As representative of the enormous group of the Lamellicorns, which, according to continental entomologists, forms a single family numbering nearly 7,000 species, we take the Cetoniidae or Rose-Chafers. These comprise a number of the most brilliant and beautifully-coloured insects, including the gigantic Goliathii, which are among the largest of known beetles. They have been assiduously collected in every part of the world, and their classification has been elaborated by many of our most eminent entomologists.

The Cetoniidae are especially abundant in tropical and warm countries, yet far more so in the Old World than in the New; and in the Old World, the Ethiopian region exhibits a marvellous richness in this family, no less than 76 genera being found there, while 64, or more than half the total number, are peculiar to it. Next in richness, though still very far behind, comes the Oriental region, with 29 genera, 17 of which are peculiar. The Neotropical has only 14 genera, but all except two are peculiar to it, and one of these is not found out of the New World. The Australian region has 11 genera, three only being peculiar. The Palaeartic region has 13, with 4 peculiar; the Nearctic 7, with 2 peculiar. The affinities of the regions for each other, as indicated by the genera confined to two adjacent regions, are in this family somewhat peculiar. The Ethiopian and Oriental show the most resemblance, 6 genera being common and peculiar to the two; the Oriental and the Australian are unusually well contrasted, having only one genus exclusively in common, while 8 genera are found in the Indo-Malay Islands which do not cross the boundary to the Austro-Malayan division, and several others only pass to the nearest adjacent islands; on the other hand, the only large Australian genus, Schizorhina, is found in many parts of the Moluccas, but not further west. The Australian and Neotropical regions exhibit no direct affinity, the nearest ally to the South American Gymnetiæ being Clinteria, an African and Asiatic genus; while not a single genus is common
to Australia and South America. The Nearctic and Palæarctic regions have 3 genera in common, which are found in no other part of the world.

Among the special features of interest connected with the distribution of this family, we must first notice the exceptional richness of Madagascar, which alone possesses 21 peculiar genera. South Africa is also very rich, having 8 peculiar genera. Stethodesma is very peculiar, being divided between South America and Mexico on the one hand, and West and South Africa on the other. Stalagmosoma is a desert genus, ranging from Persia to Dongola. No genus is cosmopolitan, or even makes any approach to being so, except Valgus, which occurs in all the regions except the Neotropical; and even the family seems to be not universally distributed, since no species are recorded either from New Zealand, the Pacific Islands, or the Antilles.

The facts here brought forward, lead us to the conclusion that the Cetoniidae are an Old-World tropical family, which had been well developed in Africa and Asia before it spread to Australia and America; and that it is only capable of being freely dispersed in the warmer regions of the earth. This view will explain the absence of affinity between the Australian and Neotropical regions, the only closer connection between which, has almost certainly occurred in the colder portions of the Temperate zone.

BUPRESTIDÆ. (109 Genera, 2,686 Species.)

The next family suited to our purpose is that of the Buprestidæ, consisting as it does of many large and some gigantic species, generally adorned with brilliant metallic colours, and attracting attention in all warm countries. Although these insects attain their full development of size and beauty only in the Tropics, they are not much less abundant in the warmer parts of the Temperate zone. In the Catalogue of the Coleoptera of Europe and the Mediterranean Basin, by M. de Marseul (1863), we find 317 species of Buprestidæ enumerated, although
the district in question only forms a part of the Palaearctic region, which would thus seem to possess its full proportion of the species of this family. Confining ourselves to the generic forms, we find far less difference than usual between the numbers possessed by the tropical and the temperate regions; the richest being the Australian, with 47 genera, 20 of which are peculiar; and the poorest the Nearctic, with 24 genera, of which 7 are peculiar. The Oriental has 41 genera, 14 of which are peculiar; the Neotropical 39, of which the large proportion of 18 are peculiar; the Ethiopian 27, of which 6 are peculiar; and the Palaearctic also 27, but with 9 peculiar.

A most interesting feature in the distribution of this family, is the strong affinity shown to exist between the Australian and Neotropical regions, which have 4 genera common to both and found nowhere else; but besides this, the extensive and highly characteristic Australian genus, *Stigmodera*, is closely related to a number of peculiar South American genera, such as *Conognatha*, *Hyperanthera*, *Dactylozodes*—the last altogether confined to Chili and Temperate South America. Here we have a striking contrast to the Cetoniidae, and we can hardly help concluding, that, as the latter is typically a tropical group, so the present family, although now so largely tropical, had an early and perhaps original development in the temperate regions of Australia, spreading thence to Temperate South America as well as to the tropical regions of Asia and Africa. The Australian and Oriental regions have 4 genera exclusively in common, but they also each possess a number of peculiar or characteristic genera, such as the Indo-Malayan *Catoxantha* (which has only a single species in the Moluccas) and nine others of less importance; and the exclusively Austro-Malayan genus, *Sambus*, with five smaller groups, and *Cyphogastra*, with only 2 Indo-Malay species. The Oriental and Ethiopian regions are very distinct, only possessing the single genus, *Sternocera*, exclusively in common. The Nearctic and Palaearctic are also distinct, only one genus, *Dieerca*, being confined to America (North and South) and Europe, a fact which again points to a southern origin for this family, and its comparatively recent extension into the
North Temperate zone. It must be remembered, however, that in view of the immense geological antiquity of the existing families of Beetles, dating back certainly to the Secondary and probably to the Palæozoic epoch, "comparatively recent" may still be of considerable antiquity.

It is somewhat singular that North and South America have no genera exclusively in common. The connection between South America and Africa seems to be shown,—by the genus Psiloptera, the mass of the species being divided between these regions, with a few widely scattered over the globe; and the American genus Actenodes, which has one species in West Africa. Somewhat allied, is the extensive genus Polybothris, strictly confined to Madagascar. The genus Agrilus is perhaps cosmopolitan, although no species of the family is recorded from New Zealand. Among the peculiarities of distribution we may notice,—the genus Sponsor, with 8 species in the island of Mauritius, 1 in Celebes, and 1 in New Guinea; Ptosima, scattered between the United States, Mendoza in South Temperate America, South Europe, the Philippine Islands, and North China; Polycesta, which besides inhabiting South America, North America, and Europe, has a single species in Madagascar; and Belionota, which has 8 species African, 8 Indo-Malayan, 2 Austro-Malayan, and 1 in California. The extensive genus Acmaeodera, is most abundant in the warm and dry portions of the Palearctic, Ethiopian, and Nearctic regions, with some in the Andes and South Temperate America, a few in Brazil and the West Indies, and 1 said to be from the Philippines. About one-third of the genera (containing more than half the species) have a tolerably extensive range, while the genera confined to single regions contain only about one-fourth of the total number of species.

It will, I think, be admitted, after a careful study of the preceding facts, that the regions and sub-regions here adopted, serve to exhibit, with great clearness, the chief phenomena of distribution presented by this interesting family.
LONGICORNIA. (1,488 Genera, 7,576 Species).

The elegant and admired group of the Longicorn Beetles, is treated by continental authors as a single family, consisting of three sub-divisions—the Prionidae, Cerambycidae, and Lamiidae of English entomologists. These are so closely related, and are so similar in form, habits, and general distribution, that it will be best to consider the whole as one group, noticing whatever peculiarities occur in the separate divisions. The endless structural differences among these insects, have led to their being classed in an unusual number of genera, which average little more than 5 species each; a number far below that in any of the other families we have been considering, and probably below that which obtains in any of the more extensive groups of animals or plants. This excessive subdivision of the genera, a large number of which consist of only one or two species, renders it difficult to determine with precision the relations of the several regions, since the affinities of these genera for each other are in many cases undetermined. A group of such enormous extent as this, can only be properly understood after years of laborious study; we must therefore content ourselves with such results as may be obtained from a general survey of the group, and from a comparison of the range of the several genera, by means of a careful tabulation of the mass of details given in the recent Catalogue of Messrs. Gemminger and Harold and the noble work of Lacordaire.

The proportionate extent of the three families of Longicorns is very unequal; the Prionidae comprising about 7 per cent., the Cerambycidae 44 per cent., and the Lamiidae 49 per cent. of the total number of species; and the genera are nearly in the same proportions, being almost exactly 10, 40, and 50 per cent. of the whole, respectively; or, 135 Prionidae, 609 Cerambycidae, and 746 Lamiidae. The several regions, however, present marked differences in their proportions of these families. In the two North Temperate regions, the Cerambycidae are considerably more numerous than the Lamiidae, in the proportion of about 12 to
9; and in this respect the Neotropical region agrees with them, though the superiority in the proportion of Cerambycidae is somewhat less. In the Old World tropical regions, however, and in Australia, the Lamiidae greatly preponderate—being nearly double in the Oriental and Ethiopian regions (or as 11 to 6), while in the Australian it is as 6 to 5. The Prionidae show a similar difference, though in a less degree; being proportionately more numerous in the North Temperate and Neotropical regions. Now, as regards the North Temperate regions, this difference can be, to some extent explained, by a difference in the habits of the insects. The Lamiidae, which both in the larva and perfect state have exceedingly powerful jaws, exclusively frequent timber trees, and almost always such as are dead; while the Cerambycidae, are generally more delicate and have weaker mandibles, and many of the species live on shrubs, dead twigs, foliage, and even on flowers. The immense superiority of the Tropics in the number and variety of their timber trees, and the extent of their forests, sufficiently accounts for their superiority to the Temperate regions in the development of Lamiidae; but the great excess of Cerambycidae in South America as compared with the rest of the Tropics, is not to be so readily explained.

Bearing in mind the different proportions of the families, as above noted, we may now consider the distribution of the Longicorn family as a whole. In number of generic forms, the Neotropical region, as in so many other groups, has a marked superiority. It possesses 516 genera, 489 of which (or about $\frac{4}{5}$ of the whole) are peculiar to it. The Australian and Oriental regions come next, and are exactly equal, both possessing 360 genera, and having almost exactly the same proportion (in each case a little less than $\frac{3}{4}$) peculiar. The Ethiopian region has 262 genera, with about $\frac{3}{5}$ peculiar; the Palaearctic 196, with 51 (rather more than $\frac{1}{4}$) peculiar; and the Nearctic 111, with 59 (a little more than half) peculiar. The more isolated of the sub-regions are also well characterised by peculiar genera. Thus, Chili with Temperate South America possesses 37, a large proportion being Cerambycidae; the Malagasi group 26,
with a preponderance of Lamiidæ; and New Zealand 12, of which the Cerambycidæ are only slightly in excess.

The relations between the Longicorn fauna of the several regions, are such as are in accordance with the dependence of the group on a warm climate and abundant vegetation; and indicate the efficiency of deserts and oceans as barriers to their migration. The Neotropical and Australian regions have only 4 genera in common, but these are sufficient to show, that there must probably once have been some means of communication between the two regions, better adapted to these insects than any they now possess. The Nearctic and Neotropical regions have 5, and the Nearctic and Palæarctic 13 genera in common and peculiar to them, the latter fact being the most remarkable, because no means of inter-communication now exists, except in high latitudes where the species of the Longicorns are very few. The Oriental and Australian regions, on the other hand, are closely connected, by having no less than 52 genera of Longicorns in common and peculiar to them. Most of these are specially characteristic of the Malay Archipelago, often extending over all the islands from Sumatra to New Guinea. This large number of wide-spread genera of course gives a character of uniformity to the entire area over which they extend; and, with analogous facts occurring in other families, has led many entomologists to reject that division of the Archipelago between the Australian and Oriental regions, which has been so overwhelmingly demonstrated to be the natural one in the case of the higher animals. The general considerations already advanced in Chapter II. enable us, however, to explain such anomalies as this, by the great facilities that exist for the transfer from island to island of such small animals, so closely connected with woody vegetation in every stage of their existence. That this is the true and sufficient explanation, is rendered clear by certain additional facts, which those who object to the sharp division of the Indo-Malay and Austro-Malay sub-regions have overlooked.

An analysis of all the Malay Longicorns proves, that besides the 52 genera characteristic of the Archipelago as a whole, there are 100 genera which are confined to one or other of its component
sub-regions. Many of these, it is true, consist of single species confined to a single island, and we will not lay any stress on these; but there are also several important groups, which extend over the Indo-Malay or the Austro-Malay islands only, stopping abruptly at the dividing-line between them. For example, on the Indo-Malay side we have *Euryarthrum*, *Leprodera*, *Aristobia*, *Caelosterna*, and *Entelopes*, and what is perhaps even more satisfactory, the large genera *Agelasta* and *Asthates*, abundant in all the Indo-Malay islands, but having only one or two species just passing the boundary into Celebes. On the other side we have *Tethionea*, *Sphingnotus*, *Arrhenotus*, *Tmesisternus* (the last three genera abounding from New Guinea to Celebes, but totally unknown further west), *Hestima*, *Trigonoptera*, *Amblymore*, *Stesila*, *Enes*, and the large genus *Micracantha*, with but a single species beyond the boundary,—30 Austro-Malayan genera in all, each found in more than one island, but none of them extending west of Celebes. Here we have clear proof that the boundary line between the two great regions exists for Longicorns, as well as for all other animals; but in this case an unusually large number have been able to get across it. This, however, does not abolish the barrier, but only proves that it is not absolutely effectual in all cases. Those who maintain that the Malay Archipelago forms a single Coleopterous region, must disprove or explain the instances of limited range here adduced.

Out of nearly 1500 known genera of these insects, only one genus, *Clytus*, appears to be cosmopolitan. *Saperda* and *Callichromia* are the only others that perhaps occur in every region; but these are both wanting over wide tracts of the earth’s surface, *Saperda* being absent from Tropical Africa and the Malay Archipelago; and *Callichromia* from the Australian region, except one species in Polynesia. Many of the genera of Longicorns have a somewhat wide and scattered distribution, indicative of decadence or great antiquity. *Mallodon* and *Parandra* are mostly South American, but have species in Australia and Africa; *Oene* is found in Brazil and the United States, with one species in West Africa; *Ceratophorus* has 2 species in West Africa and 1 in New Zealand. *Xystrocera* is mostly African, but has single species in
Borneo, Java, Amboyna and South Australia; *Phyton* has one species in North America and the other in Ceylon; *Philagetes* has 2 in South Africa, and 1 in Malacca: *Toxotus* abounds in North America and Europe, with one species away in Madagascar. *Leptura* is also North Temperate, but has a species at the Cape, one at Singapore and a third in Celebes. *Necydalis* has species in North and South America, Europe and Australia. *Hylotrupes* has 1 species in North America and Europe, and 1 in Australia; *Leptocera* prefers islands, being found only in Ceylon, Madagascar, Bourbon, Batchian, the New Hebrides, New Caledonia and North Australia; *Hathliodes* is Australian, with 1 species in Ceylon; *Schenionta* has 3 Malayan species, and 1 in Natal. Many other cases equally curious could be quoted, but these are sufficient. They cannot be held to indicate any close relation between the distant countries in which species of the same genus are now found, but perhaps serve to remind us that groups of great antiquity, and probably of great extent, have dwindled away, leaving a few surviving relics scattered far and wide, the sole proofs of their former predominance.

**General Observations on the Distribution of Coleoptera.**

We have now passed in review six of the most important and best known groups of the Coleoptera or Beetles, comprising about 2,400 genera, and more than 21,000 species. Although presenting certain peculiarities and anomalies, we have found that, on the whole, their distribution is in very close accordance with that of the higher animals. We have seen reason to believe that these great and well-marked groups have a high geological antiquity, and by constantly bearing this fact in mind, we can account for many of the eccentricities of their distribution. They have probably survived changes of physical geography which have altogether extinguished many of the more highly organised animals, and we may perhaps gain some insight into the bearing of those changes, by considering the cross relations between the several regions indicated by them. On carefully tabulating the indications given by each of the groups here discussed, I arrive at the following approximate result. The
best marked affinities between the regions are those between the Nearctic and Palaearctic,—the Oriental and Australian,—the Australian and Neotropical,—which appear to be about equal in each case. Next comes that between the Ethiopian and Oriental on the one side, and the Ethiopian and Neotropical on the other, which also appear about equal. Then follows that between the Nearctic and Neotropical regions; and lastly, and far the least marked, that between the North Temperate and South Temperate regions. That the relation between the Ethiopian and Neotropical region should be so comparatively well marked, is unexpected; but we must consider that in such a comparison as the present, we probably get the result, not of any recent changes or intermigrations, but of all the long series of changes and opportunities of migration that have occurred during many geological epochs,—probably during the whole of the Tertiary period, perhaps extending far back into the Secondary age.

It appears evident that Insects exhibit in a very marked degree in their actual distribution, the influence both of very ancient and very modern conditions of the earth's surface. The effects of the ancient geographical features of the earth, are to be traced, in the large number of cases of discontinuous and widely scattered groups which we meet with in almost every family, and which, to some extent, obscure the broader features of distribution due to the period during which the barriers which divide the several primary regions have continued to exist. And this, which we may consider as the normal distribution, is still further obscured in those cases where the barriers between existing regions are of such a nature as to admit of the free passage of insects or their larva in a variety of ways, and (what is perhaps of more importance) in which the physical features on both sides of the barrier are so nearly identical, as to admit of the ready establishment of such immigrants as may occasionally arrive. These conditions concur, for some families of insects, in the case of the Oriental and Australian portions of the Malay Archipelago; and it is there that the normal distribution has been sometimes greatly obscured, but never, as we have sufficiently shown, by any means obliterated.

Vol. II.—33
CHAPTER XXII.

AN OUTLINE OF THE GEOGRAPHICAL DISTRIBUTION OF MOLLUSCA.

The Mollusca being for the most part marine, it does not enter into the plan of this work to go into much detail as to their distribution. The orders and families will, however, be passed briefly in review, and all terrestrial and fresh-water groups discussed in somewhat more detail; with the object of showing how far their distribution accords with that of the higher animals, and to what extent the anomalies they present can be explained by peculiarities of organisation and habits. If the views advocated in our fifth chapter are correct, the regions there marked out must apply to all classes of animals; and it will be the task of the students of each group, to work out in detail the causes which have led to any special features of distribution. All I can hope to do here, is to show, generally and tentatively, that such a mode of treatment is possible; and that it is not necessary, as it is certainly not convenient or instructive, to have a distinct set of "Regions" established for each class or order in the Animal and Vegetable Kingdoms.

For all the Marine groups I have merely summarised the information contained in Mr. Woodward's Manual of the Mollusca, but in the case of the Land Shells I have consulted the most recent general works, and endeavoured to give an accurate, though doubtless a very incomplete, account of the most interesting facts in their distribution. As their classification is very unsettled, I have followed that of the two latest great works, by Martens and Pfeiffer.
Class.—Cephalopoda.

Order I.—Dibranchiata.


Distribution.—Open seas of all warm regions. Two species fossil in Tertiary deposits.

Family 2.—Octopodidae. "Polypi." (7 Genera, 60 Species).

Distribution.—Norway to New Zealand, all tropical and temperate seas and coasts.

Family 3.—Teuthidae. "Squids or Sea-pens." (16 Genera, 102 Species).

Distribution.—Universal, to Greenland; 2 other genera are fossil, in the Lias and Oolite.

Family 4.—Sepiidae. "Cuttle Fish." (1 Genus, 30 Species).

Distribution.—All seas: 4 other genera are fossil, in Eocene and Miocene deposits.

Family 5.—Spirulidae. (1 Genus, 3 Species).

Distribution.—All the warmer seas.

Distribution. — Lias to Chalk in Europe, India and North America.

Order II. — Tetrabranchiata.

Family 7. — Nautilidae. (1 Genus, 3 Species, Living; 4 Genera, 300 Species, Fossil).

Distribution. — Indian and Pacific Oceans; and the fossil species from the Silurian Period to the Tertiary, in all parts of the world.


Distribution. — Lower Silurian to Lias.


Distribution. — Upper Silurian to Chalk. Found at 16,000 feet elevation in the Himalayas.
CLASS.—GASTEROPODA.

Order I.—PROSOBRANCHIATA.

Family 1.—STROMBIDÆ. (4 Genera, 86 Species.)

Distribution.—The Strombidae, or Wing-shells, inhabit tropical and warm seas from the Mediterranean to New Zealand; most abundant in the Indian and Pacific Oceans. There are nearly 200 fossil species, from the Lias to Miocene and recent deposits.

Family 2.—MURICIDÆ. (12 Genera, 1000 Species.)

Distribution.—All seas, most abundant in the Tropics. Trichotropis is confined to Northern seas; Murex and Fusus are cosmopolitan. There are about 700 fossil species, ranging from the Oolite to the Miocene and recent formations.

Family 3.—BUCCINIDÆ. (24 Genera, 1100 Species.)

Distribution.—The Buccinidæ, or "Whelks," range over the whole world, but some of the genera are restricted. Buccinum inhabits the north and south temperate seas; Monoceros the West Coast of America; Cassidaria the Mediterranean; Phos, Harpa, Eburna, and Ricinula, are confined to the Pacific; Dolium inhabits the Mediterranean as well as the Pacific. There are about 350 fossil species, mostly from the Eocene and Miocene beds.
Family 4.—CONIDÆ. (3 Genera, 850 Species.)

Distribution.—The Cones are universally distributed, but this applies only to the genus Pleurotoma. Conus is tropical and sub-tropical, and Cithara is confined to the Philippine Islands. There are about 460 fossil species, from the Chalk formation to the most recent deposits.

Family 5.—VOLUTIDÆ (5 Genera, 670 Species.)

Distribution.—The Volutes are mostly tropical; but a small species of Mitra is found at Greenland, and a Marginella in the Mediterranean. Cymba is confined to the West Coast of Africa and Portugal. Voluta extends south to Cape Horn. There are about 200 fossil species, from the Chalk and Eocene to recent formations.

Family 6.—CYPRÆIDÆ. (3 Genera, 200 Species.)

Distribution.—The well-known Cowries are found all over the world, but they are much more abundant in warm regions. One small species extends to Greenland. There are nearly 100 fossil species, from the Chalk to the Miocene and recent formations.

Family 7.—NATICIDÆ. (5 Genera, 270 species.)

Distribution.—The Naticidae, or Sea-snails, though most abundant in the Tropics, are found also in temperate seas, and far into the Arctic regions. Two other genera are fossil; and there are about 300 extinct species, ranging from the Devonian to the Pliocene formations.
Family 8.—Pyramidellidae. (10 Genera, 220 Species.)

Distribution.—These turreted shells are very widely distributed both in temperate and tropical seas; and most of the genera have also a wide range. There are about 400 extinct species, from so far back as the Lower Silurian to the Pliocene formations.

Family 9.—Cerithiidae. (5 Genera, 190 Species.)

Distribution.—These are marine, estuary, or fresh-water shells, of an elongated spiral form; they have a world-wide distribution, but are most abundant in the Tropics. Potamides (41 sp.), is the only fresh-water genus, and is found in the rivers of Africa, India and China, to North Australia and California. Another genus is exclusively fossil, and there are about 800 extinct species, ranging from the Trias to the Eocene and recent formations.

Family 10.—Melaniidae. (3 Genera, 410 Species.)

Distribution.—Fresh-water only: lakes and rivers in warm countries, widely scattered. South Palearctic and Australian regions, from Spain to New Zealand; South Africa, West Africa, and Madagascar; United States. There are about 50 fossil species, from the Wealden and Eocene to recent formations.

Family 11.—Turrithellidae. (5 Genera, 230 Species.)

Distribution.—Universal. Caeum is found in north temperate seas only. The other genera are mostly tropical, but some species reach Iceland and Greenland. There are near 300 species fossil, ranging from the Neocomian to the Pliocene formations.
Family 12.—Littorinidae. (9 Genera, 310 Species.)

Distribution.—The Littorinidae are mostly found on the coasts in shallow water; as the common Periwinkle (Littorina littorea). They are of world-wide distribution; but Solarium and Phorus are tropical; while Lacuna, Skenea, and most species of Rissoa are Northern. About 180 species are fossil, ranging from the Permian to the Pliocene formations.

Family 13.—Paludinidae. (4 Genera, 217 Species.)

Distribution.—The Paludinidae, or River-snails, are all freshwater, and range over the whole world. Paludina (60 sp.), is confined to the Northern Hemisphere; Ampullaria (136 sp.), is tropical; Amphibola (3 sp.), inhabits New Zealand and the Pacific Islands; Valvata (18 sp.), North America and Britain. There are 72 fossil species of Paludina and Valvata, in the Wealden formation and more recent freshwater deposits.

Family 14.—Neritidae. (10 Genera, 320 Species.)

Distribution.—All warm seas, ranging north to Norway and the Caspian Sea. Neritina and Navicella inhabit fresh or brackish waters, the latter confined to the countries bordering the Indian Ocean and the islands of the Pacific. There are 80 fossil species, from the Trias, Lias, and Eocene formations down to recent deposits.

Family 15.—Turbinidae. (10 Genera, 425 Species.)

Distribution.—The genus Trochus (200 sp.) has a world-wide range, but the other genera are mostly tropical, and are most abundant in the Indian and Pacific Oceans. There are more than 900 fossil species, found in all parts of the world, from the Lower Silurian to the Tertiary formations.
Family 16.—**HALIOTIDÆ.** (6 Genera, 106 Species),

**Distribution.**—The Ear-shells are most abundant in the Indian and Pacific Oceans; some are found on the east coasts of the Atlantic, but there are very few in the West Indies. *Ianthina* (10 sp.) consists of floating oceanic snails found in the warm parts of the Atlantic. Three other genera are fossil, and there are near 500 fossil species of this family ranging from the Lower Silurian to the Pliocene formations.

Family 17.—**FISSURELLIDÆ.** (5 Genera, 200 Species).

**Distribution.**—All seas. *Puncturella* (6 sp.) is confined to Northern and Antarctic seas; *Rimula* to the Philippines; and *Parmophorus* (15 sp.) from the Cape of Good Hope to the Philippines and New Zealand. There are about 80 fossil species, ranging from the Carboniferous formation to the deposits of the Glacial epoch.

Family 18.—**CALYPTRÆIDÆ.** (4 Genera, 125 Species).

**Distribution.**—The Calptraeideæ, or Bonnet-Limpets, are found on the coasts of all seas from Norway to Chili and Australia; but are most abundant within the Tropics. The genera are all widely scattered. There are 75 fossil species, ranging from the Devonian to recent formations.

Family 19.—**PATELLIDÆ.** (4 Genera, 254 Species).

**Distribution.**—The Patellidæ, or Limpets, are universally distributed, and are as abundant in the temperate as in tropical seas. There are about 100 fossil species, ranging from the Silurian to the Tertiary formations.
Family 20.—Dentaliidae. (1 Genus, 50 Species).

Distribution.—The genus Dentalium is found in the North Atlantic, Mediterranean, West Indies and India. There are 125 fossil species, found in various formations as far back as the Devonian in Europe and in Chili.

Family 21.—Chitonidae. (1 Genus, 250 Species).

Distribution.—On rocky shores in all parts of the world. There are 37 fossil species ranging back to the Silurian period.

Order II.—Pulmonifera. ("Terrestrial Molluses."

The Land and Fresh-water snails are so important and extensive a group, and their classification has been so carefully studied, that their geographical distribution is a subject of much interest. The range of the genera will therefore be given in some detail. For the Helicidae I follow the classical work of Albers—Die Helicien, Von Martens' Edition (1860); and for the Operculate families, Pfeiffer's Monographia Pneumonopomorum Viventium, 2nd Supplement, 1865. The number of species is, of course, very considerably increased since these works were published (and the probable amount of the increase I have in most cases indicated), but this does not materially affect the great features of their geographical distribution.

Family 22.—Helicidae. (33 Genera, 3,332 Species) (1860).

General Distribution.—Universal.

The Helicidae, or Snails, are a group of immense extent and absolutely cosmopolitan in their range, being found in the most barren deserts and on the smallest islands, all over the globe. They reach to near the line of perpetual snow on mountains, and
to the limit of trees or even considerably beyond it, in the Arctic regions; but they are comparatively very scarce in all cold countries. The Antilles, the Philippine Islands, Equatorial America, and the Mediterranean sub-region are especially rich in this family. Comparatively few of the genera, and those generally small ones, are restricted to single regions; but on the other hand very few are generally distributed, only two—*Helix* and *Pupa*—occurring in all the six regions, while *Helix* alone is truly cosmopolitan, occurring in every sub-region, in every country, and perhaps in every island on the globe.

The Neotropical region is, on the whole, the richest in this family, the continental Equatorial districts producing an abundance of large and handsome species, while the Antilles are pre-eminent for the number of their peculiar forms. This region possesses 22 of the genera, and 6 of them are peculiar.

The Palæarctic region seems to come next in productiveness, but this may be partly owing to its having been so thoroughly explored. It possesses 16 of the genera, and 3 of them are confined to it. The great mass of the species are found in the warm and fertile countries surrounding the Mediterranean Sea.

The Ethiopian region has 13 genera, only one of which is peculiar.

The Australian region has 14 genera, 2 of which are confined to the Pacific Islands.

The Oriental has 15 genera and the Nearctic 12, but in neither case are there any peculiar generic types.

The following is the distribution of the several genera taken in the order of their magnitude:

*Helix* (1,115 sp.), cosmopolitan. This genus is divided into 88 sub-genera, a number of which have a limited distribution. An immense quantity of species have been recently described, so that the number now exceeds 2,000.

*Nanina* (290 sp.) is characteristic of the Oriental and Australian regions, over the whole of which it extends, just entering the Palæarctic region as far as North China and Japan. Isolated from this area is a small group of 4 species occurring
in West Africa. The number of species in this genus have now been increased to about 400.

*Clausilia* (272 sp.) is most abundant in Europe, with a few species widely scattered in India, Malaya, China, Japan, Equatorial America, and one in Porto Rico. The described species have been increased to nearly 500.

*Bulimulus* (210 sp.) is American, and almost exclusively Neotropical, ranging from Montevideo and Chili, to the West Indian Islands, California and Texas; with two sub-genera confined to the Galapagos Islands. About 100 new species have been described since the issue of the second edition of Dr. Woodward’s Manual.

*Pupa* (210 sp.) abounds most in Europe and the Arctic regions, but has a very wide range, being scattered throughout Africa, continental India, Australia, the Pacific Islands, North America to Greenland, and the Antilles; but it is absent from South America, the Himalayan and Malayan sub-regions, China and Japan. An extinct species has occurred abundantly in the carboniferous strata of North America. About 160 additional species have been described.

*Bulimus* (172 sp.) abounds most in Tropical South America; it is also found from Burmah eastward through Malaya to the Solomon and Fiji Islands; there are also scattered species in Patagonia, St. Vincents, Texas, St. Helena, and New Zealand. More than 100 additional species have been described.

*Buliminus* (132 sp.) ranges from Central and South Europe over the whole Ethiopian and Oriental regions to North China, and through the Australian to New Zealand; there is also a single outlying species in the Galapagos Islands. About 50 more species have been described.

*Cochlostyla* (127 sp.) is almost peculiar to the Philippine Islands, beyond which, are a species in Borneo, one in Java, and two in Australia. Very few new species have been added to this genus.

*Achatinella* (95 sp.) is absolutely confined to the Sandwich Island group. Recent researches have more than tripled the number of described species.
Achatina (87 sp.) is most abundant and finest in the Ethiopian region, over the whole of which it ranges; but there are also species in Florida, the Antilles, the Sandwich Islands, Ceylon and India. The described species are now more than doubled.

Hyalina (84 sp.) inhabits all Tropical America and the Antilles, North America to Greenland, and Europe to the Arctic regions. Comparatively few new species have been described.

Cylindrella (83 sp.) inhabits the West Indian islands and Guatemala to Texas, with a sub-genus in the Philippine Islands. Species since described have more than trebled the number in this genus.

Cionella (67 sp.) is widely scattered; in India from Ceylon to the Khasia Mountains, Brazil, New Granada, the West Indian islands, Palearctic, and northern part of Nearctic regions, Pacific Islands, New Zealand, and Juan Fernandez. About 20 new species have since been described.

Glandina (66 sp.), Peru to South Carolina and the Antilles, with three species in Central Africa and one in South Europe. About 40 species have been added to this genus.

Stenogyra (49 sp.), widely distributed: Tropical America and West Indies to Florida, South and West Africa, the Mediterranean region, India and the Philippines. About a dozen new species have been described.

Succinea (41 sp.), widely scattered in all the regions, and in St. Helena, Juan Fernandez, Tahiti, Chiloe, Greenland, West Africa, Himalayas and Australia. The described species are now more than 100.

Partula (39 sp.), Solomon Islands to Tahiti and Sandwich Islands. This genus has also been increased to near 100 species.

Streptaxis (34 sp.), most abundant in Tropical South America, but occurs in West Africa, the Seychelles and Rodriguez Islands, Ceylon and Burmah. It now contains over 100 described species.

Spiraxis (33 sp.), Yucatan to Mexico, and less abundant in the West Indian Islands. About 20 species have been added.
Macroceramus (27 sp.), Antilles, Florida, and Peru. The species have been more than doubled.

Vitrina (26 sp.), widely scattered through North and Central Europe, North-west America and Greenland, Abyssinia, Madagascar and South Africa, Himalayas to Burmah and Australia. Species since described have more than doubled the number in this genus.

Orthalicus (23 sp.), Bolivia to Mexico and Antilles. This genus has been increased to about 40 species.

Sagda (19 sp.), Antilles only. Very few new species, if any, have been described.

Zonites (12 sp.), South Europe, with one species of a distinct type in Guatemala. The number of species in this genus has been since about tripled.

Leucochroa (11 sp.), Mediterranean region to Syria and Arabia Petrea.

Simpulopsis (7 sp.), Bahia, Antilles, and far away in the Solomon Islands. Two or three have been added.

Bala (6 sp.), Middle and North Europe, Brazil, and the Island of Tristan d’Acunha.

Daudebardia (6 sp.), Central and South Europe; and a species has since been discovered in New Zealand.

Macrocycles (4 sp.), Chili, California, Oregon and Central North America.

Columna (3 sp.), West Africa, Princes Islands and Madagascar.

Stenopus (2 sp.), Island of St. Vincent (West Indies.)

Pfeifferia (2 sp.), Philippines and Moluccas.

Testacella (2 sp.), West Europe and Teneriffe. About 8 species have been since described, including one from New Zealand.

Fossil species of Helix, Bulimus, Achatina, Bala, and Clau-silia, are found in all the Tertiary formations; while a species of Pupa (as already stated) occurs in the carboniferous formation. For interesting details of the distribution of the subgenera and species of Achatinella in the Sandwich Islands, see a paper by Rev. J. T. Gullick in the Journal of the Linnean Society. (Zoology, vol. xi. p. 496.)
Family 23.—Limacidae.—(12 Genera, 116 Species.)

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<th>Neotropical Sub-regions</th>
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The Limacidae, or Slugs, are widely distributed, but they are absent from South America, where they are represented by the next family. They also seem to be absent from the greater part of Africa. The genera are distributed as follows:—

*Limax* (51 sp.), Palearctic region, Australia and the Sandwich Islands; *Anudenus* (2 sp.), Himalayas; *Philomychus* (9 sp.), North America, China and Java; *Arion* (25 sp.), Norway to Spain and South Africa; *Parmaecilla* (7 sp.), South Europe, Canary Islands and North India; *Janella* (1 sp.), New Zealand; *Aeitea* (1 sp.), New Hebrides and New Caledonia; *Parmarion* (4 sp.), India; *Triboniophorus* (3 sp.), Australia; *Testacella* (3 sp.), South Europe, Canary Islands, and New Zealand; *Hyalimax* (2 sp.), Bourbon and Mauritius; *Krynickia* (8 sp.), Eastern Europe and North America. A few species of *Limax, Arion*, and *Testacella* have been found fossil in Tertiary deposits.

Family 24.—Oncidiidae. (2 Genera, 36 Species.)

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<th>Neotropical Sub-regions</th>
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The Oncidiidae, or Slugs with a coriaceous mantle, inhabit the Oriental region, Mauritius, Australia, the Pacific Islands, South America and South Europe. The genera are:—
Oncidium (16 sp.), South Europe (1 sp. British), Mauritius, Australia and Pacific Islands; Vaginulus (20 sp.), Neotropical and Oriental regions.

FAMILY 25.—LIMNAEIDÆ. (7 Genera, 332 Species.)

The Limnaeidae, or Fresh-water Snails, inhabit ponds and rivers in most parts of the world, but appear to be absent from the Australian region. The genera are distributed as follows:—

Limnœa (95 sp.), Nearctic, Palaearctic, and Oriental regions; Choanomphalos (2 sp.), Lake Baikal; Pompophylx (2 sp.), Western America; Chilinia (18 sp.), South America; Physa (20 sp.), Nearctic, Palaearctic, Ethiopian and Oriental regions, and extends to above 73° North Latitude in Siberia, being the most Arctic of land or fresh-water shells; Ancylus (49 sp.), Nearctic and Neotropical regions, Europe and New Zealand; Planorbis (145 sp.), Nearctic, Palaearctic and Oriental regions. Several genera are found fossil, chiefly in the Wealden, Eocene, and Miocene formations.

FAMILY 26.—AURICULIDÆ. (3 Genera, 210 Species.)

The Auriculidae are chiefly found near the sea in hot countries and are most abundant in the Eastern tropics. They are absent
from the East coast of South America. The genera have a somewhat restricted distribution as follows:

_Auricula_ (128 sp.), India, Pacific Islands, Peru and West Indies; _Melampus_ (56 sp.), West Indies and Europe; _Carychium_ (9 sp.), Europe and North America; _Plectotrema_ (14 sp.), Australia, Malay Islands, China, Cuba; _Blauneria_ (2 sp.), West Indian and Sandwich Islands. There are many fossil species ranging back to the Eocene formation.

**FAMILY 27.—ACICULIDÆ.** (4 Genera, 65 Species.) (1865.)

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The Aciculidæ are small cylindrical shells chiefly found in the West Indian Islands, but with representatives widely scattered over the globe.

_Acicula_ (5 sp.) is European only; _Geomelania_ (21 sp.), and _Chittyia_ (1 sp.), are confined to the Island of Jamaica; _Truncatella_ (38 sp.), is most abundant in the Antilles, but is also found in some part of each of the six regions, as indicated by the diagram of the family. But few new species have been added to this group.

**FAMILY 28.—DIPLOMMATINIDÆ.** (3 Genera, 23 Species.) (1865.)

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The Diplommatinitidæ are minute shells of the Oriental and Australian regions.
Diplommatina (18 sp.) inhabits India to Burmah, and the greater part of the Australian region; the number of species has now been doubled, and one has been discovered in the island of Trinidad; Clostophis (1 sp.), Moulmein; Paxillus (3 sp.), Borneo, Hong Kong, and Loo Choo Islands.

Family 29.—Cyclostomidae. (41 Genera, 1009 Species.) (1865.)

General Distribution.

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<th>Neotropical Sub-regions</th>
<th>Nearctic Sub-regions</th>
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This extensive group, comprising the largest of the operculated land-shells, is especially characteristic of the Oriental region, which possesses 25 genera, no less than 12 of them being wholly confined to it. The Neotropical region comes next, with 15 genera, 9 of which are peculiar; but a large number of these are confined to the West Indian Islands, South America itself being very poor in this group. The Palæarctic region has 3 peculiar genera; the Ethiopian and Australian 1 each. The Nearctic region has but a single West Indian species in Florida. The distribution of the genera is as follows:—

Peculiar to or characteristic of the Oriental region are, Opisthoporus (11 sp.), Rhistomata (6 sp.), Alycaeus (39 sp.), Opisthostrongylus (1 sp.), Hybocystis (3 sp.), Pterocystis (19 sp.), extending to the Moluccas; Auropoma (4 sp.), Dermatoceras (4 sp.), Leptopoma (54 sp.), extending west to the Seychelles and east to the Moluccas and New Guinea; Cyclophorus (163 sp.), most abundant in the Oriental region, but ranges to Japan, to Chili, and all Tropical America, over the whole Australian region, and to Natal and Madagascar; Cataulus (15 sp.), confined to Ceylon, the Nilgherries and Nicobar Islands; Rhaphaulus (4 sp.), Penang to Ceram; Streptaulus (1 sp.), Arinia (3 sp.), Pupinella (2 sp.), Pupina (24 sp.), half in North India to Philippines and
Japan, the other half in Moluccas, New Guinea and Australia; *Cyclotopsis* (2 sp.), India and Malaya: *Registoma* (9 sp.), Philippines and Moluccas, New Caledonia and Pacific.

Characteristic of the Neotropical region are:— *Cyclotus* (111 sp.), half in the Antilles and Tropical America, the rest in the Moluccas, China, Malaya, India, Natal, and the Seychelles; *Megalomastoma* (27 sp.), abundant in Cuba, West Indies and South America, others in India, Malaya, and Mauritius; *Jamaicia* (2 sp.), Jamaica; *Licina* (5 sp.), Antilles; *Choanopoma* (49 sp.), Antilles; *Ctenopoma* (25 sp.), Antilles; *Diplopoma* (1 sp.), Cuba; *Adamsiella* (15 sp.), Jamaica, Cuba, Guatemala; *Cyclostomus* (113 sp.), abundant in Antilles, also occurs in Madagascar, Arabia, Syria, Hungary and New Zealand; *Tudora* (34 sp.), Antilles, and one species in Algeria; *Cistula* (40 sp.), *Chondropoma* (94 sp.), *Bourcieria* (2 sp.), Tropical America.

Peculiar to or characteristic of the Palaearctic region are:— *Craspedopoma* (5 sp.), confined to Madeira, the Azores and Canaries; *Leonia* (1 sp.), Spain and Algeria; *Pomatias* (22 sp.), Europe and Canaries with a species in the Himalayas; *Cecina* (1 sp.), Manchuria.

The Ethiopian region has the peculiar genus *Litiodion* (5 sp.), Madagascar, Socotra and Arabia; and *Otopoma* (19 sp.), Mascarene Islands and Socotra, with a species in Western India and another in New Ireland.

The Australian region is characterised by *Callia* (3 sp.), in Ceram, Australia, and the Philippines respectively; *Realia* (7 sp.), New Zealand and the Marquesas Islands; *Omphalotropis* (38 sp.), the Australian region, with some species in India, Malaya, and the Mauritius.

The remaining genus, *Hydrocena* (27 sp.), has a very widely scattered distribution, being found in South Europe, Japan, the Cape, China, Malaya, New Zealand, the Pacific Islands and Chili. From 10 to 20 per cent. of new species have been since described in most of the genera of this family.
FAMILY 30.—HELCINIDÆ. (7 Genera, 433 Species.) (1868.)

General Distribution.

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<th>Neotropical Sub-regions</th>
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<th>Palæarctic Sub-regions</th>
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The Helcinidæ are very characteristic of the Antilles, comparatively few being found in any other part of the world except the Islands of the Pacific. The genera are:

*Trochatella* (33 sp.), Antilles with a species in Venezuela, and another in Cambodge; *Lucidella* (5 sp.), Antilles; *Helicina* (274 sp.), Antilles, Pacific Islands, Tropical America, Southern United States, Moluccas, Australia, Philippines, Java, Andaman Islands and North China; *Schasischeila* (5 sp.), Mexico, Guatemala and Bahamas; *Alcania* (28 sp.), Antilles; *Goristia* (5 sp.) Moulmein to Burmah. About 10 per cent. of new species appear to have been since described in the larger genera of this family.


A consideration of the distribution of the families and genera of land-shells shows us, that although they possess some special features, yet they agree in many respects with the higher animals in their limitation by great natural barriers, such as oceans, deserts, mountain ranges, and climatal zones. A remarkable point in the distribution of these animals, is the number of genera which have a very limited range, and also the prevalence of genera having species scattered, as it were at random, all over the earth. No less than 14 genera (or about one-sixth of the whole number) are confined to the Antilles, while the greater part of the sub-genera of modern authors are restricted to limited areas.

If we first compare the New World with the Old, we find the difference as regards genera quite as great as in most of the
vertebrates. In the Helicidae, 10 genera are confined to the New, and 7 to the Old World, 16 being common to both. In the Operculata the number of genera of restricted range is greater,—the New World having 15, the Old World 32 genera, only 8 being common to both. Of the New World genera 12 out of the 15 do not occur at all in South America; and of those of the Old World, 22 out of the 32 occur in a single region only. If we take the northern and southern division proposed by Professor Huxley (the latter comprising the Australian and Neotropical regions), we find a much less well-marked diversity. Among the Helicidae only 4 are exclusively northern, 8 southern; while among the Operculata 22 are northern, 16 southern. The best way to compare these two kinds of primary division will be to leave out all those genera confined to a single region each, and to take account only of those characteristic of two or more of the combined regions; which will evidently show which division is the most natural one for this group. The result is as follows:

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<th>Helicidae</th>
<th>Operculata</th>
<th>Totals</th>
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<td>Southern</td>
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<td>13</td>
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<td>Old World</td>
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We find then that the northern and southern division of the globe is not at all supported by the distribution of the terrestrial molluscs. It is indeed very remarkable, that the connection so apparent in many groups between Australia and South America is so scantily indicated here. The only facts supporting it seem to be, the occurrence of Geotrochus (a sub-genus of Helix) in Brazil, as well as in the Austro-Malayan and West Pacific Islands and North Australia; and of Bulimus in the same two parts of the globe, but peculiar sub-genera in each. But in neither case is there any affinity shown between the temperate portions of the two regions, so that we must probably trace this resemblance to some more ancient diffusion of types than that which led to the similarity of plants and insects. Still more curious is the entire
absence of genera confined to, and characteristic of Africa and India. One small sub-genus of Helix, (Rachis), and one of Achatina, (Homorus), appear to have this distribution,—a fact of but little significance when we find another sub-genus of Helix, (Hapalus), common and confined to Guinea and the Philippine Islands; and when we consider the many other cases of scattered distribution which cannot be held to indicate any real connection between the countries implicated. No genus is confined to the Palaearctic and Nearctic regions as a whole. A large number of sub-genera, many of them of considerable extent, are peculiar to one or other of these regions, but only 3 sub-genera of Helix and 2 of Pupa are common and peculiar to the two combined, and these are always such as have an Arctic range and whose distribution therefore offers no difficulty.

We find, then, that each of our six regions and almost all of our sub-regions are distinctly confirmed by the distribution of the terrestrial mollusca; while the different combinations of them which have at various times been suggested, receive little or no support whatever. Even those remarkably isolated sub-regions, New Zealand and Madagascar, have no strictly peculiar genera of land-shells, although they both possess several peculiar sub-genera; being thus inferior in isolation to some single West Indian Islands, to the Sandwich Islands, and even to the North Atlantic Islands (Canaries, Madeira, and Azores), each of which have peculiar genera. This of course, only indicates that the means by which land mollusca have been dispersed are somewhat special and peculiar. To determine in what this speciality consists we must consider some of the features of the specific distribution of this group.

The range of genera, and even of sub-genera is, as we have seen, often wide and erratic, but as a general rule the species have a very restricted area.

Hardly a small island on the globe but has some land-shells peculiar to it. Juan Fernandez has 20 species, all peculiar. Madeira and Porto Santo have 109 peculiar species out of a total of 134. Every little valley, plain, or hill-top, in the Sandwich Islands, though only a few square miles in extent, has its
peculiar species of *Achatinella*. Another striking feature of the distribution of land molluscs, is the richness of islands as compared with continents. The Philippines contain more species than all India; and those of the Antilles according to Mr. Bland almost exactly equal the numbers found in the entire American continent from Greenland to Patagonia. Taking the whole world, it appears that many more species of land-shells are found in the islands than on the continents of the globe, a peculiarity that obtains in no other extensive group of animals.

Looking at these facts it seems probable, that the air-breathing molluscs have been chiefly distributed by air- or water-carriage, rather than by voluntary dispersal on the land. Even seas and oceans have not formed impassable barriers to their diffusion; whereas they only spread on dry land with excessive slowness and difficulty. The exact mode in which their diffusion is effected is not known, and it may depend on rare and exceptional circumstances; but it seems likely to occur in two ways. Snails frequently conceal themselves in crevices of trees or under bark, or attach themselves to stems or foliage, and either by their operculum or mucous diaphragm, are able to protect themselves from the injurious effects of salt water for long periods. They might therefore, under favourable conditions, be drifted across arms of the sea or from island to island; while wherever there are large rivers and occasional floods, they would by similar means be widely scattered over land areas. Another possible mode of distribution is by means of storms and hurricanes, which would carry the smaller species for long distances, and might occasionally transport the eggs of the larger forms. Aquatic birds might occasionally get both shells and eggs attached to their feet or their plumage, and convey them across a wide extent of sea. But whether these, or some other unknown agency has acted, the facts of distribution clearly imply that some means of transport over water is, and has been, the chief agent in the distribution of these animals; but that its action is very rare or intermittent, so that its effects are hardly perceptible in the distribution of single species.

Another important factor in enabling us to account for the
distribution of these animals is the geological antiquity of the group, and the amount of change exhibited in time, by species and genera. Now we find that most of the genera of land-shells range back to the Eocene period, while those inhabiting fresh water are found almost unchanged in the Wealden. In North America a species of *Pupa* and one of *Zonites*, have been discovered in the coal measures, along with Labyrinthodonts; and this fact seems to imply, that many more terrestrial molluses would be discovered, if fresh-water deposits, made under favourable conditions, were more frequently met with in the older rocks. If then the existing groups of land-molluscs are of such vast antiquity, and possess some means, however rarely occurring, of crossing seas and oceans, we need not wonder at the wide and erratic distribution now presented by so many of the groups; and we must not expect them to conform very closely to those regions which limit the range of animals of higher organization and less antiquity.

The total number of species of pulmoniferous mollusca is about 7,000, according to the estimate of Mr. Woodward, brought down to 1868 by Mr. Tate. But this number would be largely increased if the estimates of specialists were taken. Mr. Woodward for example, gives 760 as the number of species in the West Indian Islands; whereas Mr. Thomas Bland, who has made the shells of these islands a special study, considers that there were 1,340 species in 1866. So, the land-shells of the Sandwich Islands are given at 267; but Mr. Gulick has added 120 species of Achatinellidae, bringing the numbers up to nearly 400,—but no doubt several of these are so closely related that many conchologists would class them as varieties. The land-shell fauna of the Antilles is undoubtedly the most remarkable in the world, and it has been made the subject of much interesting discussion by Mr. Bland and others. This fauna differs from that of all other parts of the globe in the proportions of the operculate to the inoperculate shells. The Operculata of the globe are about one-seventh, the Inoperculata about six-sevenths of the whole; and some general approximation to this proportion (or a much smaller one) exists in almost all the continents, islands, and
archipelagoes. In the Philippines, for example, the proportion of the Operculata is a little more than one-seventh; in the Mauritius, between one-third and one-fourth; in Madeira, one-fourteenth; in the whole American continent about one-eighth; but when we come to the Antilles we find them to amount to nearly five-sixths, about half the Operculata of the globe being found there!

Mr. Bland endeavours to ascertain the source of some of the chief genera found in the West Indian Islands, on the principle that "each genus has had its origin where the greatest number of species is found;" and then proceeds to determine that some have had an African, some an Asiatic, and some an American origin, while others are truly indigenous. But we fear there is no such simple way of arriving at so important a result; and in the case of groups of extreme antiquity like the genera of mollusca, it would seem quite as possible that the origin of a genus is generally not where the greatest number of species are now found. For during the repeated changes of physical conditions that have everywhere occurred since the Eocene period (to go no further back) every genus must have made extensive migrations, and have often become largely developed in some other district than that in which it first appeared. As a proof of this, we not unfrequently find fossil shells where the species and even the genus now no longer exists; as Auricula, found fossil in Europe, but only living in the Malay and Pacific Islands; Anastoma and Megaspira, now peculiar to Brazil, but fossil in the Eocene of France; and Proserpina of the West Indies, found in the Eocene formation of the Isle of Wight. The only means by which the origin of a genus can satisfactorily be arrived at, is by tracing back its fossil remains step by step to an earlier form; and this we have at present no means of doing in the case of the land-shells. Taking existing species as our guide we should certainly have imagined that the genus Equus originated in Africa or Central Asia; but recent discoveries of numerous extinct species and of less specialized forms of the same type, seem to indicate that it originated in North America, and that the whole tribe of "horses" may be, for anything we yet know
to the contrary, recent immigrants into the Old World! This example alone must convince us, that it is impossible to form any conclusion as to the origin of a genus, from the distribution of existing species only.

The general conclusion we arrive at, therefore, is, that the causes that have led to the existing distribution of the genera and higher groups of the terrestrial mollusca are so complex, and have acted through such long periods, that most of the barriers which limit the range of other terrestrial animals do not apply to them, although the species are, in most cases, strictly limited by them. Some means of diffusion—which, though probably acting very slowly and at long intervals, and more powerfully on continents than between islands, is yet highly efficient when we consider the long duration of genera—has, to a considerable extent, dispersed them across continents, seas, and oceans. On the other hand, those mountain barriers which separate many groups of the higher vertebrates, are generally less ancient than the genera of land-shells, which are thus often distributed independently of them. In order to compare the distribution of the terrestrial mollusca on equal terms with those of land animals generally, we must take genera of the former as equivalent to family groups of the latter; and we shall, I believe, then find that the distribution of the sub-genera and smaller groups of species do accord mainly with those divisions of the earth into regions and sub-regions which we have here indicated. Mr. Harper Pease, in a communication on Polynesian Land Shells in the Proceedings of the Zoological Society for 1871 (p. 449), marks out the limits of the Polynesian sub-region, so as exactly to agree with that arrived at here from a consideration of the distribution of vertebrata; and he says that this sub-region, (or region, as he terms it) is distinctly characterised by its land-shells from all the surrounding regions. The genera (or sub-genera) *Partula, Pitys, Achatinella, Palaina, Omphalotropis,* and many others, are either wholly confined to this sub-region or highly characteristic of it. Mr. Binney, in his Catalogue of the Air-breathing Mollusces of North America, marks out our Nearctic region (with almost identical limits) as most clearly
characterised. He also arrives at a series of sub-divisions, which generally (though not exactly) agree with the sub-regions which I have here adopted. The Palearctic, the Ethiopian, and the Oriental regions, are also generally admitted to be well characterised by their terrestrial molluscs. There only remain the Australian and the Neotropical regions, in which some want of homogeneity is apparent, owing to the vast development and specialisation of certain groups in the islands which belong to these regions. The Antilles, on the one hand, and the Polynesian Islands, on the other, are so rich in land-shells and possess so many peculiar forms, that, judged by these alone, they must form primary instead of secondary divisions. We have, however, already pointed out the inconvenience of any such partial systems of zoological geography, and the causes have been sufficiently indicated which have, in the case of land-shells as of insects, produced certain special features of distribution.

We therefore venture to hope, that conchologists will give us the advantage of their more full and accurate knowledge both of the classification and distribution of this interesting group of animals, not to map out new sets of regions for themselves, but to show what kind of barriers have been most efficient in limiting the range of species, and how their distribution is actually effected, so as to be able to explain whatever discrepancies exist between the actual distribution of land-shells and that of the higher animals.

Order III.—OPISTHO-BRANCHIATA.

There are ten families in this order, all of which, as far as known, are widely or universally distributed. Some of them are found fossil, ranging back to the Carboniferous epoch. They are commonly termed Sea-slugs, and have either a thin small shell or none. We shall therefore simply enumerate the families, with the number of genera and species as given by Mr. Woodward.
Family 31.—Tornatellidae. (7 Genera, 62 Species living, 166 fossil.)

Family 32.—Bullidae. (12 Genera, 168 Species living, 88 fossil.)

Family 33.—Aphysiidae. (8 Genera, 84 Species living, 4 fossil.)

Family 34.—Pleurobranchidae. (7 Genera, 28 Species living, 5 fossil.)

Family 35.—Phyllidiidae. (4 Genera, 14 Species living, 0 fossil.)

Family 36.—Doridae. (23 Genera, 160 Species living, 0 fossil.)

Family 37.—Tritoniidae. (9 Genera, 38 Species living, 0 fossil.)

Family 38.—Æolidae. (14 Genera, 101 Species living, 0 fossil.)

Family 39.—Phyllyrhoïdæ. (1 Genus, 6 Species living, 0 fossil.)

Family 40.—Elysiidae. (5 Genera, 13 Species living, 0 fossil.)
Order IV.—**NUCLEO-BRANCHIATA.**

These are oceanic, swimming mollusks, of a delicate texture. They are found in all warm seas, and range back to the Lower Silurian epoch. There are only two families.

**Family 41.—FIROLIDÆ.** (2 Genera, 33 Species living, 1 fossil.)

**Family 42.—ATLANTIDÆ.** (5 Genera, 22 Species living, 159 fossil.)

**Class.—PTEROPODA.**

These are swimming, oceanic molluscs, inhabiting both Arctic, Temperate, and Tropical seas. The three families have each a wide distribution in all the great oceans. They range back to the Silurian period.

**Family 1.—HYALEIDÆ.** (9 Genera, 52 Species living, 95 fossil.)

**Family 2.—LIMACINIDÆ.** (4 Genera, 19 Species living, 0 fossil.)

**Family 3.—CLIONIDÆ.** (4 Genera, 14 Species living, 0 fossil.)
**Class.**—**BRACHIOPODA.**

These are sedentary, bivalve, marine mollusca, having laterally symmetrical shells, but with unequal valves. Both in space and time they are the most widely distributed molluscs. They are found in all seas, and at all depths; and when any of the families or genera have a restricted range, it seems to be due to our imperfect knowledge, rather than to any real geographical limitations. In time they range back to the Cambrian formation, and seem to have had their maximum development in the Silurian period. It is not, therefore, necessary for our purpose, to do more than give the names of the families with the numbers of the genera and species, as before.

**Family 1.**—**TEREBRATULIDÆ.** (5 Genera, 67 Species living, 340 fossil.)

**Family 2.**—**SPIRIFERIDÆ.** (4 Genera, 0 Species living, 380 fossil.)

**Family 3.**—**RHYNCHONELLIDÆ.** (3 Genera, 4 Species living, 422 fossil.)

**Family 4.**—**ORTHIDÆ.** (4 Genera, 0 Species living, 328 fossil.)

**Family 5.**—**PRODUCTIDÆ.** (3 Genera, 0 Species living, 146 fossil.)

**Family 6.**—**CRANIADÆ.** (1 Genus, 5 Species living, 37 fossil.)

**Family 7.**—**DISCINIDÆ.** (2 Genera, 10 Species living, 90 fossil.)

**Family 8.**—**LINGULIDÆ.** (2 Genera, 16 Species living, 99 fossil.)
CLASS.—CONCHIFERA.

The Conchifera, or ordinary Bivalve Molluscs, may be distinguished from the Brachiopoda by having their shells laterally unsymmetrical, while the valves are generally (but not always) equal. They are mostly marine, but a few inhabit fresh water. As the distribution of some of the families presents points of interest, we shall treat them in the same manner as the marine Gasteropoda.

**Family 1.—OSTREIDÆ.** (5 Genera, 426 Species.)

**Distribution.**—The Ostreidæ, including the Oysters and Scallops, are found in all seas, Arctic as well as Tropical. There are nearly 1,400 species fossil, ranging back to the Carboniferous period.

**Family 2.—AVICULIDÆ.** (3 Genera, 94 Species.)

**Distribution.**—The Aviculidæ, or Wing-shells and Pearl Oysters, are characteristic of Tropical and warm seas, a few only ranging into temperate regions. Nearly 700 fossil species are known from various formations ranging back to the Devonian, and Lower Silurian.

**Family 3.—MYTILIDÆ.** (3 Genera, 217 Species.)

**Distribution.**—The Mytilidæ, or Mussels, have a world-wide distribution. There is one fresh-water species, which inhabits the Volga. There are about 350 fossil species, ranging back to the Carboniferous epoch.
Family 4.—Arcadæ. (6 Genera, 360 Species.)

Distribution.—The Arcadæ are universally distributed, and are most abundant in warm seas. The genus Leda is, however, abundant in Arctic and Temperate regions, and Solenella is confined to the South Temperate zone. There are near 1,200 fossil species, found in all strata as low as the Lower Silurian.

Family 5.—Trigoniadæ. (1 Genus, 3 Species.)

Distribution.—The living Trigonæ are confined to Australia, but there are 5 other genera fossil, containing about 150 species, and found in various formations from the Chalk to the Lower Silurian.

Family 6.—Unionidæ. (7 Genera, 549 Species.)

Distribution.—The Unionidæ, or Fresh-water Mussels, are found in all the fresh waters of the globe, but some of the genera are restricted. Castalia, Myctopus and Mulleria are confined to the rivers of South America; Anodon, to the Nearctic and Palæarctic regions; Iridina, and Etheria, to the rivers of Africa; Unio has a universal distribution, but is especially abundant in North America. About 60 fossil species are found in the Tertiary and Wealden formations.

Family 7.—Chamidæ. (1 Genus, 50 Species.)

Distribution.—The Chamidæ, or Giant Clams, are confined to Tropical seas, chiefly among coral reefs. There are two other genera and 62 species fossil, ranging from the Chalk to the Oolite formations.

Family 8.—Hippuritidæ. (5 Genera, 103 Species.)

Fossils of doubtful affinity, from the Chalk formation.
Family 9.—Tridacnidae. (1 Genus, 8 Species.)

Distribution.—The Tridacnidae, or Clam-shells, are of very large size, and are confined to the Tropical regions of the Indian and Pacific Oceans. A few species have been found fossil in the Miocene formation.

Family 10.—Cardiidae. (1 Genus, 200 Species.)

Distribution.—The Cardiidae, or Cockles, are of world-wide distribution. Another genus is fossil, and nearly 400 fossil species are known, ranging back to the Upper Silurian formation.

Family 11.—Lucinidae. (8 Genera, 178 Species.)

Distribution.—The Lucinidae inhabit the Tropical and Temperate seas of all parts of the world; but the genus Corbis is confined to the Indian and Pacific Oceans, Montacuta and Lepton, to the Atlantic. There are nearly 500 extinct species, ranging from the Tertiary back to the Silurian formation.

Family 12.—Cycladidae. (3 Genera, 176 Species.)

Distribution.—The Cycladidae are small fresh- or brackish-water shells found all over the globe. The genus Cyclas is most abundant in the North Temperate zone, while Cyrena inhabits the warmer shores of the Atlantic and Pacific, but is absent from the West Coast of America. There are about 150 species fossil, ranging back from the Pliocene to the Wealden formations.

Family 13.—Cyprinidae. (10 Genera, 176 Species.)

Distribution.—Universal. Cyprina and Astarte are Arctic and North Temperate; Cardita is Tropical and South Temperate. There are several extinct genera and about 1,000 species found in all formations as far back as the Lower Silurian.
Family 14.—VENERIDÆ. (10 Genera, 600 Species.)

Distribution.—Universal. Lucinopsis is confined to the North Atlantic; Glauconeza to the mouths of rivers in the Oriental region; Meroe and Trigona to warm seas. There are about 350 fossil species, ranging back to the Oolitic period.

Family 15.—MACTRIDÆ. (5 Genera, 147 Species.)

Distribution.—All seas, but more abundant in the Tropics. Gnathodon is found in the Gulf of Mexico; Anatinella in the Oriental region. There are about 60 fossil species, ranging back to the Carboniferous period.

Family 16.—TELLINIDÆ. (11 Genera, 560 Species.)

Distribution.—All seas; most abundant in the Tropics. Galatea is confined to African rivers. There are about 60 fossil species, mostly Tertiary, but ranging back to the Carboniferous period.

Family 17.—SOLENIDÆ. (3 Genera, 63 Species.)

Distribution.—All Temperate and Tropical seas. There are 80 fossil species which range back to the Carboniferous epoch.

Family 18.—MYACIDÆ. (6 Genera, 121 Species.)

Distribution.—All seas. Panopaea inhabits both North and South Temperate seas; Glycimeris, Arctic seas. There are near 350 fossil species, ranging back to the Lower Oolite formation.

Family 19.—ANATINIDÆ. (8 Genera, 246 Species.)

Distribution.—All seas. Pholadomya is from Tropical Africa; Myadora from the Western Pacific; Myochama and Chamostraea are Australian. There are about 400 fossil species, ranging back to the Lower Silurian formation.
Family 20.—Gastrochænidæ. (5 Genera, 40 Species.)

Distribution.—Temperate and warm seas. Aspergilum ranges from the Red Sea to New Zealand. There are 35 fossil species, ranging back to the Lower Oolite.

Family 21.—Pholadidæ. (4 Genera, 81 Species.)

Distribution.—These burrowing molluscs inhabit all Temperate and warm seas from Norway to New Zealand. There are about 50 fossil species, ranging back to the epoch of the Lias.

General Remarks on the Distribution of the Marine Mollusca.

The marine Mollusca are remarkable for their usually wide distribution. About 48 of the families are cosmopolitan, ranging over both hemispheres, and in cold as well as warm seas. About 15 are restricted to the warmer seas of the globe; but several of these extend from Norway to New Zealand, a distribution which may be called universal, and only 2 or 3 are absolutely confined to Tropical seas. Two small families only, are confined to the Pacific and Indian Oceans. Marine fishes, on the other hand, have a much less cosmopolitan character, no less than 30 families having a limited distribution, while 50 are universal. Some of these 30 families are confined to the Northern seas, some to the Atlantic and Mediterranean, and a considerable number to the Indian Ocean and Western Pacific. Many of these families, it is true, are much smaller than those of the Mollusca, which seem to possess very few of those small isolated families of two or three species only, which abound in all the Vertebrate classes. These differences are no doubt connected with the higher organisation of fishes, which renders them more susceptible to changed conditions of life; and this is indicated by the much less antiquity of existing families of fishes, the greater part of which do not date back beyond the Cretaceous epoch, and many of them only to the Eocene. In striking contrast we have the vast antiquity of most of the families of Mol-
lusca, as shown in the following table of their range taken from Mr. Woodward’s work, but re-arranged, and somewhat modified.

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<th>Range of Families of Mollusca in Time; arranged in their order of appearance and disappearance.</th>
<th>Lower Silurian</th>
<th>Devonian</th>
<th>Carboniferous</th>
<th>Permian</th>
<th>Trias.</th>
<th>Lower Oolite</th>
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Nor is this enormous antiquity confined to family types alone. Many genera are equally ancient. The genus Lingula has
existed from the earliest Palæozoic times down to the present day; while Terebratula, Rhynchonella, Discina, Nautilus, Natica, Pleurotomaria, Patella, Dentalium, Mytilus and many other living forms, range back to the Palæozoic epoch. That groups of such immense antiquity, and having power to resist such vast changes of external conditions as they must have been subject to, should now be widely distributed, is no more than might reasonably be expected. It is only in the case of sub-genera and species, that we can expect the influence of recent geological or climatal changes to be manifest; and it must be left to special students to work out the details of their distribution, with reference to the general principles found to obtain among the more highly organised animals.
CHAPTER XXIII.

SUMMARY OF THE DISTRIBUTION, AND LINES OF MIGRATION, OF THE SEVERAL CLASSES OF ANIMALS.

Having already given summaries of the distribution of the several orders, and of some of the classes of land animals, we propose here to make a few general remarks on the special phenomena presented by the more important groups, and to indicate where possible, the general lines of migration by which they have become dispersed over wide areas.

Mammalia.

This class is very important, and its past history is much better known than that of most others. We shall therefore briefly summarise the results we have arrived at from our examination of the distribution of extinct and living forms of each order.

Primates.—This order, being pre-eminently a tropical one, became separated into two portions, inhabiting the Eastern and Western Hemispheres respectively, at a very early epoch. In consequence of this separation it has diverged more radically than most other orders, so that the two American families, Cebidæ and Hapalidæ, are widely differentiated from the Apes, Monkeys, and Lemurs of the Old World. The Lemurs were probably still more ancient, but being much lower in organisation, they became extinct in most of the areas where the higher forms of Primates became developed. Remains found in the Eocene formation indicate, that the North American and European
Primates had, even at that early epoch, diverged into distinct series, so that we must probably look back to the secondary period for the ancestral form from which the entire order was developed.

Chiroptera.—These are also undoubtedly very ancient. The most generalised forms—the Vespertilionidae and Noctilionidae—were the most widely distributed; while special types have arisen in America, and in the Eastern Hemisphere. Remains found in the Upper Eocene formation of Europe differ little from species still living in the same countries; so that we can form no conjecture as to the origin or migration of the group. Their power of flight would, however, enable them rapidly to spread over all the great continents of the globe.

Insectivora.—This very ancient group, now probably verging towards extinction, appears to have originated in the Northern continent, and never to have reached Australia or South America. It may, however, have become extinct in the latter country owing to the competition of the numerous Edentata. The Insectivora now often maintain themselves amidst more highly developed forms, by means of some special protection. Some burrow in the earth,—like the moles; others have a spiny covering,—as the hedgehogs and several of the Centetidae; others are aquatic,—as the Potamogale and the desman; others have a nauseous odour,—as the shrews; while there are several which seem to be preserved by their resemblance to higher forms,—as the elephant-shrews to jerboas, and the tupaias to squirrels. The same need of protection is shown by the numerous Insectivora inhabiting Madagascar, where the competing forms are few; and by one lingering in the Antilles, where there are hardly any other mammalia.

Carnivora.—Although perhaps less ancient than the preceding, this form of mammal is far more highly organised, and from its earliest appearance appears to have become dominant in the world. It would therefore soon spread widely, and diverge into the various specialised types represented by existing families. Most of these appear to have originated in the Eastern Hemisphere, the only Carnivora occurring in North
American Miocene deposits being ancestral forms of Canidae and Felidae. It seems probable, therefore, that the order had attained a considerable development before it reached the Western Hemisphere. The Procyonidae, now confined to America, are not very ancient; and the occurrence of a few allied forms in the Himalayas (Ælurus and Ælurocephalus) render it probable that their common ancestors entered North America from the Palæarctic region during the Miocene period, but being a rather low type they have succumbed under the competition of higher forms in most parts of the Eastern Hemisphere. Bears and Weasels are probably still more recent emigrants to America. The aquatic carnivora (Seals, &c.) are, as might be expected, more widely and uniformly distributed, but there is little evidence to show at what period the type was first developed.

**Ungulata.**—These are the dominant vegetable-feeders of the great continents, and they have steadily increased in numbers and in specialisation from the oldest Tertiary times to the present day. Being generally of larger size and less active than the Carnivora, they have somewhat more restricted powers of dispersal. We have good evidence that their wide range over the globe is a comparatively recent phenomenon. Tapirs and Llamas have probably not long inhabited South America, while Rhinoceroses and Antelope were once, perhaps, unknown in Africa, although abounding in Europe and Asia. Swine are one of the most ancient types in both hemispheres; and their great hardiness, their omnivorous diet, and their powers of swimming, have led to their wide distribution. The sheep and goats, on the other hand, are perhaps the most recent development of the Ungulata, and they seem to have arisen in the Palæarctic region at a time when its climate already approximated to that which now prevails. Hence they are pre-eminently a Temperate group, never found within the Tropics except upon a few mountain ranges.

**Proboscidea.**—These huge animals (the Elephants and Mastodons) appear to have originated in the warmer parts of the Palæarctic region, but they soon spread over all the great
Continents, even reaching the southern extremity of America. Their extinction has probably depended more on physical than on organic changes, and we can clearly trace their almost total disappearance to the effects of the Glacial epoch.

**Rodentia.**—Rodents are a very dominant group, and a very ancient one. Owing to their small size and rapid powers of increase, they soon spread over almost every part of the globe, whence has resulted a great specialisation of family types in the South American continent which remained so long isolated. They are capable of living wherever there is any kind of vegetable food, hence their range will be determined rather by organic than by physical conditions; and the occupation of a country by enemies or by competing forms, is probably the chief cause which has prevented many of the families from acquiring a wide range. The occurrence of isolated species of the South American families, Octodontidae and Echimyidae in the Ethiopian and Palsearctic regions, is an indication that the range of many of the families has recently become less extensive.

**Edentata.**—These singular and lowly-organised animals appear to have become almost restricted to the two great Southern lands—South Africa and South America—at an early period; and, being there free from the competition of higher forms, developed a number of remarkable types often of huge size, of which the Megatherium is one of the best known. The incursion of the highly-organised Ungulates and Carnivora into Africa during the Miocene epoch, probably exterminated most of them in that continent; but in America they continued in full force down to the Post-Pliocene period; and even now, the comparatively diminutive Sloths, Ant-eaters, and Armadillos, form a large and important portion of the fauna.

**Marsupialia and Monotremata.**—These are probably the representatives of the most ancient and lowly-organised types of mammal. They once existed in the northern continents, whence they spread into Australia; and being isolated, and preserved from the competition of the higher forms which soon arose in other parts of the world, they have developed into a variety of types, which, however, still preserve a general
uniformity of organisation. One family, which continued to exist in Europe till the latter part of the Miocene period, reached America, and has there been preserved to our day.

*Lines of Migration of the Mammalia.*—The whole series of phenomena presented by the distribution of the Mammalia, looked at broadly, are in harmony with the view that the great continents and oceans of our own epoch have been in existence, with comparatively small changes, during all Tertiary times. Each one of them has, no doubt, undergone considerable modifications in its area, its altitude, and in its connection with other lands. Yet some considerable portion of each continent has, probably, long existed in its present position, while the great oceans seem to have occupied the same depressions of the earth's crust (varied, perhaps, by local elevations and subsidences) during all this vast period of time. Hence, allowing for the changes of which we have more or less satisfactory evidence, the migrations of the chief mammalian types can be pretty clearly traced. Some, owing to their small size and great vitality, have spread to almost all the chief land masses; but the majority of the orders have a more restricted range. All the evidence at our command points to the Northern Hemisphere as the birth-place of the class, and probably of all the orders. At a very early period the land communication with Australia was cut off, and has never been renewed; so that we have here preserved for us a sample of one or more of the most ancient forms of mammal. Somewhat later the union with South America and South Africa was severed; and in both these countries we have samples of a somewhat more advanced stage of mammalian development. Later still, the union by a northern route between the Eastern and Western Hemispheres appears to have been broken, partly by a physical separation, but almost as effectually by a lowering of temperature. About the same period the separation of the Palæarctic region from the Oriental was effected, by the rise of the Himalayas and the increasing contrast of climate; while the formation of the great desert-belts of the Sahara, Arabia, Persia, and Central Asia, helped to complete the separation of
the Temperate and Tropical zones, and to render further intermi-
gration almost impossible.

In a few cases—of which the Rodents in Australia and the
pigs in Austro-Malaya are perhaps the most striking examples
—the distribution of land-mammals has been effected by a sea-
passage either by swimming or on floating vegetation; but, as
a rule, we may be sure that the migrations of mammalia have
taken place over the land; and their presence on islands is,
therefore, a clear indication that these have been once connected
with a continent. The present class of animals thus affords the
best evidence of the past history of the land surface of our
globe; and we have chiefly relied upon it in sketching out (in
Part III.) the probable changes which each of our great regions
has undergone.

**Birds.**

Although birds are, of all land-vertebrates, the best able to
cross seas and oceans, it is remarkable how closely the main
features of their distribution correspond with those of the Mamm-
alia. South America possesses the low Formicaroid type of
Passeres,—which, compared with the more highly developed
forms of the Eastern Hemisphere, is analogous to the Cebidae
and Hapalidae as compared with the Old World Apes and Mon-
keys; while its Cracidae as compared with the Pheasants and
Grouse, may be considered parallel to the Edentata as compared
with the Ungulates of the Old World. The Marsupials of
America and Australia, are paralleled, among birds, in the Stru-
thionidae and Megapodiidae; the Lemurs and Insectivora pre-
served in Madagascar are represented by the Mascarene Dididae;
the absence of Deer and Bears from Africa is analogous to the
absence of Wrens, Creepers, and Pheasants; while the African
Hyracidae and Chrysochloridae among mammals, may well be
compared with the equally peculiar Coliidae and Musophagidae
among birds.

From these and many other similarities of distribution, it is
clear that birds have, as a rule, followed the same great lines of
migration as mammalia; and that oceans, seas, and deserts, have
always to a great extent limited their range. Yet these barriers have not been absolute; and in the course of ages birds have been able to reach almost every habitable land upon the globe. Hence have arisen some of the most curious and interesting phenomena of distribution; and many islands, which are entirely destitute of mammalia, or possess a very few species, abound in birds, often of peculiar types and remarkable for some unusual character or habit. Striking examples of such interesting bird-faunas are those of New Zealand, the Sandwich Islands, the Galapagos, the Mascarene Islands, the Moluccas, and the Antilles; while even small and remote islets,—such as Juan Fernandez and Norfolk Island, have more light thrown upon their past history by means of their birds, than by any other portion of their scanty fauna.

Another peculiar feature in the distribution of this class is the extraordinary manner in which certain groups and certain external characteristics, have become developed in islands, where the smaller and less powerful birds have been protected from the incursions of mammalian enemies, and where rapacious birds—which seem to some degree dependent on the abundance of mammalia—are also scarce. Thus, we have the Pigeons and the Parrots most wonderfully developed in the Australian region, which is pre-eminently insular; and both these groups here acquire conspicuous colours very unusual, or altogether absent, elsewhere. Similar colours (black and red) appear, in the same two groups, in the distant Mascarene islands; while in the Antilles the parrots have often white heads, a character not found in the allied species on the South American continent. Crests, too, are largely developed, in both these groups, in the Australian region only; and a crested parrot formerly lived in Mauritius,—a coincidence too much like that of the colours as above noted, to be considered accidental.

Again, birds exhibit to us a remarkable contrast as regards the oceanic islands of tropical and temperate latitudes; for while most of the former present hardly any cases of specific identity with the birds of adjacent continents, the latter often show hardly any differences. The Galapagos and Madagascar
are examples of the first-named peculiarity; the Azores and the Bermudas of the last; and the difference can be clearly traced to the frequency and violence of storms in the one case and to the calms or steady breezes in the other.

It appears then, that although birds do not afford us the same convincing proof of the former union of now disjoined lands as we obtain from mammals, yet they give us much curious and suggestive information as to the various and complex modes in which the existing peculiarities of the distribution of animals have been brought about. They also throw much light on the relation between distribution and the external characters of animals; and, as they are often found where mammalia are quite absent, we must rank them as of equal value for the purposes of our present study.

Reptiles.

These hold a somewhat intermediate place, as regards their distribution, between mammals and birds, having on the whole rather a wider range than the former, and a more restricted one than the latter.

Snakes appear to have hardly more facilities for crossing the ocean than mammals; hence they are generally absent from oceanic islands. They are more especially a tropical group, and have thus never been able to pass from one continent to another by those high northern and southern routes, which we have seen reason to believe were very effectual in the case of mammalia and some other animals. Hence we find no resemblance between the Australian and Neotropical regions, or between the Palæarctic and Nearctic; while the Western Hemisphere is comparatively poor as regards variety of types, although rich in genera and species. Deserts and high mountains are also very effectual barriers for this group, and their lines of migration have probably been along river valleys, and occasionally across narrow seas by means of floating vegetation.

Lizards, being somewhat less tropical than snakes, may have passed by the northern route during warm epochs. They are also more suited to traverse deserts, and they possess some unknown
means of crossing the ocean, as they are not unfrequently found in remote oceanic islands. These various causes have modified their distribution. The Western Hemisphere is much richer in lizards than it is in snakes; and it is also very distinct from the Eastern Hemisphere. The lines of migration of lizards appear to have been along the mountains and deserts of tropical countries, and, under special conditions, across tropical seas from island to island.

Crocodiles are a declining group. They were once more generally distributed, all the three families being found in British Eocene deposits. Being aquatic and capable of living in the sea, they can readily pass along all the coasts and islands of the warmer parts of the globe. Tortoises are equally ancient, and the restriction of certain groups to definite areas seems to be also a recent phenomenon.

*Amphibia.*

The Amphibia differ widely from Reptiles in their power of enduring cold; one of their chief divisions, the Urodela or Tailed-Batrachia, being confined to the temperate parts of the Northern Hemisphere. To this class of animals the northern and southern routes of migration were open; and we accordingly find a considerable amount of resemblance between South America and Australia, and a still stronger affinity between North America and the Palæarctic continent. The other tropical regions are more distinct from each other; clearly indicating that, in this group, it is tropical deserts and tropical oceans which are the barriers to migration. The class however is very fragmentary, and probably very ancient; so that descendants of once widespread types are now found isolated in various parts of the globe, between which we may feel sure there has been no direct transmission of Batrachia. Remembering that their chief lines of migration have been by northern and southern land-routes, by floating ice, by fresh-water channels, and perhaps at rare intervals by ova being carried by aquatic birds or by violent storms,—we shall be able to comprehend most of the features of their actual distribution.
Fresh-water Fishes.

Although it would appear, at first sight, that the means of dispersal of these animals are very limited, yet they share to some extent the wide range of other fresh-water organisms. They are found in all climates; but the tropical regions are by far the most productive, and of these South America is perhaps the richest and most peculiar. There is a certain amount of identity between the two northern continents, and also between those of the South Temperate zone; yet all are radically distinct, even North America and Europe having but a small proportion of their forms in common. The occurrence of allied fresh-water species in remote lands—as the *Aphritis* of Tasmania and Patagonia, and the *Comephorus* of Lake Baikal, distantly allied to the mackerels of Northern seas—would imply that marine fishes are often modified for a life in fresh waters; while other facts no less plainly show that permanent fresh-water species are sometimes dispersed in various ways across the oceans, more especially by the northern and southern routes.

The families of fresh-water fishes are often of restricted range, although cases of very wide and scattered distribution also occur. The great zoological regions are, on the whole, very well characterized; showing that the same barriers are effectual here, as with most other vertebrates. We conclude, therefore, that the chief lines of migration of fresh-water fishes have been across the Arctic and Antarctic seas, probably by means of floating ice as well as by the help of the vast flocks of migratory aquatic birds that frequent those regions. On continents they are, usually, widely dispersed; but tropical seas, even when of small extent, appear to have offered an effectual barrier to their dispersal. The cases of affinity between Tropical America, Africa, Asia, and Australia, must therefore be imputed either to the survival of once widespread groups, or to analogous adaptation to a fresh-water life of wide-spread marine types; and these cases cannot be taken as evidence of any former land connection between such remote continents.
It has already been shown (Vol. I. pp. 209-213 and Vol. II. pp. 44-48) that the peculiarities of distribution of the various groups of insects depend very much on their habits and general economy. Their antiquity is so vast, and their more important modifications of structure have probably occurred so slowly, that modes of dispersal depending on such a combination of favourable conditions as to be of excessive rarity, may yet have had time to produce large cumulative effects. Their small specific gravity and their habits of flight render them liable to dispersal by winds to an extent unknown in other classes of animals; and thus, what are usually very effectual barriers have been overstepped, and sometimes almost obliterated, in the case of insects. A careful examination will, however, almost always show traces of an ancient fauna, agreeing in character with other classes of animals, intermixed with the more prominent and often more numerous forms whose presence is due to this unusual facility of dispersal.

The effectual migration of insects is, perhaps more than in any other class of animals, limited by organic and physical conditions. The vegetation, the soil, the temperature, and the supply of moisture, must all be suited to their habits and economy; while they require an immunity from enemies of various kinds, which immigrants to a new country seldom obtain. Few organisms have, in so many complex ways, become adapted to their special environment, as have insects. They are in each country more or less adapted to the plants which belong to it; while their colours, their habits, and the very nature of the juices of their system, are all modified so as to protect them from the special dangers which surround them in their native land. It follows, that while no animals are so well adapted to show us the various modes by which dispersal may be effected, none can so effectually teach us the true nature and vast influence of the organic barrier in limiting dispersal.

It is probable that insects have at one time or another taken advantage of every line of migration by which any terrestrial
organisms have spread over the earth, but owing to their small size and rapid multiplication, they have made use of some which are exclusively their own. Such are the passage along mountain ranges from the Arctic to the Antarctic regions, and the dispersal of certain types over all temperate lands. It will perhaps be found that insects have spread over the land surface in directions dependent on our surface zones—forests, pastures, and deserts;—and a study of these, with a due consideration of the fact that narrow seas are scarcely a barrier to most of the groups, may assist us to understand many of the details of insect-distribution.

Terrestrial Mollusca.

The distribution of land-shells agrees, in some features, with that of insects, while in others the two are strongly contrasted. In both we see the effects of great antiquity, with some special means of dispersal; but while in insects the general powers of motion, both voluntary and involuntary, are at a maximum, in land-molluscs they are almost at a minimum. Although to some extent dependent on vegetation and climate, the latter are more dependent on inorganic conditions, and also to a large extent on the general organic environment. The result of these various causes, acting through countless ages, has been to spread the main types of structure with considerable uniformity over the globe; while generic and sub-generic forms are often wonderfully localized.

Land-shells, even more than insects, seem, at first sight, to require regions of their own; but we have already pointed out the disadvantages of such a method of study. It will be far more instructive to refer them to those regions and sub-regions which are found to accord best with the distribution of the higher animals, and to consider the various anomalies they present as so many problems, to be solved by a careful study of their habits and economy, and especially by a search after the hidden causes which have enabled them to spread so widely over land and ocean.

The lines of migration which land-shells have followed, can
hardly be determined with any definiteness. On continents they seem to spread steadily, but slowly, in every direction, checked probably by organic and physical conditions rather than by the barriers which limit the higher groups. Over the ocean they are also slowly dispersed, by some means which act perhaps at very long intervals, but which, within the period of the duration of genera and families, are tolerably effective. It thus happens that, although the powers of dispersal of land-shells and insects are so very unequal, the resulting geographical distribution is almost the opposite of what might have been expected,—the former being, on the whole, less distinctly localized than the latter.

CONCLUSION.

The preceding remarks are all I now venture to offer, on the distinguishing features of the various groups of land-animals as regards their distribution and migrations. They are at best but indications of the various lines of research opened up to us by the study of animals from the geographical point of view, and by looking upon their range in space and time as an important portion of the earth's history. Much work has yet to be done before the materials will exist for a complete treatment of the subject in all its branches; and it is the author's hope that his volumes may lead to a more systematic collection and arrangement of the necessary facts. At present all public museums and private collections are arranged zoologically. All treatises, monographs, and catalogues, also follow, more or less completely, the zoological arrangement; and the greatest difficulty the student of geographical distribution has to contend against, is the total absence of geographical collections, and the almost total want of complete and comparable local catalogues. Till every well-marked district,—every archipelago, and every important island, has all its known species of the more important groups of animals catalogued on a uniform plan, and with a uniform nomenclature, a thoroughly satisfactory account of the Geographical Distribution of Animals will not be possible. But more than this is wanted. Many of the most curious relations between animal
forms and their habitats, are entirely unnoticed, owing to the productions of the same locality never being associated in our museums and collections. A few such relations have been brought to light by modern scientific travellers, but many more remain to be discovered; and there is probably no fresher and more productive field still unexplored in Natural History. Most of these curious and suggestive relations are to be found in the productions of islands, as compared with each other, or with the continents of which they form appendages; but these can never be properly studied, or even discovered, unless they are visibly grouped together. When the birds, the more conspicuous families of insects, and the land-shells of islands, are kept together so as to be readily compared with similar associations from the adjacent continents or other islands, it is believed that in almost every case there will be found to be peculiarities of form or colour running through widely different groups, and strictly indicative of local or geographical influences. Some of these coincident variations have been alluded to in various parts of this work, but they have never been systematically investigated. They constitute an unworked mine of wealth for the enterprising explorer; and they may not improbably lead to the discovery of some of the hidden laws (supplementary to Natural Selection), which seem to be required, in order to account for many of the external characteristics of animals.

In concluding his task, the author ventures to suggest, that naturalists who are disposed to turn aside from the beaten track of research, may find in the line of study here suggested a new and interesting pursuit, not inferior in attractions to the lofty heights of transcendental anatomy, or the bewildering mazes of modern classification. And it is a study which will surely lead them to an increased appreciation of the beauty and the harmony of nature, and to a fuller comprehension of the complex relations and mutual interdependence, which link together every animal and vegetable form, with the ever-changing earth which supports them, into one grand organic whole.
GENERAL INDEX.
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All names in Italics refer, either to the genera and other groups of Extinct Animals in Part II. of the First Volume;—or to the genera whose distribution is given under Geographical Zoology (Part IV.) in the Second Volume; the Families and higher groups being in small capitals. All other references are in ordinary type.

The various matters discussed under Zoological Geography (Part III.), are indexed as much as possible by subjects and localities. None of the genera mentioned in this Part are indexed, as this would have more than doubled the extent of the Index, and would have served no useful purpose, because the general distribution of each genus is given in Part IV., and the separate details can always be found by referring to the region, sub-region, and class.

A.

Aard-vark of East Africa, figure of, i. 261
Aard-vark, ii. 246
Aard-wolf, ii. 196
Abarcus, ii. 491
Abarus, ii. 489
Abisara, ii. 475
Ablabes, ii. 375
Abhisara, ii. 489
Abrosis, ii. 258
Abronzus, ii. 392
Abrostomus, ii. 451
Aburria, ii. 343
Acalyphts, ii. 384
Acanthias, ii. 444
Acanthopus, ii. 383
Acanthopthalmt, ii. 455
Acanthoptila, ii. 261
Acanthopyga, ii. 390
Acanthorhynchus, ii. 275
Acanthosaur, ii. 404
Acanthosaurus, ii. 402
Acrura, ii. 438
Accentor, ii. 260
Accentorium, ii. 257
Accipiter, ii. 459
ACCIPERENIID.E, ii. 459
Accipiter, ii. 348
Acepittres, European Eocene, i. 163
Acepittres, classification of, i. 97
range of Palaearctic genera of, i. 248
range of Ethiopian genera of, i. 312
range of Oriental genera of, i. 385
range of Australian genera of, i. 486
ACCIPITRES, ii. 345
general remarks on the distribution of, ii.
Acesta, ii. 444
Acesta, ii. 108
Achelus, ii. 375
Achara, ii. 454
Achara, ii. 515
Achathulla, ii. 514
Acherontia, ii. 483
Achiles, ii. 452
Acherontia, N. American Tertiary, i. 133
Acheta, ii. 519
ACICULID.E, ii. 519
Acinostera, ii. 497
Acodon, ii. 230
ACONTIAD.E, ii. 399
Acontias, ii. 399
Acanthorium, European Eocene, i. 126
Acanthorium, ii. 218...
GENERAL INDEX.

Amblyrhiza, ii. 237
Amblyrhizichthys, ii. 452
Amblystoma, ii. 413
Amelus, ii. 390
America, recent separation of North and South, i. 40
extinct mammalia of, i. 129
N, Post-Pliocene fauna of, i. 129
American Creepers, ii. 295
AMMIDE, ii. 442
Anamurinus, ii. 284
Anaxodryas, ii. 440
Anamala, ii. 289
AMMONITIDE, ii. 506
Anomus, N. American Tertiary, i. 134
Amphelops, ii. 287
AMPELIDE, ii. 230
Ampello, ii. 192
Ampela, ii. 289
Amphictonus, European Miocene, i. 117
ii. 138
Amphibia, means of dispersal of, i. 28
classification of, i. 190
peculiar to Palaearctic region, i. 180
of Central Europe, i. 196
of the Mediterranean sub-region, i. 205
of the Siberian sub-region, i. 220
of the Manchurian sub-region, i. 236
table of Palaearctic families of, i. 237
of the Ethiopian region, i. 255
of West Africa, i. 264
S. African, i. 268
of Madagascar, i. 289
table of Ethiopian families of, i. 298
of the Oriental region, i. 317
of the Indian sub-region, i. 326
of Ceylon, i. 327
of the Indo-Chinese sub-region, i. 331
do the Indo-Malay sub-region, i. 349
table of Oriental families of, i. 369
of the Australian region, i. 387
resemblances of Australian and South-American, i. 400
of New Guinea, i. 416
of New Zealand, i. 457
Neotropical, ii. 11
of South Temperate America, ii. 41
of the Mexican sub-region, ii. 54
do the Antilles, ii. 72
table of Neotropical families of, ii. 89
of the Neartic region, ii. 130
of California, ii. 128
of Central North America, ii. 131
do the Eastern United States, ii. 134
table of Neartic families of, ii. 143
AMPHIBIA, ii. 411
general remarks on the distribution of, ii. 412
fossil, ii. 423
summary and conclusion, ii. 548
lines of migration of, ii. 548
Amphibola, ii. 510
Amphibius, Indian Miocene, i. 122
ii. 225
Amphictonus, European Miocene, i. 118
Indian Miocene, i. 121
N. American Tertiary, i. 134
ii. 198
ii. 302
Amphigenus, ii. 398
Amphicormiers, European Miocene, i. 119
Amphinectens, European Miocene, i. 120
ii. 220
Amphictonus, ii. 464
Amphihynix, ii. 455
Amphibolus, ii. 389
AMPHISBENIID. E, ii. 388
Amphibors, European Miocene, i. 118
Amphitragulus, European Miocene, i. 120
ii. 218
Amphironus, ii. 412
AMPHIUMIDE, ii. 412
Amphicorbusi, ii. 397
Amphibolus, ii. 458
Amphides, ii. 285
Amphicus, ii. 285
Amphichlides, ii. 183
Amphidiscus, ii. 183
Amphilestes, ii. 450
ANACANTHINI, ii. 439
Anacrysta, ii. 445
Anacanthus, ii. 517
Anadia, ii. 393
ANADIAE, ii. 393
Anacanthus, ii. 101, 291
Anatidae, ii. 413
Anatellus, ii. 268
Anarchonus, ii. 356
Anarhichas, ii. 431
Anas, ii. 303
Anastoma, European Tertiary, i. 169
ii. 527
Anastomus, ii. 361
ANATIDE, ii. 363
ANATINIDE, ii. 536
Anatinella, ii. 536
Anasornes, ii. 191
Anchaspis, European Eocene, i. 125
Anchylodes, N. American Eocene, i. 139
Anchicypis, N. American Tertiary, i. 135
Anchithrix, N. American Tertiary, i. 135
ii. 212
Anchithecium, European Miocene, i. 119
European Eocene, i. 125
N. American Tertiary, i. 135
Ancient fauna of New Zealand, i. 459
An菜moena, ii. 118
Anchitherium, Miocene of Greece, i. 116
European Miocene, i. 121
Ancltherium, ii. 246
Ancltherus, ii. 473
Ancltherus, ii. 518
Andaman Islands, zoology of, i. 333
probable past history of, i. 334
Andrope, ii. 367
Andrias, European Miocene, i. 165
Androdon, ii. 107
Andropodus, ii. 267
Anatoe, ii. 517
Anagryla, ii. 456
Anas, ii. 397
Angwantho, ii. 176
Animal kingdom, primary divisions of, i 85
Animals, development of, affecting distribution, i. 7
dispersal and migration of, i. 10
rapid multiplication of, i. 10
Anserine, N. American Tertiary, i. 137
Anserus, peculiarities of, i. 428
Anser, ii. 222
Anser, ii. 534
Anser, ii. 490
Anaswatarus, ii. 235
Anomalurus, ii. 397
Anopsolus, ii. 383
Anopsolus, European Miocene, i. 119
Anopsolus, European Miocene, i. 119
European Eocene, i. 126
S. American Eocene, i. 1
Anophthalmus, ii. 459
560  GENERAL INDEX.

Anostomus, ii. 445
Anous, ii. 365
Anser, ii. 363
Anseranas, ii. 363
Anseres, arrangement of, i. 98
peculiar Paleartic genera of, i. 250
peculiar Ethiopian genera of, i. 313
peculiar Australian genera of, i. 457
Ansères, general remarks on the distribution of, ii. 367
Antarctica, ii. 490
ii. 492
Ant-eaters, ii. 247
Antechinomys, ii. 249
Antechinus, ii. 249
Antelopes in the Indian Miocene deposits, i. 122
birthplace and migrations of, i. 155
Palaeartic, i. 182
ii. 221
Antelotherium, Indian Miocene, i. 122
Anteonotus, ii. 431
Anteors, ii. 476
Anthis, ii. 491
Anthips, ii. 270
Anthophorina, ii. 478
Anthochaema, ii. 375
Anthornis, ii. 275
Anthracotherio, N. American Tertiary, i. 157
Anthracotherium, European Miocene, i. 119
ii. 215
Anthropod, ii. 276
Anthropoid apes, ii. 170
Anthropoides, ii. 357
Anthracothere, ii. 299
Antecedon, N. American Tertiary, i. 138
Antillean sub-region, ii. 61
mammalia of, ii. 62
birds of, ii. 64
illustration of zoology of, ii. 67
table of distribution of resident land-birds of, ii. 68
reptiles and amphibia of, ii. 72
fresh-water fish of, ii. 73
insects of, ii. 73
land-shells of, ii. 75
past history of, ii. 78
Antilles, Pliocene Mammalia of, i. 148
land-shells of, i. 529
Antilocomys, ii. 229
ANTILOCAPRINE, ii. 223
Antilocapre, Post-Pliocene, i. 112
in Brazilian caves, i. 144
ii. 223
ii. 296
Antiquity of the genera of insects, i. 166
of the genera of land and fresh-water shells, i. 168
Antrostomus, ii. 319
Ant-thrushes, ii. 297
Anumbus, ii. 163
Anutra, ii. 414
Anuroserax, ii. 190
Aonyx, ii. 190
Apalis, ii. 258
Agelother, ii. 314
Aptern, ii. 474
Aphanaptery of Mauritian, i. 164
ii. 352
Aphlebotes, ii. 167
Apheltherium, European Eocene, i. 125
Aphnus, ii. 477
Aphodius, ii. 283
APHREDODERIDE, ii. 425
Aphritis, ii. 428
ii. 549
Aphribus, ii. 356
Aphysiotes, ii. 539
Aphyocypris, ii. 452
Aplocera, ii. 224
Aplodontia, ii. 296
Aplonis, ii. 288
Apelepsia, ii. 333
Apethia, ii. 476
Apogon, ii. 425
Apomia, ii. 396
Aphridi, ii. 396
APRASIADE, ii. 396
Aprosmictus, ii. 325
Aprosidiatia, ii. 366
APTERYGIDIE, ii. 369
Apterz, ii. 369
Aquila, European Miocene, i. 161
ii. 348
AQUILINIE, ii. 348
Ars, ii. 328
Arachnotheria, ii. 276
Arachnotherites, ii. 277
ARAMIDE, ii. 357
Aratides, ii. 352
Aratus, ii. 357
Arayar, ii. 454
Archerpila, ii. 333
ARCADIE, ii. 534
Archaenomys, ii. 238
Archaeopteryx, Bavarian Oolite, i. 163
Architectura, ii. 348
Arctic shells, ii. 518
zone not a separate region, i. 68
Arcitès, ii. 190
Arctocyon, ii. 176
Arctocephalus, ii. 302
Arctogyn, European Eocene, i. 125
ii. 206
Arctodae, N. American Post-Pliocene, i. 130
ii. 202
Arctogale, ii. 195
Arctonyx, European Pliocene, i. 113
ii. 235, 236
Arctopus, ii. 199
Arctopithèque, ii. 344
Arctotherium in Brazilian caves, i. 144
S. American Pliocene, i. 146
Ardea, ii. 329
ARDIDE, ii. 359
Arishtomus, ii. 490
Argentina, ii. 488
Argus, ii. 444
ARGONAUTIDE, ii. 505
Argus pheasant, figure of, i. 339
peculiarity in display of plumage, and confirmation of Mr. Darwin's views, i. 340
Argusiana, ii. 340
Argutor, ii. 489
Argynnis, ii. 474
Arctes, ii. 476
Arctic, ii. 395
Arinthe, ii. 529
Arion, ii. 547
Aristobia, ii. 501
Arius, ii. 443
Arnaudillos, ii. 245
Aronoidus, ii. 441
Aromochelys, ii. 408
Arranm, ii. 490
Arrhenius, ii. 501
Artamia, ii. 268
ii. 271
ii. 288
ARTAMIDE, ii. 288
Artamides, ii. 269
Artamus, ii. 288
Arthroleptis, ii. 421
Arthroleptida, European Eocene, i. 126
Artrithropterus, American Tertiary, i. 137
Arthrolepta, i. 148
Arthroleptida, European, Pliocene, i. 113
in Brazilian caves, i. 115
S. American Pliocene, i. 147
S. American Eocene, i. 148
Artemia, ii. 239, 261
Asio, ii. 350
Aspergilium, ii. 557
Aspidodera, ii. 452
Aspidorhina, ii. 391
Aspidurus, ii. 374
Aspius, ii. 453
Aspros, ii. 444
Aspro, ii. 425
Aster, ii. 555
Asterias, ii. 501
Asterophyrs, ii. 421
Asterophyrs, ii. 443
Asterohyrs, ii. 381
Astropus, ii. 274
Astrobolus, ii. 444
Astur, ii. 348
Asturina, ii. 348
Asturina, ii. 348
Ateleopodidae, ii. 440
Atoeis, ii. 174
Ateleops, ii. 416
Ateleoris, ii. 312
Aterias, ii. 474
Athene, ii. 350
Atheris, ii. 454
Atherinichthys, ii. 494
Atherinidae, ii. 434
Atherina, ii. 386
Atherina, ii. 240
Athylax, ii. 195
Athynya, ii. 474
Atlanticide, ii. 531
Ateutes, ii. 284
Atractaspididae, ii. 382
Atractaspidis, ii. 383
Atractosum, ii. 375
Artichochis, ii. 389
Atrichididae, ii. 299
Atripes, ii. 385
Attaias, ii. 354
Attalinze, ii. 293
Attis, ii. 108
Atticius, ii. 251
Attilda, ii. 102
Augeninsel, ii. 443
Augusta, N. American Post-Pliocene, i. 130
ii. 217
Augustepterus, ii. 443
Auckland Islands, birds of, i. 455
Australasie, ii. 108
Aukis, ii. 307
Aula, ii. 102
Aulaeodora, ii. 239
Aulaeodon, ii. 239
Aulaeodermaphyes, ii. 307
Aulopomus, ii. 520
Aulopyge, ii. 452
Aulteria, ii. 319, 527
Auriculidae, ii. 518
Auriparus, ii. 260
Australian, physical features of, i. 387
Australia and S. America, supposed land-connection between, i. 390
Australian region, description of, i. 387
zoological characteristics of, i. 390
Australian region, mammals of, i. 390
birds of, i. 391
reptiles of, i. 396
amphibias of, i. 397
fresh-water fish of, i. 397
summar of vertebrata of, i. 397
supposed land-connection of with S. America, i. 398
insects of, i. 403
lepidoptera of, i. 404
coleoptera of, i. 405
land-shells of, i. 407
sub-regions of, i. 408
early history of, i. 405
Australian sub-region, mammals of, i. 438
illustration of mammals of, i. 439
birds of, i. 440
illustration of fauna of, i. 441
Australian hedgehog, ii. 254
Austro-Malayan sub-region, physical features of, i. 388
zoology of, i. 409
Austroafrican, ii. 193
Aviculidae, ii. 533
Avocettula, ii. 107
Avocettinus, ii. 108
Aye-aye, figure of, i. 273
ii. 177
Axolotus, ii. 477
Azores, visited by European birds, i. 17
birds of, i. 207
butterflies of, i. 207
beetles of, i. 207, 209
peculiarly modified birds of, i. 207
stragglers to, i. 208
how stocked with animal life, i. 208

B
Babiruma of Celebes, peculiarities of, i. 428
Babiruma, ii. 215
Badger, figure of, i. 195
Badis, ii. 433
Badips, ii. 475
Bagrinas, ii. 443
Bagrichthys, ii. 442
Bagridae, ii. 442
Bagre, ii. 442
Balaird, Professor, on fauna of Cape St. Lucas, ii. 130
on representative birds of United States, ii. 180
Balana, European Pliocene, i. 112
ii. 207
Balaniops, ii. 360
Balanidide, ii. 207
Balanodon, European Pliocene, i. 112
Balanoptera, ii. 297
Balanopteridae, ii. 297
Ballena, ii. 516
Balarlax, ii. 357
Balay, M. L., on Phytophaga of Japan, i. 239
Banc, its peculiar species and solution of a problem in distribution, i. 356
Bandeir, ii. 435
Bandicoots, ii. 250
Barangia, ii. 199
Barbatula, ii. 306
Barbetta, ii. 305
Barrichthys, ii. 452
Barbus, ii. 451
Barilius, ii. 452
Barilius, ii. 292
Barriers, as affecting distribution, i. 6
permanence of, as affecting distribution, i. 7
to the dispersal of birds, i. 17
Baryptythus, ii. 313
Baryus, ii. 492
Basilisk, ii. 279
Basilorhina, ii. 287
Basanis, ii. 200
Batara, ii. 104
Bates, Mr., on Caribide of Japan, i. 228
on Longicorn of Japan, i. 230
Bathymot, N. American Tertiary, i. 136
Bathyrod, N. American Tertiary, i. 133
Bathyerges, i. 231
BATMICHEL, ii. 402
BATOIDEI, ii. 431
Baurhochphalus, ii. 443
Bausch, ii. 413
Batzotaonous, ii. 318
Bats, powers of flight of, I. 15
of New Zealand, i. 450
Bears, ii. 108
Beau, ii. 349
Bedoyle, i. 195
Bearded Reedling, ii. 282
Bears, probable cause of absence of, from tropical Africa, i. 291
ii. 291
Beaver, N. American Tertiary, i. 140
Beavers, ii. 293
Beer-eaters, ii. 312
Beetles, families selected for study, i. 103
from the Lias, i. 107
of Azores, i. 287
of Japan, i. 297
of S. Temperate America, ii. 44
BELEMNITIDE, ii. 506
Bleomorphylius, European Pliocene, i. 112
Belideus, ii. 252
Belomaca, ii. 497
Belodonta, ii. 441
Belone, ii. 450
Beloneas, ii. 450
Belt, Mr., his theory of a great Siberian lake
during the glacial epoch, i. 218; ii. 296
on change of climate caused by diminu-
tion of obliquity of ecliptic, i. 466
Beldi, ii. 205
Benbecula, ii. 489
Berardina, ii. 298
Beranovkrai, ii. 317
Bermodus, zoology of, ii. 131
Berndt, ii. 393
Bertin, i. 258
BERYCID,E, ii. 424
Bossumuris, ii. 296
Bottocia, ii. 251
Birgus, ii. 269
Bhutonius, ii. 479
Bhils, ii. 270
Bistaia, ii. 104
Bibos, ii. 292
Bison, ii. 292, 295
Binney, Mr., on Air-breathing Mollusca of N. America, ii. 528
Birds, means of dispersal of, i. 15
dispersal of by winds, i. 16
American, found in Europe, i. 16
reaching the Azores, i. 17
barriers to dispersal of, i. 17
limited by forests, i. 17
classification of, i. 93
Miocene of Greece, i. 116
extinct, i. 160
fossil of Palaearctic region, i. 161
European of Miocene period, i. 161
Eocene of Europe, i. 162
relations of, i. 162
Birds, extinct of North America, i. 163
recently extinct in New Zealand, i. 164
Cretaceous of N. America, i. 164
remains of in Brazilian caves, i. 104
recently extinct in Madagascar and the Mascarene Islands, i. 164
corresponding of Southern group, i. 176
numerous Palaearctic genera, i. 183
of the European sub-region, i. 193
northern range of in Europe, i. 193
of the zone of pine forests, i. 194
of Ireland, i. 195
of the Mediterranean sub-region, i. 203
of Malta, i. 206 (note)
of the Azores, i. 297
of the Cape Verdi Islands, i. 215
of the Siberian sub-region, i. 219
Oriental found in Siberia, i. 219
extreme northern Asiatic, i. 219
of northern Asiatic forests, i. 220
of the Manchurian sub-region, i. 223
Palaearctic genera of, in the Manchurian sub-region, i. 224
Oriental genera of, in the Manchurian sub-region, i. 224
characteristic of N. W. China and Mongu-
olia, i. 226
table of Palaearctic families of, i. 235
of West Africa, i. 243
list of Palaearctic genera of, i. 243
of the Ethiopian region, i. 253
of the East African sub-region, i. 260
S. African, i. 276
genera of, peculiar to Madagascar, i. 275
common to Madagascar and Oriental or
Ethiopian regions, i. 276
species common to Madagascar and Africa
or Asia, i. 277
table of Ethiopian families of, i. 295
table of Ethiopian genera of, i. 306
of the Oriental region, i. 316
of the Indian sub-region, i. 322
Oriental genera of in Central India, i. 324
Palaearctic and Ethiopian genera in
Central India, i. 325
of Ceylon, i. 327
of the Indo-Chinese sub-region, i. 330
of the Indo-Malayan sub-region, i. 337
illustration of peculiar Malayans, i. 339
of the Philippine Islands, i. 340
table of Oriental families of, i. 356
table of Oriental genera of, i. 375
of Australian region, i. 391
specialy organized Australian families of,
ii. 392
of the Pampas Islands, i. 410
peculiarities of, i. 413
brilliant colours of, i. 413
remarkable forms of, i. 414
of the Moluccas, i. 418
peculiarities of, i. 421
of the Timor group, i. 423
of Celebes, i. 428
of Australia, i. 440
of New Zealand, i. 451
peculiar to New Zealand, i. 452
of Norfolk Island, i. 453
of Lord Howe's Island, i. 454
of the Chatham Islands, i. 454
of the Auckland Islands, i. 455
table of families of Australian, i. 471
table of genera of Australian, i. 478
of the Neotropical region, ii. 6
distinctive characters of Neotropical, ii. 7
of the Mexican sub-region, ii. 52
of the Antilles, ii. 64
Birds, table of distribution of, ii. 68
  table of families of Neotropical, ii. 80
  table of genera of Neotropical, ii. 96
  of the Neartic region, ii. 116
  list of typical genera of, ii. 118
  of California, ii. 127
  of Central America, ii. 130
  of Eastern United States, ii. 132
  of Canada, ii. 136
  table of Neartic families of, ii. 141
  table of Neartic genera of, ii. 148
  and Mammals, parallelism of distribution of, ii 545
  lines of migration of, ii. 545
  peculiar development of, in islands, ii. 546
  contrast of distribution in tropical and temperate oceanic islands, ii. 546

Biscuiu, ii. 364
Blacies, ii. 102
Black Blakieus, ii. 427
Bland, Mr. Thomas, on Antillan land-shells, ii. 19
ii. 526
Blandford, Mr. W. T., on the "Indian" region, i. 60
  on relations of Indian sub-region to Africa, i. 321
Blapsidium, Oolitic insect, i. 167
Blaria, ii. 191
Blumen, ii. 519
Blenniidae, ii. 431
Blenniops, ii. 431
Blennius, ii. 431
Bledisia, ii. 480
Billing burrowing snakes, ii. 372
Blunt-heads, ii. 389
Blyth, Mr., on zoological regions, i. 60
  on the relations of Indian sub-region with Africa, i. 321
Bos, ii. 381
Boxeon, ii. 380
Bos, ii. 381
Boe, ii. 452
Boborthynchus, ii. 328
Boleosoma, ii. 425
BOMIVATORIDÆ, ii. 416
Bombylantor, ii. 417
Bona, ii. 389
Bonnet-limpets, ii. 511
Bony Pikes, ii. 459
Bonherium, ii. 225
Borneo, probable recent changes in, i. 337
Bos, Post-Pliocene, i. 112
Indian Miocene, i. 122
ii. 222, 225
Botaurus, ii. 339
Bothriodon, ii. 215
Botia, ii. 453
Bourbon, zoology of, ii. 280
reptiles of, i. 281
Boucieria, ii. 108
ii. 521
Boeidea, European Miocene, i. 120
BOVIIDE, ii. 221
BOVINE, ii. 222
Braehynyx, ii. 459
BRACHIPODA, ii. 532
Brachiocephalus, ii. 383
Brachyurus, ii. 175
Brachylestes, ii. 445
Brachygaleus, ii. 414
Brachypterus, ii. 411
Brachyophas, ii. 401
Brachymyctes, ii. 397
Brachymycus, ii. 416

Brachynyx, European Miocene, i. 120
ii. 522
ii. 529
Brachysphyraz, ii. 447
Brachypteraga, ii. 256
Brachypterus, ii. 505
Brachyparrus, ii. 299
Brachypteracias, ii. 312
Brachypteryx, ii. 367
Bradypotes, ii. 413
Bradycerus, ii. 480
Bradyporus, ii. 271
BRADYPODÆ, ii. 244
Bradypetes, ii. 258
Bradycus, ii. 244
Bradylus, ii. 499
Brama, ii. 429
Bramatherium, Miocene of Perim Island, i. 128
ii. 529
Branchiostegus, ii. 442
Branta, ii. 364
BRASSOLIDÆ, ii. 472
Brassolis, ii. 472
Brazilian cave-fauna, i. 143
  remarks on, i. 145
Brazilian sub-region, description of, ii. 21
  mammalia of, ii. 23
  birds of, ii. 24
  illustration of mammalia of, ii. 23
  illustration of birds of, ii. 25
  islands of, ii. 29
Bracon, ii. 419
Bregeria borinensis, Carboniferous insect, i. 163
Britain, peculiar species in, i. 197
British Isles, zoology of, i. 197
Brook-bill, Malayan, figure of, i. 340
Broad-bills, ii. 294
Bromoscela, ii. 402
Brotetis, ii. 444
Brotherhood, N. American Tertiary, i. 137
Brontotherium, N. American Tertiary, i. 137
Brotoberys, ii. 328
Brush-turkeys, ii. 341
Brycon, ii, 445
Bryconinus, ii. 445
Brytus, ii. 425
Buetenaon, ii. 99
Bubalis, ii. 222
Buta, European Miocene, i. 162
ii. 550
BUCCINIDÆ, ii. 567
Bucephalus, ii. 567
Bucco, ii. 510
BUCCONIDÆ, ii. 310
Bucephalus, ii. 364
Bucephalus, ii. 379
Buceros, ii. 317
Bucerotidæ, ii. 316
Buceros, ii. 317
Buceros, ii. 317
Budorcas, ii. 224
Buodon, ii. 224
Budistes, ii. 290
Buffalo, ii. 221
Bunio, ii. 415
BUFONIDÆ, ii. 415
Bubalus, ii. 367
BULLIDÆ, ii. 530
Bullimus, ii. 514
Bulimulus, ii. 514
Bulimus, Eocene, i. 109
ii. 514, 523
Bunostomus, N. American Tertiary, i. 134
Bunotherias, ii. 383
Bunopus, ii. 492
Bunocephalichthys, ii. 444
Bunocephalus, ii. 444
### GENERAL INDEX

<table>
<thead>
<tr>
<th>Page</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>564</td>
<td>Buphagus, ii. 288</td>
</tr>
<tr>
<td></td>
<td>Butyracophilus, ii. 405</td>
</tr>
<tr>
<td></td>
<td>Butyracophilidae, i. 167</td>
</tr>
<tr>
<td></td>
<td>Buxurbites, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Bush-shrikes, ii. 297</td>
</tr>
<tr>
<td></td>
<td>Bustards, ii. 336</td>
</tr>
<tr>
<td></td>
<td>Butalia, ii. 570</td>
</tr>
<tr>
<td></td>
<td>Butastur, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Buteo, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Buteoidei, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Buteoninae, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Butex, ii. 348</td>
</tr>
<tr>
<td></td>
<td>Butyrophilus, ii. 98</td>
</tr>
<tr>
<td></td>
<td>Butterflies, arrangement of, i. 103</td>
</tr>
<tr>
<td></td>
<td>Palearctic, i. 187</td>
</tr>
<tr>
<td></td>
<td>of Central Europe, i. 196</td>
</tr>
<tr>
<td></td>
<td>of the Mediterranean sub-region, i. 205</td>
</tr>
<tr>
<td></td>
<td>of Azores, i. 207</td>
</tr>
<tr>
<td></td>
<td>peculiar to Siberian sub-region, i. 220</td>
</tr>
<tr>
<td></td>
<td>of Japan and North China, i. 227</td>
</tr>
<tr>
<td></td>
<td>of the Ethiopian region, i. 255</td>
</tr>
<tr>
<td></td>
<td>number of Ethiopian species, i. 256</td>
</tr>
<tr>
<td></td>
<td>of Indo-Malayan sub-region, i. 342</td>
</tr>
<tr>
<td></td>
<td>of the Australian region, i. 404</td>
</tr>
<tr>
<td></td>
<td>of the Austro-Malayan sub-region, i. 404</td>
</tr>
<tr>
<td></td>
<td>of the Moluccas, i. 419</td>
</tr>
<tr>
<td></td>
<td>of Celebes, peculiarities of, i. 434</td>
</tr>
<tr>
<td></td>
<td>of New Zealand, i. 437</td>
</tr>
<tr>
<td></td>
<td>ii. 470</td>
</tr>
<tr>
<td></td>
<td>general remarks on the distribution of, ii. 483</td>
</tr>
<tr>
<td></td>
<td>fossil, ii. 486</td>
</tr>
<tr>
<td></td>
<td>of S. Temperate America, ii. 43</td>
</tr>
<tr>
<td></td>
<td><strong>Bycanistes</strong>, ii. 217</td>
</tr>
<tr>
<td></td>
<td>C.</td>
</tr>
<tr>
<td></td>
<td>Calabrus, ii. 352</td>
</tr>
<tr>
<td></td>
<td>Cabrita, ii. 391</td>
</tr>
<tr>
<td></td>
<td>Cacaotonus, ii. 325</td>
</tr>
<tr>
<td></td>
<td><strong>Cacatuidae</strong>, ii. 324</td>
</tr>
<tr>
<td></td>
<td>Cacicus, ii. 339</td>
</tr>
<tr>
<td></td>
<td>Cacicus, ii. 453</td>
</tr>
<tr>
<td></td>
<td>Cacomantis, ii. 300</td>
</tr>
<tr>
<td></td>
<td>Carpodacus, ii. 383</td>
</tr>
<tr>
<td></td>
<td>Carpodacinen, ii. 291</td>
</tr>
<tr>
<td></td>
<td>Cacopsia, ii. 416</td>
</tr>
<tr>
<td></td>
<td>Cacochlaerus, ii. 417</td>
</tr>
<tr>
<td></td>
<td>Cacopis, ii. 284</td>
</tr>
<tr>
<td></td>
<td>Cacophonous, European Eocene, i. 125</td>
</tr>
<tr>
<td></td>
<td>Callicia, ii. 411</td>
</tr>
<tr>
<td></td>
<td><strong>Caliciidae</strong>, ii. 411</td>
</tr>
<tr>
<td></td>
<td>Cercus, ii. 500</td>
</tr>
<tr>
<td></td>
<td>Celebes, in Brazilian caves, i. 145</td>
</tr>
<tr>
<td></td>
<td>Caleotes, in Brazilian caves, i. 144</td>
</tr>
<tr>
<td></td>
<td>ii. 241</td>
</tr>
<tr>
<td></td>
<td><strong>Canaophus</strong>, European Eocene, i. 124</td>
</tr>
<tr>
<td></td>
<td>ii. 178</td>
</tr>
<tr>
<td></td>
<td>Centropus, ii. 445</td>
</tr>
<tr>
<td></td>
<td>Cananthitherium, European Miocene, i. 120</td>
</tr>
<tr>
<td></td>
<td>European Eocene, i. 120</td>
</tr>
<tr>
<td></td>
<td>Carno, ii. 564</td>
</tr>
<tr>
<td></td>
<td>Catela, ii. 328</td>
</tr>
<tr>
<td></td>
<td>Calananaus, ii. 258</td>
</tr>
<tr>
<td></td>
<td>Calamaria, i. 374</td>
</tr>
<tr>
<td></td>
<td><strong>Calamarhidae</strong>, ii. 374</td>
</tr>
<tr>
<td></td>
<td>Calamoscyon, <em>N. American Eocene</em>, i. 139</td>
</tr>
<tr>
<td></td>
<td>Calamoscyon, ii. 258</td>
</tr>
<tr>
<td></td>
<td>Calamoscyoninae, ii. 258</td>
</tr>
<tr>
<td></td>
<td>Calamoscyonidae, ii. 258</td>
</tr>
<tr>
<td></td>
<td>Cantho, ii. 317</td>
</tr>
<tr>
<td></td>
<td>Canthus, ii. 489</td>
</tr>
<tr>
<td></td>
<td>Caledonica, ii. 487</td>
</tr>
<tr>
<td></td>
<td>Calendula, ii. 259</td>
</tr>
<tr>
<td></td>
<td>Caliceopterus, ii. 271</td>
</tr>
<tr>
<td></td>
<td>Calidris, ii. 105</td>
</tr>
<tr>
<td></td>
<td>Calidris, ii. 353</td>
</tr>
<tr>
<td></td>
<td>Calicethrus, ii. 309</td>
</tr>
<tr>
<td></td>
<td>California, illustration of zoology of, ii. 125</td>
</tr>
<tr>
<td></td>
<td>Californian sub-region, ii. 127</td>
</tr>
<tr>
<td></td>
<td>mammalia of, ii. 127</td>
</tr>
<tr>
<td></td>
<td>birds of, ii. 127</td>
</tr>
<tr>
<td></td>
<td>reptiles of, ii. 128</td>
</tr>
<tr>
<td></td>
<td>nudibranchia of, ii. 128</td>
</tr>
<tr>
<td></td>
<td>fresh-water fishes of, ii. 128</td>
</tr>
<tr>
<td></td>
<td>Caligo, ii. 472</td>
</tr>
<tr>
<td></td>
<td>Calluna, ii. 479</td>
</tr>
<tr>
<td></td>
<td>Calido, ii. 471</td>
</tr>
<tr>
<td></td>
<td>Calicea, ii. 257</td>
</tr>
<tr>
<td></td>
<td>Callia, ii. 521</td>
</tr>
<tr>
<td></td>
<td>Calluchroma, i. 501</td>
</tr>
<tr>
<td></td>
<td>Callirroes, ii. 442</td>
</tr>
<tr>
<td></td>
<td>Callitichus, ii. 444</td>
</tr>
<tr>
<td></td>
<td>Callipepla, ii. 490</td>
</tr>
<tr>
<td></td>
<td>Callidryas, ii. 478</td>
</tr>
<tr>
<td></td>
<td>Callionymus, ii. 430</td>
</tr>
<tr>
<td></td>
<td>Calliope, ii. 295</td>
</tr>
<tr>
<td></td>
<td>Callipipo, ii. 389</td>
</tr>
<tr>
<td></td>
<td>Calliperidia, ii. 108</td>
</tr>
<tr>
<td></td>
<td>Calliphox, ii. 198</td>
</tr>
<tr>
<td></td>
<td>Callirrhynchos, ii. 375</td>
</tr>
<tr>
<td></td>
<td>Callisarurus, ii. 401</td>
</tr>
<tr>
<td></td>
<td>Callistis, ii. 98</td>
</tr>
<tr>
<td></td>
<td>Callithrichus, ii. 489</td>
</tr>
<tr>
<td></td>
<td>Callithrix, ii. 474</td>
</tr>
<tr>
<td></td>
<td>Callithrix, in Brazilian caves, i. 184</td>
</tr>
<tr>
<td></td>
<td>ii. 175</td>
</tr>
<tr>
<td></td>
<td>ii. 178</td>
</tr>
<tr>
<td></td>
<td>Callocephalus, ii. 294</td>
</tr>
<tr>
<td></td>
<td>Callochroa, ii. 363</td>
</tr>
<tr>
<td></td>
<td>Calomystax, ii. 543</td>
</tr>
<tr>
<td></td>
<td>Calopodis, ii. 383</td>
</tr>
<tr>
<td></td>
<td>Calopsittas, ii. 413</td>
</tr>
<tr>
<td></td>
<td>Calopsittidae, ii. 300</td>
</tr>
<tr>
<td></td>
<td>Calophila, ii. 292</td>
</tr>
<tr>
<td></td>
<td>Calloselasma, ii. 885</td>
</tr>
<tr>
<td></td>
<td>Calocompsa, ii. 478</td>
</tr>
<tr>
<td></td>
<td>Calomys, ii. 416</td>
</tr>
<tr>
<td></td>
<td>Calonemus, ii. 290</td>
</tr>
<tr>
<td></td>
<td>Calocitta, ii. 273</td>
</tr>
<tr>
<td></td>
<td>Calodromas, ii. 344</td>
</tr>
<tr>
<td></td>
<td>Calotes, ii. 333</td>
</tr>
<tr>
<td></td>
<td>Calothorax, ii. 339</td>
</tr>
<tr>
<td></td>
<td>Calophila, ii. 490</td>
</tr>
<tr>
<td></td>
<td>Calopterygium, ii. 325</td>
</tr>
<tr>
<td></td>
<td>Calopophila, ii. 375</td>
</tr>
<tr>
<td></td>
<td>Calophila, ii. 503</td>
</tr>
<tr>
<td></td>
<td>Calotis, ii. 288</td>
</tr>
<tr>
<td></td>
<td>Calosoma, ii. 439</td>
</tr>
<tr>
<td></td>
<td>Calothrix, ii. 410</td>
</tr>
<tr>
<td></td>
<td>Calotes, ii. 492</td>
</tr>
<tr>
<td></td>
<td>Calothrix, ii. 108</td>
</tr>
<tr>
<td></td>
<td>Calyptorhynchus, ii. 476</td>
</tr>
<tr>
<td></td>
<td>Calyptorhynchus, ii. 198</td>
</tr>
<tr>
<td></td>
<td>Camaroptera, ii. 122</td>
</tr>
<tr>
<td></td>
<td>Camaropteridae, ii. 511</td>
</tr>
<tr>
<td></td>
<td>Camaropteridae, ii. 102</td>
</tr>
<tr>
<td></td>
<td>Camaropterus, ii. 284</td>
</tr>
<tr>
<td></td>
<td>Camarostoma, ii. 298</td>
</tr>
<tr>
<td></td>
<td>Camptotheca, <em>in Indian Miocene</em>, i. 122</td>
</tr>
<tr>
<td></td>
<td>birth-place and migrations of, i. 155</td>
</tr>
<tr>
<td></td>
<td>Paleartic, i. 182</td>
</tr>
<tr>
<td></td>
<td>Camptotheca, essentially extra-tropical, i. 112</td>
</tr>
<tr>
<td></td>
<td>N. American Tertiary, i. 138</td>
</tr>
<tr>
<td></td>
<td>CAMELIDAE, ii. 216</td>
</tr>
<tr>
<td></td>
<td>CAMELOPARDAE, ii. 221</td>
</tr>
<tr>
<td></td>
<td>Camelpardalis, Miocene of Greece, i. 116</td>
</tr>
</tbody>
</table>
Camelopardalis, Indian Miocene, i. 122
Camelotherium, S. American Pliocene, i. 147
Canines, ii. 477
Campephaga, ii. 269
Campephagidae, ii. 268
Campephilus, ii. 303
Campephilus, ii. 101
Camptodactylus, ii. 364
Camptolaimus, ii. 107
Camptorhynchus ii. 264
Campanian sub-region, mammalia of, ii. 435
birds of, ii. 136
reptiles and fishes of, ii. 137
insects of, ii. 137
Canaries, birds of, i. 264
beetles of, i. 309
Cancrena, ii. 359
Canis, European Miocene, i. 118
European Eocene, i. 125
European Pliocene, i. 125
North American Pliocene, i. 129
in Brazilian caves, i. 144
S. American Pliocene, I. 146
Canis, European Pliocene, i. 122
Canis, i. 397
Capromys, ii. 101
Capra, ii. 224, 225
Capra, i. 219
Caprimulgidae, ii. 319
Caprimulgus, ii. 319
Caprine, ii. 224
Carpobrotus, ii. 238
Carpus, ii. 477
Carabidae, ii. 488
Carabus, ii. 488
Carabidae, ii. 489
Carabus, ii. 451
Caracara, ii. 396
Capra, ii. 224, 225
Capra, ii. 219
Caprimulgus, ii. 319
Caprine, ii. 224
Carpobrotus, ii. 238
Carpus, ii. 477
Carabidae, ii. 488
Carabus, ii. 488
Caracara, ii. 489
Carabidae, ii. 429
Carabus, ii. 451
Caracara, ii. 460
Carabidae, ii. 319
Cardiidae, ii. 279
Cardiidae, ii. 535
Cardinalis, ii. 285
Cardiodactylus, S. American Pliocene, i. 147
Cardiopetalus, ii. 492
Cardito, ii. 535
Caracara, ii. 490
Caracaras, Brazilian caves, i. 164
Caracara, ii. 357
Carapace, ii. 357
Caracara, ii. 316
Caracara, ii. 397
Caracara, S. American Pliocene, i. 112
Miocene of Greece, i. 115
European Miocene, i. 118
Indian Miocene, i. 121
Carnivora, S. American Pliocene, i. 129
Carnivora, South American Tertiary, i. 154
of Brazilian caves, i. 144
S. American Pliocene, i. 146
Carnivora, classification of, i. 88
antiquity of, i. 153
of the Palaeartic region, i. 182
list of Palaeartic genera of, i. 240
list of Ethiopian genera of, i. 302
range of Oriental genera of, i. 373
list of Australian genera of, i. 476
CARNIVORA, ii. 192
general remarks on the distribution of,
range of, in time, ii. 206
summary and conclusion, ii. 541
Caroline Islands, birds of, i. 442
Carpinez, Dr. Philip, on Panama shells, ii. 20
Carpiodes, ii. 431
Caparochytra, ii. 399
Capriola, ii. 245
Carpoctites, ii. 244
Capron, ii. 238
Capsus, ii. 477
Carabidae, ii. 488
Carabus, ii. 488
Caracito, ii. 489
Caracara, ii. 451
Caracara, ii. 460
Carabidae, ii. 319
Cardiidae, ii. 279
Cardiidae, ii. 535
Cardinalis, ii. 285
Cardiodactylus, S. American Pliocene, i. 147
Cardiopetalus, ii. 492
Cardito, ii. 535
Caracara, ii. 490
Caracaras, Brazilian caves, i. 164
Caracara, ii. 357
Carapace, ii. 357
Caracara, ii. 316
Caracara, ii. 397
Caracara, S. American Pliocene, i. 112
Miocene of Greece, i. 115
European Miocene, i. 118
Indian Miocene, i. 121
Carnivora, S. American Pliocene, i. 129
Carnivora, South American Tertiary, i. 154
of Brazilian caves, i. 144
S. American Pliocene, i. 146
Carnivora, classification of, i. 88
antiquity of, i. 153
of the Palaeartic region, i. 182
list of Palaeartic genera of, i. 240
list of Ethiopian genera of, i. 302
range of Oriental genera of, i. 373
list of Australian genera of, i. 476
CARNIVORA, ii. 192
general remarks on the distribution of,
range of, in time, ii. 206
summary and conclusion, ii. 541
Caroline Islands, birds of, i. 442
Carpinez, Dr. Philip, on Panama shells, ii. 20
Carpiodes, ii. 431
Caparochytra, ii. 399
Capriola, ii. 245
Carpoctites, ii. 244
Capron, ii. 238
Capsus, ii. 477
Carabidae, ii. 488
Carabus, ii. 488
Caracito, ii. 489
Caracara, ii. 451
Caracara, ii. 460
Carabidae, ii. 319
Cardiidae, ii. 279
Cardiidae, ii. 535
Cardinalis, ii. 285
Cardiodactylus, S. American Pliocene, i. 147
Cardiopetalus, ii. 492
Cardito, ii. 535
Caracara, ii. 490
Caracaras, Brazilian caves, i. 164
Caracara, ii. 357
Carapace, ii. 357
Caracara, ii. 316
Caracara, ii. 397
Caracara, S. American Pliocene, i. 112
Miocene of Greece, i. 115
European Miocene, i. 118
Indian Miocene, i. 121
Carnivora, S. American Pliocene, i. 129
Carnivora, South American Tertiary, i. 154
of Brazilian caves, i. 144
S. American Pliocene, i. 146
Carnivora, classification of, i. 88
antiquity of, i. 153
of the Palaeartic region, i. 182
list of Palaeartic genera of, i. 240
list of Ethiopian genera of, i. 302
range of Oriental genera of, i. 373
list of Australian genera of, i. 476
| Cave-fauna of Brazil, l. 143 |
| Cave, European Miocene, i. 121 |
| in Brazilian caves, i. 144 |
| S. American Pliocene, l. 147 |
| ii. 241 |
| Cavea, ii. 241 |
| CAVIDÆ, ii. 241 |
| CEBIDÆ, ii. 174 |
| Ceboides, European Eocene, l. 126 |
| ii. 215 |
| Cebus in Brazilian caves, i. 144 |
| ii. 174 |
| ii. 178 |
| Cecnæ, ii. 327 |
| Celebes, physical features of, i. 389 |
| mammalia of, i. 426 |
| birds of, l. 428 |
| insects of, i. 434 |
| origin of fauna of, i. 436 |
| Celeus, ii. 327 |
| Celles, ii. 303 |
| Celina, ii. 489 |
| Cercharctis, ii. 385 |
| Cantets, ii. 188 |
| Centeide, European Miocene, i. 118 |
| CENTETIDÆ, ii. 188 |
| Centroceratæ, ii. 425 |
| CENTROSCIDÆ, ii. 436 |
| Centroidea, ii. 436 |
| Centrites, i. 101, 291 |
| Centrocerus, ii. 399 |
| Centrotus, ii. 437 |
| Centrolophus, ii. 429 |
| Centronotulus, ii. 443 |
| Centroscyllus, ii. 431 |
| Centropygius, ii. 300 |
| Centropyge, ii. 286 |
| Centropyx, ii. 390 |
| Centurus, ii. 305 |
| Cephalopelis, ii. 168 |
| Cephalopelits, ii. 389 |
| CEPHALOPHINÆ, ii. 224 |
| Cephalophus, ii. 224 |
| CÉPHALOPODA, ii. 505 |
| Cephalopterus, ii. 103, 294 |
| Cephalopus, ii. 296 |
| Cepola, ii. 435 |
| CEPOLIDÆ, ii. 435 |
| CERAMBYCIDÆ, ii. 498 |
| Ceraithyrsus, ii. 452 |
| Ceratina, ii. 470 |
| Ceratodus, remarkable Australian fish, i. 307 |
| Ceratodus, ii. 458 |
| Ceratophylus, ii. 418 |
| Ceratophora, ii. 402 |
| Ceratophorus, ii. 501 |
| Ceratophyrs, ii. 420 |
| Ceratoptera, ii. 453 |
| Ceratotrichia, ii. 367 |
| Ceratotherium, ii. 213 |
| Ceratothermus, ii. 213 |
| Cerberus, ii. 576 |
| Cereaispis, ii. 380 |
| Cerechis, ii. 349 |
| Cercoehiasma, ii. 173 |
| Cercoedila in Brazilian caves, i. 145 |
| ii. 240 |
| CERCALABIDÆ, ii. 239 |
| Cercoelopes, ii. 300 |
| Cercomera, ii. 164 |
| Cercomela, ii. 290 |
| Cerconyx, ii. 290 |
| Cercothipe in European Pliocene, l. 112 |
| ii. 173 |
| Ceratodus, ii. 394 |
| CERCOSAURIDÆ, ii. 394 |
| Cerocypis, ii. 383 |
| Cerorhincus, ii. 349 |
| CEROTHIADEF. ii. 509 |
| Certes, ii. 264 |
| Certhrise, ii. 278 |
| CERITHIDÆ, ii. 264 |
| Certhioides, ii. 289 |
| Certherio, ii. 278 |
| Certhiuridae, ii. 266 |
| Ceratias, ii. 224 |
| CERVicaprine, ii. 224 |
| Cervidae, European Miocene, i. 120 |
| birth-place and migrations of, i. 155 |
| CERVIDÆ, ii. 218 |
| Cervus, European Pliocene, i. 113 |
| Indian Pliocene and Miocene, i. 122 |
| N. American Post-Pliocene, i. 130 |
| N. American Tertiary, i. 138 |
| in Brazilian caves, i. 144 |
| S. American Pliocene, i. 147 |
| ii. 219 |
| Ceryle, ii. 316 |
| CESTRACIONIDÆ, ii. 461 |
| Cetacea, European Pliocene, i. 112 |
| European Miocene, i. 119 |
| N. American Post-Pliocene, i. 130 |
| N. American Tertiary, i. 140 |
| Cetacea, classification of, i. 59 |
| range of Oriental genus, i. 574 |
| CETAÆA, ii. 267 |
| Chelica, ii. 474 |
| CETONIDÆ, ii. 494 |
| Cetopsis, ii. 443 |
| Cettia, ii. 258 |
| Ceylonochares, ii. 309 |
| Ceyropsis, ii. 316 |
| Ceylon and Malaya, resemblance of insects of, 327 |
| Ceylonese sub-region, i. 326 |
| mammalia of, i. 327 |
| birds of, i. 327 |
| reptiles of, i. 327 |
| amphibia of, i. 327 |
| insects of, i. 327 |
| past history of, as indicated by its fauna, |
| i. 328 |
| Cegar, ii. 316 |
| Cherax, ii. 441 |
| Chahorion, ii. 259 |
| Chaeophelis, 333 |
| Chaperodonta, ii. 482 |
| Chetobranchus, ii. 439 |
| Chactoceres, ii. 198 |
| i. 249 |
| Chalcites, ii. 427 |
| Chaltonya, ii. 240 |
| Chloptera, ii. 256 |
| Chlopteryx, ii. 276 |
| Chlopterynx, ii. 260 |
| Chloptostoma, ii. 444 |
| Chlotas, ii. 220 |
| Chlotus, ii. 456 |
| Chalceus, ii. 445 |
| CHALCIDÆ, ii. 393 |
| Chalcis, ii. 445 |
| Chalcis, ii. 445 |
| Chalcites, ii. 393 |
| Chalcodora, ii. 189 |
| Chalcochrysis, ii. 333 |
| Chalcopteryx, ii. 333 |
| Chalcospila, ii. 276 |
| Chalcosoma, European Pliocene, i. 113 |
| Indian Miocene, i. 119 |
| Chalcothorax, European Miocene, i. 119 |
| fossil in N. China, i. 123 |
Climate, as a limit to the range of mammalia, i. 14
gradual change of, before the glacial epoch, i. 41

Clasteria, ii. 494

CLIOCAEIDE, ii. 551

Cladocera, ii. 520

Chapa, ii. 454

CLupeidae, ii. 474

Chlamydoptera, ii. 290

Clupeidae, ii. 282

Clupeomorphae, i. 104

Clytiornis, ii. 105

Clytaemenia, ii. 501

Cladosocera, ii. 310

Clytherina, ii. 101

Clytopterus, ii. 101, 291

Cobitis, ii. 453

Cobus, ii. 382

Coccodirus, ii. 284

Coccogyrus, ii. 399

Coccostoma, ii. 310

Cochleostoma, ii. 452

Cochlosoma, ii. 514

Cochlostomus, ii. 309

Cochlearia, ii. 269

Cockatoos, ii. 234

Cockles, ii. 535

Cocos Islands, bird of, ii. 60

Coeptes, ii. 481

Cotelanus, ii. 107

Cotodon, ii. 245

Cotamandu, ii. 457

Cotula, ii. 377

Cotosterna, ii. 591

Cotopaxyna, ii. 471

Coreba, ii. 278

Cerebidae, ii. 278

Cephalotes, ii. 208

Coeloptera, ii. 294

Coeloptera, families selected for study, i. 103

Paleartctic, i. 188

number of Palearctic species, i. 189

of Central Europe, i. 196

of the Mediterranean sub-region, i. 205

of the Cape Verd Islands, i. 215

of the Ethiopian region, i. 256

of the S. African, i. 268

of Madagascar, ii. 282, 283

of the Oriental region, i. 319

of the Indo-Malay sub-region, i. 342

of the Australian region, i. 405

of the Australian region, i. 406, 407

affinity of Australian and South American, i. 406, 407

of California, i. 435

of New Zealand, i. 457

of the Neotropical region, ii. 15

of S. Temperate America, ii. 44

of the Mexican sub-region, ii. 56

of the Antilles, ii. 74

of the Neartic region, ii. 123

Coeloptera, ii. 480

general observations on the distribution of, ii. 502 (see also Beetles)

Collasia, ii. 478

Collies, ii. 307

Collidae, ii. 307

Collina, ii. 307

Collinus, ii. 256

Collulosa, European Miocene, i. 101

Collurana, ii. 329

Collurina, ii. 272

Collums, ii. 479

Collumia, ii. 480, 487

Colubridae, European Miocene, i. 117

Colubridae, ii. 172

Colubrines, ii. 474

Colubris, ii. 478

Colubridae, ii. 307

Collinus, ii. 307

Collinus, ii. 256

Collulosa, European Miocene, i. 101

Collurina, ii. 329

Collurina, ii. 272

Collums, ii. 479

Collumia, ii. 480, 487

Colubridae, European Miocene, i. 117

Colubridae, ii. 172

Colubris, ii. 474
Coloenea, N. American Tertiary, i. 136
Colopterus, ii. 101
Coloaneophyla of Indian Miocene, i. 123, 165
Colpocetes, ii. 489
Coluber, ii. 375
COLUMBIDÆ, ii. 375
COLUMBRIE, ii. 573
Columba, classification of, i. 96
range of Palaeartic genera of, i. 248
range of Ethiopian genera of, i. 311
range of Oriental genera of, i. 384
range of Australian genera of, i. 485
Columba, ii. 392
COLUMBE, ii. 331
general remarks on the distribution of, ii. 335
COLUMBIDÆ, ii. 331
Columbula, ii. 516
COLUMBYDE, ii. 366
Columbus, ii. 366
COMEPOHIDÆ, ii. 452
Comophora, ii. 549
Comoro islands, zoology of, i. 281
Compsodon, ii. 98, 375
CONCHIDÆ, ii. 533
Condylura, ii. 190
Cones, ii. 508
Conger, ii. 456
CONIDÆ, ii. 508
Contirostrum, ii. 278
Conocephala, ii. 496
Conophago, ii. 100
CONOPHAGIDÆ, ii. 291
Conophis, ii. 575
Conopias, ii. 101
Conorhynchus, ii. 443
Conostoma, ii. 362
Continents, distribution of, i. 37
recent changes of, i. 35
Continental extension in Mesozoic times, i. 156
Conotopus, ii. 102, 294
CONURIDÆ, ii. 327
Conura, ii. 528
Conus, ii. 508
Copea, ii. 416
Cophoscincus, ii. 397
Cophylognathus, ii. 441
Cophylognathus, ii. 489, 492
Copaetus, ii. 101
Copyschus, ii. 259
Coracina, ii. 311
CORACIDÆ, ii. 311
Coracopsis, ii. 328
Corales, ii. 471
Corallus, ii. 381
Corbula, ii. 355
Corumetaurus, ii. 392
Corvulus, ii. 392
Coregonus, ii. 447
Coriphina, ii. 327
Corvinella, ii. 437
Corvina, ii. 375
CORONELLIDÆ, ii. 375
Coronis, ii. 481
Cornucius, ii. 419
CORNIDÆ, ii. 272
Corea, ii. 428
Corephila, ii. 272
Coreutus, ii. 274
Coreus, European Miocene, i. 101
ii. 274
Coreylophus, ii. 290
Coreyanus, ii. 290
Coreylophus, ii. 445
Coreylophus, ii. 163
Coryphodon, European Eocene, i. 126
Coryphaspis, ii. 284
Corythornis, ii. 207
Corythopalaeus, ii. 600
Corythornis, ii. 316
Cosmopterus, ii. 277
Cosmopterus, ii. 320
Cosmopterus, ii. 384
Cosmopolitan groups enumerated, i. 175
Cosyphus, ii. 256
Cotinga, ii. 162, 294
Cotingidæ, ii. 293
Coturnix, ii. 428
Coturnix, ii. 284
Coturnix, ii. 338
Cotyphus, ii. 281
Cotta, ii. 309
Couchia, ii. 439
Cotus, Dr., on the blue crow of the Rocky Mountains, ii. 123
Course, ii. 335
Cowries, ii. 508
Coyopa, ii. 238
CRACIDÆ, ii. 342
CRACINIDÆ, ii. 343
Cracetus, ii. 273
Crane, ii. 357
CRANIDÆ, ii. 582
Crane, ii. 317
Craspedomycterus, ii. 385
Craspedophonus, ii. 531
Crateropus, ii. 261
Crax, ii. 312
Creadion, ii. 287
Creeper, ii. 364
Creeper, ii. 445
Cremna, ii. 264
Cremna, ii. 475
Crenicichla, ii. 439
Crenidactylus, ii. 437
Crenidactylus, ii. 445
Cresphilus, ii. 99
Cricetodon, European Miocene, i. 120
ii. 230
Cricetomyia, ii. 230
Cricetus, ii. 230
Cricetus, European Eocene, i. 113
ii. 230
Cricetomys, ii. 476
Cricetus, ii. 420
Crateropus, ii. 264
Cricetula, ii. 285
Crocodura, ii. 191
Crocodylus, Eocene, i. 165
B. 406
lines of migration of, i. 548
Crocodylia, classification of, i. 100
CROCODILIA, ii. 405
general remarks on the distribution of, ii. 406
fossil, ii. 407
CROCODILIDÆ, ii. 406
Crocodylus, ii. 200
Crocodylus, ii. 406
Crocodylus, ii. 200
Crocodile, billed plovers of New Zealand, i. 456
Crocodilus, ii. 195
Crocodylus, ii. 451
Crocodylus, ii. 419
Crocodylus, ii. 540
Crocophana, ii. 197
CROCEI, ii. 384
Crotalinae, ii. 384
Crotalophorus, ii. 355
Crotalus, ii. 385
Crotalus, ii. 385
Crotace, Mr., on beetles of the Azores, i. 209
Crotaphaga, ii. 400
Crowed-pigeon, figure of, i. 415
Crows, ii. 273

GENERAL INDEX.
Cryptocrinth, ii. 273
Cryptothelphurus, ii. 395
Cryptodacus, ii. 375
Cryptoproc., ii. 194
CRYPTOPROCTID., ii. 194
Cryptoprous, ii. 441
Crypotornis, European Eocene, i. 163
Cryptostis, ii. 421
Crypturus, ii. 344
Ctenodactyle, ii. 459
Ctenodactylus, ii. 328
Ctenolabrus, ii. 437
Ctenopharyngodon, i. 226
Ctenopteryx, i. 396
Ctenolabrus, ii. 371
Cuckoos, i. 270
Cuckoo-shrikes, i. 270
Cticulus, i. 284
CUCLID., ii. 508
Ctenochas, ii. 286
Curculionidium, i. 268
Curcogam, i. 308
Curmus, i. 468
Cutter, i. 453
Cunningham, Professor, lizard discovered by, in Tierra-del-Fuego, ii. 41
Cuvicinctus, i. 230
Cynophorus, ii. 272
Cynipid, ii. 339
Cynarctia, i. 342
Cynurus, ii. 382
Curetis, ii. 377
Curvius, i. 400
Cylindrella, ii. 286
Cyclotus, ii. 219
Cyclorhizus, ii. 257
Cyclopis, ii. 290
Cyclophorus, ii. 249
Cyclops, ii. 305
Cyclopsittus, ii. 339
Cyclostomus, ii. 437
Cyclorhizus, ii. 339
Cyclophorus, ii. 249
Cynocephalus, i. 167
Cynopterus, ii. 401
Cynocephalus, ii. 195
Cynocephalus, ii. 173
Cynodictis, ii. 198
Cynodon, ii. 445
Cynognale, ii. 195
CYNOPTHECIDE, ii. 172
Cynoptehens of Celebes, affinities of, i. 427
Cynopithecus, ii. 173
Cynomys, ii. 320
Cyprinus, ii. 270
Cypris, European Eocene, i. 125
Cypris, ii. 198
Cyclostrimii, ii. 401
Cynoptera, ii. 496
Cuphelius, ii. 264
CYPREIDE, ii. 508
Cyprinid, ii. 535
CYPRINID., ii. 451
Cyprinus, ii. 535
Cyprinus, ii. 451
Cyprinix, ii. 452
Cypselodon, ii. 450
CYPRINODONTID., ii. 450
CYPSELID., ii. 320
Cypseloides, ii. 320
Cyprinus, ii. 320
Cyprinus, ii. 290
Cynocephalus, ii. 399
Cyprinidae, i. 553
Cyprinidae, ii. 399
Cyprinidae, ii. 553
Cyprinidae, ii. 266
Cyprinidae, ii. 505
Cyprtodraco, ii. 273
Cyprinomys, i. 109
Cyprinopsis, ii. 373
Cyprinotus, ii. 270
Cyprinotus, ii. 325
Cyprinopeza, ii. 284
Cyprinotis, i. 101
Cyprinurus, ii. 273
Cyprinuridae, ii. 101
Cyprinuridae, ii. 101
Cyprinuridae, ii. 259
Cyprinuridae, ii. 489
Cyprinuridae, ii. 535
Cyprinuridae, ii. 555
Cyprinuridae, ii. 380
Cyprinuridae, ii. 409
Cyprinuridae, ii. 397
Cyprinuridae, ii. 376
Cyprinuridae, ii. 376
Cyprinuridae, ii. 520
Cyprinuridae, ii. 430
Cyprinuridae, ii. 328
Cyprinuridae, ii. 420
Cyprinuridae, Eocene, i. 169
CYCLOSTOMATAE, ii. 438
CYCLOSTOMATAE, ii. 529
Cyprinuridae, ii. 523
Cyprinuridae, ii. 247
Cyprinuridae, ii. 521
Cyprinuridae, ii. 521
Cynurus, ii. 382
Cynurus, ii. 363
Cystiderilla, ii. 315
Cyclindrifica, ii. 373
Cylindrophis, European Cretaceous, i. 167
D.

Dacelo, ii. 316
Dacens, ii. 278
Dactyladura, ii. 422
DACTYLETHRID., ii. 422
Dactylomura, ii. 329
Dactyloscida, ii. 249
Dactylolomus, ii. 496
Dafila, ii. 363
Dana, ii. 219
Danistes, ii. 481
Dermophila, ii. 199
DANAIDE, ii. 470
Danistes, ii. 470
Danaida, ii. 451
Darino, ii. 462
Dusophorus, N. American Tertiary, i. 134
Darters, ii. 305
Darwin, Mr., his explanation of the cause of the abundance of aperont insects in Madeira, i. 211
on the relation of flowers and insects, i. 463
and aphidia collected by, in S. Temperate
America, ii. 41
mites collected by, in S. Temperate
America, ii. 37
on physical geography of the Galapagos,
ii. 33
Dasia, ii. 397
Dasypodius, ii. 369
Dasyopithecus, ii. 472
Dasyptilus, ii. 377
GENERAL INDEX.

Dipsadoboa, ii. 379
Dipsas, ii. 379
Dipterus, ii. 452
Dipsis, ii. 452
Discoba, ii. 452
Discobolus, ii. 450
Discophora, ii. 472
Discus, ii. 107

Dispersals of animals, i. 10
of mammalia, i. 10
of reptiles and amphibias, i. 28

Distela, ii. 384
Disticholus, ii. 445

Distribution, affected by climate, i. 5
affected by physical features, i. 5
contrasts of, in similar climates, i. 5
similarities of, in diverse climates, i. 6
barriers as affecting, i. 6
study of, dependent on a good classification, i. 83
of animals an adjunct to geology, i. 8
of animals requires certain preliminary studies, i. 8
of animals dependent on physical geography, i. 35
of animals, as affected by the glacial epoch, i. 44
of animals, as affected by changes of vegetation, i. 43
of animals, as affected by organic changes, i. 44
of animals, hypothetical illustration of, i. 46
of animals, complexity of the causes affecting, i. 46
of animals, problems in, i. 51
of plants, as affected by the glacial epoch, i. 42

Distrigus, ii. 490
Dinax, ii. 284
Dinopis, ii. 284
Dine, i. 98
Divers, ii. 366
Docimates, i. 108
Dodo of Mauritius, ii. 292
i. 334
Dodon, ii. 475
Doderico, i. 107
Dolichodon, i. 288
Dolichon, i. 283
Dolichopterus, European Miocene, i. 162
Dolichoptes, ii. 241
Doliphius, ii. 241
Dolus, ii. 507
Domina, N. American Tertiary, i. 134
Donacichtus, ii. 264
Donacoilus, ii. 267
Donacopius, ii. 264
Doras, ii. 443
Doracothrix, European Miocene, i. 129
Dorygea, ii. 251
Dorora, ii. 463
Dorichia, ii. 108
DORIDE, ii. 530
Doritis, ii. 473
Dornico, ii. 273
Dorygryphus, ii. 457
Doryphora, ii. 107
Douraravailus, ii. 175
Draco, ii. 402

Drepanotherium, Miocene of Greece, i. 116
Drepanotherium, European Miocene, i. 120
i. 218
DREPTANIDIDE, ii. 277
Dryephasis, ii. 277
Dryepanos, ii. 275
i. 276
Dresser, Mr. H. E., on northern range of European birds, i. 193
Drilomatoa, ii. 489
Drusus, ii. 368
Dromas, ii. 350
Dromatherium, N. American Triassic, i. 134
oldest American mammal, i. 160
Dromidae, ii. 456, 487
Dromicola, ii. 252
Dromicus, ii. 375
Dromius, ii. 489
Dromococcus, ii. 309
Dromococetus, ii. 290
Dromops, ii. 377
Drongo-srike, Malayan, figure of, i. 340
Dryoideus, ii. 375
Dryophialus, ii. 379
Dryops, ii. 261
Dryomantes, ii. 259
Drymoa, ii. 257
Drymecine, ii. 257
Drymomyces, ii. 236
Drymornis, ii. 103
Dryonyx, ii. 365
Dryopithacus, European Miocene, i. 117
ii. 178
Dryopithecus, ii. 284
Dryopithecus, ii. 348
Duelluis, ii. 263
Dutus, ii. 250
Dunnart, ii. 408
Duena, ii. 201

Duninclina, ii. 258
Duncan, Dr., on fossil corals of the Antilles, i. 21
D'Urbana, ii. 477
Dwarf-ground snakes, ii. 374

Dynamo, ii. 472
Dychochites, ii. 489
Dyochus, ii. 481
Dyophanes, ii. 104
Dysocus, ii. 184

E.

Eagles, ii. 347
Eared Seals, ii. 202
Ear-shells, ii. 511
East Africa, geographical features of, i. 258
wide range of genera and species over, i. 259
few special types in, i. 260
East African sub-region, description of, i. 258
genera and species ranging over the whole of, i. 259
mammals of, i. 260
birds of, i. 260
reptiles of, i. 260
amphibias and fishes of, i. 260
insects of, i. 260
few peculiar types in, i. 260
illustration of zoology of, i. 271
East Australia, peculiar birds of, i. 449
GENERAL INDEX. 573

East Thibet, mamma of, i. 222
Eaton, Rev., A. B., on insects of Kerguelen Island, i. 211
Eburna, ii. 507
Echidna, ii. 254
ECHIDNIDÆ, ii. 254
Echimynæ, in Brazilian caves, i. 145
ECHIMYIDÆ, ii. 288
Echimos, ii. 239
Echinigale, European Miocene, i. 118
Echinops, ii. 189
Echinerhinus, ii. 461
Echidothrix, ii. 230
Echis, ii. 386
Echus, ii. 326
Ectonathus, N. American Eocene, i. 139
Ectopistes, ii. 332
Edentata, Miocene of Greece, i. 116
European Miocene, i. 121
N. American Post-Pliocene, i. 130
N. American Pliocene, i. 149
of Brazilian caves, i. 145
S. American Pliocene, i. 147
Edentata, classification of, i. 90
probable birthplace of, i. 155
range of Ethiopian genera of, i. 305
range of Oriental genus of, i. 375
EDENTATA, ii. 244
general remarks on the distribution of, ii. 247
summary and conclusion, ii. 543
Epa, ii. 490
Egerina, ii. 397
Elaine, ii. 101, 291
ELAINEÆ, ii. 291
Elaphro, ii. 397
Elasmotherium, ii. 397
Elasmotherium, ii. 397
Elasmos, ii. 349
Elephantodon, ii. 220
Elephantus, ii. 489
ELAPIDÆ, ii. 382
ELAPIDÆ, ii. 375
ELAPS, ii. 383
ELAPSIDÆ, ii. 232
ELAPUS, ii. 232
ELEPHANTIDEÆ, ii. 227
Elephants, fossil of, Indian Miocene, i. 123
fossil in N. American Post-Pliocene formations, i. 130
birthplace and migrations of, i. 155
ii. 227
Elephant shrews, S. African, ii. 267
ii. 189
Elephas, Post-Pliocene, i. 112
fossil in N. China, i. 123
N. American Tertiary, i. 138
ii. 227
Elasmotherium, ii. 232
Elliot, Mr., his great work on the birds of paradise, ii. 115
on classification of the birds of paradise, ii. 274
Ellipsopus, ii. 463
ELLOPOIDEÆ, ii. 413
Elliot, ii. 258
Ellolobium, ii. 251
Elminius, ii. 271
Elminius, ii. 473
Elphinstonia, ii. 453
Ellora, European Miocene, i. 162
Elora, ii. 419
Elaterid, N. American Tertiary, i. 137, 139
ii. 215, 216
Eltegrax, ii. 408
Elwes, Mr., on birds of Persia, ii. 204
Elwes, Mr., on true relations of the birds of Central India, i. 323
ELYMUS, Island, i. 471
ELYMUSIDÆ, ii. 471
ELSIA DIÆ, ii. 530
Embanthus, N. American Tertiary, i. 134
Embiornæ, ii. 255
EMERIZINE, ii. 285
Emberizoidæ, ii. 284
Embothrium, ii. 287
Embyrurus, ii. 284
EMBRYOCHEIÆ, ii. 438
Emeis, ii. 476
Emen, figure of, i. 441
Emeis, ii. 363
Emeliones, ii. 390
Empidaga, ii. 101
Empidium, ii. 102, 291
Empidochromes, ii. 102
Empidium, ii. 102, 291
Empidonomus, ii. 102
Empyla, ii. 499
Emydula, N. Indian Miocene, i. 123
Emydocephala, ii. 395
Emys, Indian Miocene, i. 123
Miocene and Eocene, i. 165
i. 408
Emys, ii. 503
Enestox, ii. 416
ENYSTOMIDÆ, ii. 416
Enydrinæ, ii. 384
Enhydrinæ, Indian Miocene, i. 121
ii. 200
Enhydris, ii. 199
Eniæn, ii. 263
Enipet, ii. 472
Enidos, ii. 288
Enopla, ii. 375
Enopla, ii. 429
Entelocera, ii. 501
Entolomus, ii. 276
Entomophila, ii. 275
Enygrus, ii. 381
Eobasileus, N. American Eocene, i. 139
Eocene period, ii. 124
fauna of S. America, i. 148
Eophora, ii. 284
Eosactria, ii. 271
Eos, ii. 327
Epacteischorrhynchus, ii. 451
Ephemera, from the Lias, ii. 167
Epithalameu, ii. 260
Epidaurus, ii. 474
Epiceratos, ii. 351
EPIMACHINÆ, ii. 275
Epimachus, ii. 275
Epistemon, ii. 268
Epithyrax, ii. 419
Epitaphia, ii. 417
Eporeodon, N. American Tertiary, i. 138
EQUIDEÆ, European Pliocene, ii. 112
Miocene of Greece, i. 115
European Eocene, i. 125
Equus, European Pliocene, i. 112
Post-Pliocene, i. 112
Indian Miocene, i. 121
N. American Post-Pliocene, i. 130
N. American Tertiary, i. 135
Brazilian caves, i. 144
S. American Pliocene, i. 146
ii. 211
Erebis, ii. 471
Eremias, ii. 391
Eremonecla, ii. 258
Eremophilus, ii. 444
Extinct mammalian fauna of Europe, general considerations on, i. 126
mammals of N. America and Europe, comparison of, i. 140
mammals of the Antilles, i. 148
mammals of the Old and New Worlds, general remarks on, i. 148
fauna of New Zealand, i. 459
Amphibia, ii. 428
Ant-eaters, ii. 247
Armadillos, ii. 246
Bovidae, ii. 225
Bradytaphidae, ii. 245
Camelidae, ii. 217
Camelopardidae, ii. 221
Canidae, ii. 197
Castoridae, ii. 234
Caviidae, 241
Centetidae, ii. 189
Cercopithecidae, ii. 240
Cetacea, ii. 260
Chinchillidae, ii. 227
Chiroptera, ii. 185
Crocodylidae, ii. 467
Deer, ii. 230
Didelphyidae, ii. 249
Dipodidae, ii. 232
Echidnidae, ii. 254
Echimyidae, ii. 239
Elephantidae, ii. 227
Equidae, ii. 211
Erinaceidae, ii. 188
Felidae, ii. 193
Hippopotamidae, ii. 214
Hyenas, ii. 196
Hystricidae, ii. 240
Insectivora, ii. 192
Lacertilia, ii. 404
Lagonyidae, ii. 242
Leporidae, ii. 243
Macropodidae, ii. 251
Mursidae, ii. 236
Mustelidae, ii. 199
Myocidae, ii. 222
Octodontidae, ii. 238
Ophididae, ii. 287
Orycteropodidae, ii. 246
Otariidae, ii. 203
Procyonidae, ii. 201
Quadrupedal, ii. 178
Rallidae, ii. 252
Rhinocerotidae, ii. 213
Soricidae, ii. 236
Seals, ii. 204
Sirenia, ii. 210
Struthionidae, ii. 369
Suidae, ii. 215
Eupotidae, ii. 190
Tapirs, ii. 212
Tortoises, ii. 410
Tragulidae, ii. 218
Ursidae, ii. 186
Viveridae, ii. 204
Viverridae, ii. 195
Extinction of large animals, causes of, i. 158

F.

Falcinellus, ii. 560
Falco, ii. 249
FALCONID^, ii. 347
FALCONIN^, ii. 349
Falcons, ii. 247
Falculia, ii. 228
Falkland Islands, zoology of, ii. 49
Fanged, ground, snakes, ii. 380
Pareuctes, ii. 377
Fauna of Japan, general character and affinities of, i. 239
of Palearctic region, general conclusions of, i. 251
extinct, of Madagascar and Mascarene Islands, i. 282
Malayan, probable origin of, i. 359
Mohewan, peculiarities of, i. 419
Timorese, origin of, i. 422
c of Celebes, origin of, i. 436
of New Zealand, origin of, i. 460
of Galapagos, origin of, ii. 23
of Central America, origin of, ii. 57
of Antilles, origin of, ii. 78
of Neotropical region, origin of, ii. 80
FELID^, ii. 192
Felis, Miocene of Greece, i. 115
European Miocene, i. 118
Indian Miocene, i. 121
N. American Post-Pliocene, i. 129
in Brazilian caves, i. 144
ii. 193
Felis spelaea, i. 110
Femina, ii. 477
Fennecus, ii. 197
Fennecus, ii. 197
Ferarnia, ii. 375
Fernando Po, zoological features of, i. 265
Ferocelis, ii. 191
Fiber, ii. 220
Figuia, ii. 493
Fiji, Tonga, and Samoa Islands, birds of, i. 443
Finches, ii. 283
FIRSOIDE, ii. 531
Fish, means of dispersal of, i. 29
classification of, i. 101
cosmopolitan groups of, i. 176
do the Palearctic region, i. 186
do the European sub-region, i. 196
do the Mediterranean sub-region, i. 205
do the Manchurian sub-region, i. 227
t fresh-water, table of Palaeartic families of, i. 227
do the Ethiopian region, i. 255
do South Africa, i. 268
fresh-water, table of Ethiopian families of, i. 208
do the Oriental region, i. 318
do the Indo-Malay sub-region, i. 341
fresh-water, table of Oriental families of, i. 369
fresh-water, of the Australian region, i. 397
fresh-water, resemblance of Australian and S. American, i. 400
how the transmission may have taken place, i. 401
fresh-water, of New Zealand, i. 457
fresh-water, table of Neotropical families of, ii. 89
do Central N. America, ii. 131
do Eastern United States, ii. 134
do Canada, ii. 137
fresh-water, table of Nearctic families of, ii. 143

GENERAL INDEX.
Fish, remarks on the distribution of, ii. 464
Fishing-hawks, ii. 349
FISSURELLIDÆ, ii. 511
FISTULARIDÆ, ii. 486
Flicora, ii. 450
Flamings, European Miocene, i. 152
Flora, of New Zealand, as influenced by scarcity of insects, i. 462
Fossil of Australia, i. 467
Floras, cretaceous and tertiary, of North America, i. 155
Florisuga, ii. 107
Flower, Professor, on classification of mammalia, i. 85
FUCHSIA, ii. 190
Flycatchers, ii. 270
Flying Lemur, Malayian, figure of, i. 337
Flying Lizards, ii. 401
Flying Otter, figure of, i. 442
Fordius, ii. 376
Forests, essential to existence of many European animals, i. 192
Siberian, greatest extent of, i. 216
FORMICARIDÆ, ii. 397
FORMICARINÆ, ii. 298
Formicarius, ii. 104
Formicicora, ii. 104
FORMICIVORINÆ, ii. 287
Formosa, zoology of, i. 332
Fossa, ii. 195
Foudia, ii. 286
Frassolina, ii. 338
Fraseria, ii. 272
Fratercula, ii. 367
Fregatta, ii. 355
Fregilupus, ii. 288
Fregilus, ii. 274
Fresh-water fishes, Neotropical, ii. 12
of S. Temperate America, ii. 42
of the Mexican sub-region, ii. 54
of the Antilles, i. 73
of the Neartic region, i. 120
of California, ii. 128
summary and conclusion, ii. 549
Fresh-water mussels, ii. 524
shell, the most Arctic, ii. 518
snakes, ii. 376
snails, ii. 518
Fringilla, ii. 283
Fringillaria, ii. 285
Fringillauda, ii. 283
FRINGILLIDÆ, ii. 284
Frog-mouths, ii. 518
Frogs, ii. 420
Fulica, ii. 352
Fuligula, ii. 364
Fulmarus, ii. 363
Foudia, ii. 450
FURNARINÆ, ii. 295
Furnarius, ii. 103
Fusca, ii. 507
Galapagos islands, ii. 29
Galapagiania, i. 286
birds of, ii. 30
reptiles of, ii. 32
insects of, ii. 33
land-shells of, ii. 33
conclusions as to the origin of their fauna, ii. 33
Galeta, ii. 536
Galaxias, ii. 448
Galaxiidae, ii. 448
Galbephyrhusius, ii. 311
Galbula, ii. 311
GALBULIDÆ, ii. 311
Galley, in European Pliocene, i. 112
ii. 198
Galecthus, ii. 448
Galeopthericidae, ii. 186
Galeocryptes, ii. 236
Galeopodax, European Miocene, i. 118
Galeus, ii. 190
Galootherium, Post-Pliocene, i. 111
Galera, N. American Post-Pliocene, i. 130
Galirella, ii. 195
Galerita, ii. 289
Galerius, ii. 490
Galerita, ii. 188
Gallenga, European Eocene, i. 125
ii. 198
Galeus, ii. 446
Galletis, in Brazilian caves, i. 144
Gallidæ, ii. 195
Galliformes, ii. 195
Galline, classification of, i. 96
range of Palaeartic genera of, i. 248
range of Ethiopian genera of, i. 311
range of Oriental genera of, i. 384
range of Australian genera of, i. 485
GALLINÆ, ii. 337
ii. 340
general remarks on the distribution of, ii. 344
Gallinago, ii. 353
Gallinula, ii. 352
Gallus, Miocene of Greece, i. 116
ii. 340
Gallus bravoensis, European Pliocene, i. 161
Galopele, ii. 195
Gambusia, ii. 450
Gampsorhynchus, ii. 349
Gampsoklychnus, ii. 261
Gamnetis, ii. 365
Ganoidei, ii. 458
Gape-eyed Snail, ii. 395
Gar fish, ii. 459
Garrod, Professor, on the Classification of Parrots, ii. 324
Garrulax, ii. 261
Garrulus, ii. 273
GASTEROPYJDA, ii. 507
GASTEROSTEI, ii. 424
Gastropoda, ii. 454
Gastornis, European Eocene, i. 163
GASTROCHÉNIDÆ, ii. 337
Gastropolycaeus, ii. 445
GAVIALIDÆ, ii. 405
Gavialis, ii. 405
Gavialis, ii. 495
Gea, ii. 223
Gazella, ii. 223
Gazella, ii. 302
Gecina, ii. 303
Geco, ii. 399
GECKOTIDÆ, ii. 399
Geese, ii. 368
Gehyra, ii. 440
Genera common to Post-Pliocene and Pliocene faunas of N. America, i. 132
Genetta, ii. 195
Genidens, ii. 443
Geobates, ii. 105
Geobiastes, ii. 312
Geochlora, ii. 256
Geococcyx, ii. 309
Geodacops, ii. 504
GEODEPHAGA, ii. 486
Georgopus, ii. 326
Geographical zoology, introduction, ii. 167
Gerauda, ii. 168
Geological history of Oriental region, i. 362
Geology and Physical Geography of the Antilles, ii. 62, 79
Geourotus, ii. 319
Geequa, ii. 233
Geopelia, ii. 258
Geopoma, ii. 325
Geotrypus, ii. 237
Geophaps, ii. 319
Geranospiza, ii. 265
Giant-Clams, ii. 479
Gervasia, ii. 289
Gerrhosaurus, ii. 301
Gerontinis, ii. 253
Gibraltar, ii. 259
Gibbon, ii. 271
Glacial epoch, as affecting the distribution of animals, i. 151
as a cause of the great change in the fauna of the temperate zones, since Pliocene times, i. 151
probably simultaneous in both hemispheres, i. 151
causing a general subsidence of the ocean, i. 152
Glandina, Eocene, i. 109
ii. 515
Glaucota, ii. 355
GLAFOLID.E, ii. 355
Glaucia, ii. 107
Glaucludum, ii. 350
Glauconea, ii. 536
Glaucopsia, ii. 481
Glossiphonia, ii. 275
Gla, ii. 352
Glibrocephales, ii. 209
Glossoptia, ii. 275
Glossothorax, in Brazilian caves, i. 145
S. American Pliocene, i. 147
ii. 247
Glycinornis, ii. 536
Glypheidodon, ii. 457
Glyptopolus, ii. 416
Glyptorhynchus, ii. 103
Glyptodon, S. American Pliocene, i. 147
Glyptosternum, ii. 443
Gnaphodes, ii. 471
Gnathodon, ii. 536
Gnathopsis, S. American Pliocene, i. 147
Goats, Palaearctic, i. 182
ii. 221
Goat-suckers, ii. 519
GOBIESOCID.E, ii. 436
GOBID.E, ii. 430
Gobio, ii. 452
Gobius, ii. 430
Godman, Mr., on Natural History of the Azores, i. 297
Golden Moles, S. African, i. 267
Golesthi, ii. 494
 Gonnycteris, ii. 478
Genidactylus, ii. 400
Gongylipus, ii. 382
Gonocyclidae, ii. 453
Gonoecephalus, ii. 402
Gonomys, ii. 379
Gondidia, ii. 107
Genus, ii. 333
Graecilurus, S. American Cretaceous, i. 164
Graile, arrangement of, i. 97
peculiar or characteristic Palaearctic genera, i. 249
peculiar Ethiopian genera of, i. 31
peculiar Oriental genera of, 386
peculiar Australasian genera of, i. 486
GRAIL.E, ii. 351
general remarks on the distribution of, ii. 362
Graillaria, ii. 104
Graulichia, ii. 104
Graulina, ii. 273
Grammatophorina, ii. 402
Grammatophyllum, ii. 261
Grampus, ii. 260
Grauxellus, ii. 279
Granulata, ii. 259
Graphidurus, ii. 292
Graphiptyrus, ii. 491
Grauculus, ii. 268
Gray, Dr. J. E., on classification of Cetacea, i. 88
Grayia, ii. 376
Grayson, Col., on birds of Tres Marias, ii. 59
Graham, ii. 357
Greece, Upper Miocene deposits of, i. 115
summary of Miocene fauna of, i. 116
Green Bullbils, ii. 267
Greenland, zoology of, ii. 125
Greenlets, ii. 280
Groups peculiar to a region, how defined, ii. 184
Grouse, ii. 328
GRUID.E, ii. 356
Grus, ii. 357
Grypticus, ii. 421
Grus, ii. 107
Guacharo, ii. 107
Guans, ii. 342
Guaranas, ii. 357
Gubernatrix, ii. 285
Guilemottus, ii. 267
Guira, ii. 360
Gualero, ii. 285
Gulick, Rev. J. T., on Achatinellide of the Sandwich Islands, i. 446
Guils, ii. 564
Gul, ii. 299
 Günther, Dr., his classification of reptiles, i. 98
his classification of fishes, i. 101
on gigantic tortoises of Galapagos and the Mascarene Islands, i. 239
Günther, Dr., on range of Indian reptiles in the Himalayas, i. 329
on identical Atlantic and Pacific fishes, ii. 21
on fresh-water fishes of Central America, ii. 54

Gygis, ii. 365
Gymnarchidæ, ii. 449
Gymnarchus, ii. 449
Gymnetis, ii. 494
Gymnobucco, ii. 306
Gymnocephalus, ii. 103
Gymnoclichia, ii. 104
Gymnooeris, ii. 274
Gymnoorinus, ii. 452
Gymnodactylus, ii. 400
Gymnoderini, ii. 293
Gymnoderus, ii. 103
Gymnodontes, ii. 457
Gymnogloiax, ii. 359
Gymnokittia, ii. 273
Gymnomyzax, ii. 282
Gymnopelis, ii. 333
Gymnos, ii. 257
Gymnopithalmidæ, ii. 395
Gymnophthalmaus, ii. 395
Gymnopus, ii. 190
Gymnoehina, ii. 273
Gymnostomus, ii. 451
Gymnotidæ, ii. 455
Gymnotus, ii. 455
Gynura, ii. 188
Gypactus, ii. 348
Gypohierax, ii. 348
Gypopholmis, ii. 349
Gypos, ii. 346

II.

Haast, Dr., on extinct birds of New Zealand, i. 460
Habitat, definition of, i. 4
Habroconus, ii. 238
Habroptila, ii. 352
Habrurus, ii. 101
Hadrastomus, ii. 102, 293
Harmatolaurus, ii. 103
Harmatopus, ii. 350
Harmatospiza, ii. 255
Harmatophila, ii. 284
Harmulon, ii. 425
Hastera, ii. 471
Hagria, ii. 397
Hainau, zoology of, i. 334
Halcyon, iii. 316
Halegornis, European Eocene, i. 107
Halecyn, ii. 394
Haliacetus, ii. 348
Haliastur, ii. 348
Haliacrenus, ii. 204
Haliscera, ii. 216
Haliodonidæ, ii. 511
Halithersium, European Pliocene, i. 112
European Miocene, i. 119
ii. 211
Halmaturus, ii. 251
Halosaurusidæ, ii. 455
Halys, ii. 383
Hamadryas, ii. 470
Hang-nests, ii. 281
Harpale, ii. 176
Harpalurus, ii. 176
Hapalidæ, ii. 175
Haplactis, ii. 230
Hapalus, ii. 524

Haplocrius, iii. 374
Haplochilus, iii. 450
Haplocithon, ii. 446
Haplodontidæ, ii. 446
Haplodonidæ, ii. 427
Haploodon, ii. 236
Haploodontidæ, ii. 236
Haplophoca, ii. 284
Haplophoca, ii. 372
Haralda, ii. 364
Hares, ii. 242
Harma, ii. 474
Harpa, ii. 349
Harps, ii. 507
Harpycales, ii. 314
Harpygus, ii. 349
Harpylus, ii. 489
Harpyrynchus, ii. 256
Harpyphilaetus, ii. 348
Harthubius, ii. 288
Hathliodes, ii. 502
Hatteria, of New Zealand, i. 456
Hatteria, ii. 465
Hawks, ii. 347
Hedcheghs, ii. 187
Hedymetes, ii. 285
Helarcotes, ii. 292
Hel crya, ii. 474
Helothrepus, ii. 320
Heliactia, ii. 108
Heliorhynchos, ii. 108
Helianthea, ii. 108
Heliantaster, ii. 457
Helicidæ, ii. 512
Helicina, ii. 522
Heliconidæ, ii. 473
Heliconius, ii. 445
Helicops, ii. 377
Helictis, Himalayan, figure of, i. 331
Helictis, ii. 199
Helobates, ii. 103
Helichorera, ii. 102
Heliodora, ii. 107
Helioandrites, ii. 108
Heliodorus, ii. 107
Heliodorus, ii. 251
Heliorhynchos, ii. 417
Heliorhynchos, ii. 359
Heliothrix, ii. 108
Heliotrupho, ii. 108
Heliz, Eocene, i. 109
ii. 513
Heliodotherium, Miocene of Greece, i. 116
European Miocene, i. 120
ii. 221
Heliovomorpha, ii. 490
Helminthura, ii. 279
Helminthophaga, ii. 279
Helotyrannus, ii. 390
Helodermaidæ, ii. 390
Helotyrannus, ii. 393
Heloscapa, ii. 195
Helops, ii. 442
Helornithinae, ii. 352
Helotyrannus, ii. 348
Helops, ii. 195
Helops, ii. 442
Helornithinae, ii. 365
 Helmostos, Indian Miocene, i. 122
ii. 225
Heliodractes, ii. 188
Heliocercus, ii. 303
Helmichildon, ii. 290
Helioctremis, ii. 438
Helmyleon, European Miocene, i. 118
ii. 198
Hemidactylus, ii. 278
GENERAL INDEX.

Ibidipoda, European Miocene, i. 162
Ibidorhynchus, ii. 353
Ibidorhynchus, figure of, I. 331
Ibis, ii. 360
Ibraeia, ii. 300
Ibwyot, ii. 347
Icealand, zoology of, i. 198
Ichneumia, ii. 193
Ichthyops, ii. 446
Ichthyopsis, ii. 411
Icteria, ii. 279
ICTERIDE, ii. 281
Icterus, ii. 283
Icthopinous, N. American Cretaceous, I. 164
Icticyon, in Brazilian caves, i. 144
Ictite-rus, ii. 197
Ictita, ii. 349
Ictitherium, Miocene of Greece, i. 115
European Miocene, i. 118
ii. 105
W. 197
Ictonyx, ii. 199
Ictops, N. American Tertiary, i. 133
Icopeus, ii. 470
Idmats, ii. 478
Idiama, ii. 401
Ignanas, ii. 400
IGNANIDE, ii. 409
Ileda, ii. 477
Ilicera, ii. 102
India, Miocene fauna of, allied to that of
Europe, i. 123
geological features of, i. 328
Indian region, description of, i. 321
supposed relation to Ethiopian region, i.
321
mammalia of, i. 322
birds of, i. 323
reptiles and amphibia of, i. 326
Indicator, ii. 304
INDICATORIDE, ii. 304
Indo-Chinese sub-region, description of, i. 329
zoological characteristics of, i. 330
illustration of, i. 331
reptiles of, i. 331
amphibia of, i. 331
insects of, i. 332
islands belonging to, i. 333
Indo-Malayan sub-region, description of,
ii. 334
mammalia of, i. 336
illustrations of, i. 336, 339
birds of, i. 337
remote geographical relations of, i. 339
reptiles and amphibia of, i. 340
fishes of, i. 341
insects of, i. 341
coleoptera of, i. 342
terrestrial mollusca of, i. 343
zoological relations of islands of, i. 345
recent geographical changes in, i. 357
probable origin of fauna of, i. 359
India, ii. 269
INSECTIVORA, European Miocene, i. 117
N. American Post-Pliocene, i. 129
N. American Tertiary, i. 133
Insectivora, classification of, i. 57
of the Palaearctic region, i. 183
of N. China and E. Tibet, i. 222
range of Palaearctic genera of, i. 239
of Madagascar, i. 273
range of Ethiopian genera of, i. 301
of the Oriental region, i. 315
range of Oriental genera of, i. 372
range of Australian genera of, i. 476
INSECTIVORA, ii. 189

INSECTIVORA, general remarks on the
distribution of, ii. 191
summary and conclusion, ii. 541
Insects, means of dispersal of, i. 32
tenacity of life of, i. 33
adapted to special conditions, i. 33
groups selected for the study of their
geographical distribution, i. 102
antiquity of the genera of, i. 106
fossil of European Miocene, i. 160
European Cretaceous, i. 167
European Wolden, i. 167
Patagonia, i. 168
Palaearctic, i. 187
of Central Europe, i. 196
of the Mediterranean sub-region, i. 205
of the Siberian sub-region, i. 220
of the Manchurian sub-region, i. 227
of the Ethiopian region, i. 255
of the E African sub-region, i. 260
of W. African, i. 265
of S. African, i. 268
of Madagascar, i. 282
general remarks on, i. 284
tropical Africa and America, probable
cause of similarities in, i. 291
of Indo-Chinese sub-region, i. 332
of the Oriental region, i. 318
of Ceylon, i. 327
of Indo-Malay sub-region, i. 341
statistics of collecting in the various
islands of the Malay Archipelago, i. 343
of the Australian region, i. 403
of New Guinea, i. 417
of the Moluccas, i. 420
of the Timor group, i. 426
of Celebes, i. 454
of New Zealand, i. 458
scarcity of, in New Zealand, i. 462
influence of, on the flora, i. 463
of the Neotropical region, ii. 13
of S. Temperate America, ii. 42
of S. Temperate America, Palaearctic
affinity of, ii. 45
of the Mexican sub-region, ii. 55
of the Antilles, ii. 73
of the Nearctic region, ii. 192
of Canada, ii. 137
distribution of, ii. 468
range of, in time, ii. 469
summary and conclusion, ii. 540
lines of migration of, ii. 541
Iododipoda, ii. 102
Iolema, ii. 107
Ioloxus, ii. 477
Iole, ii. 267
Iora, ii. 267
Iphios, ii. 473
Ilios, ii. 394
IPHISADE, ii. 394
Irene, ii. 269
Iridiana, ii. 534
Iridoria, ii. 93
Iriressor, ii. 318
IRRISORIDE, ii. 318
Iscis, N. American Tertiary, i. 133
Ischagnostus, ii. 575
Ischiguan, N. American Tertiary, i. 140
ii. 227
Islands, N. European, zoology of, i. 197
of the Mediterranean sub-region, i. 206
of the W. African sub-region, i. 265
of the Ethiopian region, i. 299
Mascarene, i. 280
of the Indo-Chinese sub-region, i. 333
of the Indo-Malay sub-region, i. 345
Islands, Fiji, Tonga, and Samoa, i. 443
Society and Marquesas, i. 444
New Caledonia and New Hebrides, i. 445
Sandwich, i. 446
of New Zealand sub-region, i. 453
Norfolk, i. 453
Lord Howe's, i. 454
Chatham, i. 454
Auckland, i. 455
of Tropical S. America, ii. 29
of the Mexican sub-region, ii. 59
of Eastern United States, ii. 124
peculiar colours of pigeons in, ii. 336
abundance of land-shells in, ii. 525
Isotachytis, ii. 413
Ipsidina, ii. 516
Iselodromus, European Pliocene, i. 113
ii. 392
Ithaginis, ii. 340
Ithomia, ii. 479
Ithygypus, ii. 379
Ivalus, ii. 419
Ixonotus, ii. 287
Izalus, ii. 269

J.
Jacamenes, ii. 311
Jacanars, iii. 311
Jacanaea, iii. 311
Jasminas, ii. 255
Jacchus, in Brazilian caves, i. 144
Jaculus, ii. 232
Jahirus, ii. 375
Jamesina, ii. 521
Janella, ii. 517
Janthochineta, ii. 251
Japalura, ii. 492
Japan and North China, physical features of, ii. 221
southern extremity of perhaps belongs to the Oriental region, i. 229
Japan, general character of the fauna of, i. 230
former land-connexions of, i. 231
Java, mammalia of, i. 348
productions of, well known, i. 350
birds of, i. 351
representative species of birds in, i. 352
origin of the anomalous features of its fauna, i. 592
Sumatra and Borneo, their geographical contrasts and zoological peculiarities explained, i. 357
Jays, ii. 273
Jesynisha, ii. 459
Jerboas, ii. 231
Juan Fernandez, Carabidae of, ii. 44
birds of, ii. 49
beetles and land-shells of, ii. 51
Juda, ii. 288
Julemya, ii. 196
Juneo, ii. 284
Jun danger, European Miocene, i. 107
ii. 474
K.
Kagu, ii. 359
Kakapo, of New Zealand, i. 455
Kalophrynus, ii. 415
Kangaroo, extinct in Australia, i. 157
ii. 251
Kenexia, ii. 397
Kerguelen Island, apterous insects of, i. 211
(note)
Kerodon, in Brazilian caves, i. 144
S. American Pliocene, i. 147
ii. 241
Ketinos, ii. 443
Kenya, ii. 550
King-fisher, racquet-tailed, of New Guinea, figure of, ii. 415
King-fishers, ii. 235
Kittacincla, ii. 259
Kiwi of New Zealand, i. 455
Kestrel, ii. 453
Kestus, ii. 224
Koodoo antelope, figure of, i. 261
Kriopont's, ii. 478
Krynicia, ii. 517

L.
Labeo, ii. 451
Lactorix, ii. 425
LACRIBI.E, ii. 437
Labrus, ii. 437
LABYRINTHICI, ii. 434
Lacerta, ii. 451
LACERTID.E, ii. 390
Lacertilia, classification of, i. 99
LACERTILLA, ii. 588
general remarks on the distribution of, ii. 403
fossil, ii. 494
Lacuna, ii. 510
Ladrones Islands, birds of, i. 444
Lamana, ii. 461
Lamasthenes, ii. 489
Larosipis, ii. 477
Larvina, ii. 107
Larvinaea, ii. 268
Lagenorhynchus, ii. 269
Lagicidum, ii. 237
LAGOMYIDE, ii. 242
Lagomya, European Pliocene, i. 113
European Miocene, i. 120
ii. 242
Lagonus, ii. 339
Lagophides, ii. 251
Lagostoma, in Brazilian caves, i. 145
S. American Pliocene, i. 147
ii. 257
Lagophis, ii. 174
Lais, ii. 442
Lake Baikal, seals of, i. 218
ii. 296
Lalage, ii. 269
Lachna, ii. 286
LAMID.E, ii. 498
Lamarr, ii. 469
LAMIND.E, ii. 490
Lampros, ii. 107
Lamprays, ii. 468
Lamprina, ii. 493
Lampyris, ii. 429
Lampitidae, ii. 288
Lamproclesma, ii. 107
Lamphaxis, ii. 350
Lampropor, ii. 282
Lampygotus, ii. 108
Lamprophrurus, ii. 477
Lamprophiis, ii. 99
Lamprocles, ii. 98
Laneclet, ii. 464
Land lizards, ii. 391
Land and water, proportions of, i. 35
Land and fresh-water shells, antiquity of the genera of, i. 168
GENERAL INDEX

LYCERNIDE, ii. 477
Lycaenaceae, i. 197
Lycaonide, ii. 439
Lycodon, ii. 388
LYCodontIDE, ii. 389
Lycophidion, ii. 389
Lycorea, ii. 470
Lygosoma, ii. 397
Lyogrossela, ii. 397
Lymnas, ii. 471
Lynx, ii. 320
Lycopsis, ii. 393
Lytorhynchus, ii. 376
Lyre-bird, figure of, i. 441
ii. 298
M.
Mabuya, ii. 397
Macacus, European Pliocene, i. 112
Miocene of Greece, i. 115
Indian Miocene, i. 121
supposed in European Eocene, i. 255
ii. 173
ii. 178
Macaws, ii. 327
Macrolepidoptera, ii. 110, 111
Miocene of Greece, i. 115
European Miocene, i. 118
Indian Miocene, i. 121
N. American Tertiary, i. 134
in American caves, i. 144
S. American Pliocene, i. 146
ii. 193
Macetornis, ii. 101
Macelhampius, ii. 349
Macelhynus, ii. 271
Macelhysterus, ii. 102
Machetes, ii. 358
Macrochelys, S. American Pliocene, i. 146
Macracanthus, ii. 374
Macrocercus, ii. 516
Macroclyta, ii. 516
Macropedipus, ii. 320
Macrotomus, ii. 445
Macroglossus, ii. 482
Macronus, ii. 445
Maccopus, ii. 291
Macquey, ii. 290
MACROPODIDÉ, ii. 250
Macropus, ii. 251
Macropogon, ii. 352
Macrorhampus, ii. 353
MACROSELIDIDE, ii. 186
MACROSELIDÉ, ii. 186
Macropodidea, ii. 482
Macrotarsus, Miocene of Greece, i. 116
European Miocene, i. 121
ii. 245
Macrotus californicus, ii. 182
MACROURIDÉ, ii. 440
MADRIDE, ii. 443
Madagascar, extinct birds of, i. 164
description of, i. 272
mammal of, i. 272
birds of, i. 274
reptiles of, i. 279
amphibia of, i. 280
extinct fauna of, i. 282
general remarks on insect fauna of, i. 284
Madeira, birds of, i. 286
land-shells of, i. 298
beetles of, i. 310
Madeira, wingless insects numerous in, i. 231
how stocked with animals, i. 213
MALACANTHIDE, ii. 433
Malaca, Sumatra, and Borneo, zoological unity of, i. 353
comparison of mammalia, i. 354
of birds, i. 355
Malacocercus, ii. 361
Malacoderm, ii. 261
Malacoptila, ii. 310
Malacophila, ii. 364
Malacorthus, ii. 250
Malagasy sub-region, description of, i. 272
mammal of, i. 272
- birds of, i. 274
illustration of zoology of, i. 278
reptiles of, i. 279
amphibia of, i. 280
extinct fauna of, i. 282
insects of, i. 282
early history of, i. 286
Malapterurus, ii. 443
Malaya and Indo-Malaya, terms defined, i. 345 (note)
Malay, meaning of term, ii. 281
Malay Archipelago, distribution of butterflies in, i. 484
distribution of Cicindellidae in, ii. 487
distribution of Longicorn in, ii. 506
Malayan fauna of life reappearing in West Africa, i. 293
fauna, probable origin of, i. 359
resemblances to that of Madagascar and Ceylon explained, i. 361
Malimbus, ii. 298
Mallodon, ii. 501
Mallopus, ii. 447
Malta, Extinct Pliocene fauna of, i. 114
formerly joined to Africa, i. 201
fossil elephants of, i. 201
birds of, i. 296 (note)
Malurus, ii. 279
Mammal, the most ancient American, i. 134
Manimala, means of dispersal of, i. 10
as limited by climate, i. 11
as limited by rivers, i. 12
how far limited by the sea, i. 13
dispersed by ice-floes and drift-wood, i. 14
means of dispersal of aquatic, i. 15
of most importance in determining zoological regions, i. 57
classification of, i. 85
birthplace and migrations of some families of, i. 142, 153
cosmopolitan groups of, i. 176
of the Palearctic region, i. 181
of the European sub-region, i. 192
of the Mediterrean sub-region, i. 292
of the Siberian sub-region, i. 217
characteristic of Western Tartary, i. 218
of the Manchurian sub-region, i. 222
Palaearctic genera of, in the Manchurian sub-region, i. 222
Oriental genera of, on borders of same sub-region, i. 223
peculiar to Japan, i. 223
characteristic of N.W. China and Mongolia, i. 226
table of Palaearctic families of, i. 234
range of Palaearctic genera of, i. 259
of the Ethiopian region, i. 253
absence of certain important groups, i. 253
of the E. African sub-region, i. 260
of W. Africa, i. 292
of S. Africa, i. 267
GENERAL INDEX.

Megalachrynschus, ii. 161
Megaspira, European Tertiary, i. 169
ii. 527
Megatherioids, ii. 145
in Brazilian caves, i. 145
S. American Pliocene, i. 147
H. 245
Metanis, ii. 359
Melanipitka, ii. 298
Melanipus, ii. 519
Melanochecus, ii. 303
Melanie, European Secondary, i. 169
MELANIA, ii. 569
Melanotia, ii. 471
Melanocithara, ii. 263
Melanocorypha, ii. 263
Melanophidium, ii. 374
Melanopitka, ii. 256
Melanotis, ii. 236
MELEAGRINÆ, ii. 340
Melogris, N. American Miocene, i. 163
ii. 340
Moles, ii. 199
Moldeota, ii. 276
Molclora, ii. 316
Moleracz, ii. 348
Melometa, ii. 470
Melorrîis, ii. 275
Melophaga, ii. 275
MELIPHAGIDÆ, ii. 275
Melipotes, ii. 276
Meliphorphabet, ii. 276
Melitaea, ii. 474
Melitthepus, ii. 276
Melitthophaga, ii. 312
Melitthophila, ii. 259
Melitthogra, ii. 108
Melittheria, Indian Miocene, i. 121
ii. 199
Melolonthidium, Oolitic insect, i. 167
Melopeltis, iii. 333
Melopsitacus, ii. 325
Melopsycha, ii. 285
Melopsychis, ii. 284
Melurus, ii. 292
Menetia, ii. 395
Mecoceros, ii. 517
Meniscus, N. American Tertiary, i. 138
Meniscus, Minas, ii. 412
Menopoma, ii. 412
MENOPOMIDÆ, ii. 412
Menotherium, N. American Tertiary, i. 133
Menura, ii. 298
MENURIDÆ, ii. 298
Mephitida, in Brazilian caves, i. 144
ii. 199
Mer根etta, ii. 364
Merganus, ii. 367
Mergus, ii. 364
Meriones, ii. 282
ii. 290
Meristae, ii. 272
Merulaccus, ii. 439
Merou, ii. 536
MEROPIDÆ, ii. 312
Meropis, ii. 312
Meropogon, ii. 312
Merops, ii. 312
Merula, ii. 297
Merychus, N. American Tertiary, i. 138
Merychippus, N. American Tertiary, i. 135
Merychochus, N. American Tertiary, i. 138
Merychodus, N. American Tertiary, i. 138
ii. 239
Merycopotamus, Indian Miocene, i. 122
ii. 214
Merycotherium, of Siberian drift, i. 112
ii. 217
Mesocodon, N. American Tertiary, i. 133
Mesopisa, ii. 479
Mesites, ii. 293
Mesokhippus, N. American Tertiary, i. 135
Mesops, ii. 299
Mesonata, ii. 438
Mesonyx, N. American Tertiary, i. 134
Mesopithecus, Miocene of Greece, i. 115
ii. 178
Mesopithecus, ii. 425
Mesops, ii. 439
Mesopithecus, ii. 475
Massalina, ii. 391
Massarctos, ii. 474
Mettallura, ii. 108
Metaphela, ii. 476
Metelouros, ii. 476
Metpes, ii. 492
Metopis, ii. 102
Metopius, i. 364
Metopus, ii. 283
Metopotheria, i. 102
Metopotheria, ii. 333
Mexican sub-region, ii. 51
mammalia of, ii. 52
birds of, ii. 52
reptiles of, ii. 54
amphibia of, ii. 54
fresh-water fish of, ii. 54
insects of, ii. 55
land-shells of, ii. 57
its relations to the N. and S. American
continents, ii. 57
islands of, ii. 59
Meyer, Dr. A. B., on reptiles and amphibia of
New Guinea, i. 415
Microcha, ii. 370
Microcantho, ii. 501
Microcatus, ii. 347
Microchene, ii. 350
Microcynida, ii. 414
Microcates, ii. 164
Microcrocutus, ii. 176
Microcercal, ii. 364
Microcratera, ii. 167
Microcranoscus, ii. 325
Microchere, ii. 540
Microdolichus, oldest European mammal, i. 163
Micromeryx, European Miocene, i. 120
ii. 226
Micropelema, ii. 353
Microperus, ii. 354
Microterus, ii. 364
Microtrachys, ii. 267
Microtoma, ii. 488
Microtus, N. American Tertiary, i. 133
Microtherium, European Miocene, i. 120
Midas, ii. 176
Middlemas, on extreme northern birds, ii. 219
Midea, ii. 478
Miglydites, ii. 364
Migrating birds, in which region to be placed,
ii. 125
Migation of animals, i. 10
general phenomena of, i. 18
of birds, i. 19
of birds in Europe, i. 19
probable origin of, ii. 22
of birds in India and China, i. 23
of birds in N. America, i. 23
changes in extent of, i. 24
of birds in Temperate America, i. 25
Migration of animals, general remarks on, i. 25
Milites, ii. 477
Milvulus, ii. 192, 291
Milvus, European Miocene, i. 162
ii. 349
Mimetes, ii. 268
Mimetes, ii. 170
Mimocicla, ii. 256
Mimius, ii. 256
Mimulus, ii. 266
Miocene fauna of the Old World, i. 114
fauna of Greece, i. 115
fauna of Greece, summary of, i. 116
fauna of Central Europe, i. 117
deposits of Siwalik Hills, i. 121
faunas of Europe and Asia, general observations on, i. 123
Miokippus, N. American Tertiary, i. 135
Mionectes, ii. 101
Mirafra, ii. 289
Mito, ii. 269
Mityus, ii. 453
Mitre, ii. 508
Mitraphorus, ii. 102
Mitra, ii. 243
Mivart, Professor, on classification of pri-
mates, i. 86
on classification of insectivora, i. 87
on classification of amphibia, i. 101
of classification of lemurs, ii. 176
Mizynus, ii. 261
Mniotilta, ii. 279
Mniotiltidae, ii. 273
Moechocerus, ii. 443
Moes, ii. 397
Moho, ii. 276
Mole-rat of W. Tartary, ii. 218
Mole-rats, ii. 211
Moles, almost wholly Palearctic, i. 181
ii. 190
Molluscs, ii. 450
Mollusca, means of dispersal of, i. 30
classification of, i. 104
groups selected for study, i. 104
MOLLUSCA, distribution of, ii. 504
range of families of, in time, ii. 538
Mollusca, zoology of, i. 417
birds of, i. 419
reptiles of, i. 420
Molecular, ii. 429
insects of, i. 429
peculiarities of fauna of, i. 421
Molokaya, ii. 184
Molothrus, ii. 282
Molus, ii. 439
MOMOTIDAE, ii. 313
Mometes, ii. 313
Monanicalyon, ii. 316
Monarcha, ii. 270
Monasa, ii. 311
Monitor, ii. 389
Monkeys on the high Himalayas, i. 12
fossil in N. American Miocene, i. 133
in E. Thibet, i. 222
abundance of in the Oriental region, i. 315
Monoceros, ii. 507
Monodon, ii. 268
MONODONTIDAE, ii. 208
Monoploca, ii. 590
Monopterus, ii. 455
Monotremata, classification of, i. 91
list of Australian genera of, i. 477
MONOTREMATA, ii. 253
remarks on the distribution of, ii. 254
Monotrophi, ii. 289
Montacuta, ii. 355
Monticolus, ii. 226
Monticiguilla, ii. 284
Moreh, Dr., on Panama shells, ii. 20
Morelia, ii. 351
"Monogerm" of Australia, figure of, i. 442
Morethria, ii. 349
Mormolyce, ii. 490
MORMridae, ii. 448
Mormopyga, ii. 488
Morococcyx, ii. 309
Morganian, N. American Pliocene, i. 149
Morphidae, ii. 472
Morphus, ii. 448
Morpho, ii. 472
Mormona, ii. 294
Mouches, ii. 219
Motaclina, European Miocene, i. 161
ii. 290
MOTAclidae, ii. 290
Motella, ii. 439
Mouches, ii. 191
Motmaks, ii. 313
Mound-builders, peculiar Australian birds, ii. 293
Moupin, position and zoology of, ii. 221
Mous-deer, ii. 218
Mozostoma, ii. 451
Mugil, ii. 435
MUGILLIDAE, ii. 435
Mulleridae, ii. 535
Mullericicus, ii. 303
Mullidae, ii. 426
Mullus, ii. 420
Mungo, ii. 195
Mus, ii. 267
Murenidae, ii. 456
Murunopsis, ii. 412
Murina, ii. 507
MURICIDAE, ii. 507
Muridae, S. American Pliocene, i. 147
MURIDAE, ii. 229
Murray, Mr. Andrew, on zoological region.
i. 12
Mus, ii. 229
Muscardinus, ii. 232
Musciusina, ii. 270
MUSCICAPIDAE, ii. 270
Muscicapola, ii. 270
Muscigrella, ii. 101
Muscipygus, ii. 101
Muscicranziole, ii. 101, 291
Muscicrites, ii. 271
Muscivora, ii. 101
Musophaga, ii. 367
MUSOPHAGIDAE, ii. 307
Mussels, ii. 533
Musota, Miocene of Greece, i. 115
European Miocene, i. 118
S. American Pliocene, i. 146
ii. 198
MUSTELIDAE, in Brazilian caves, i. 144
MUSTELIDAE, ii. 15
Mustelus, ii. 460
MYACIDAE, ii. 535
Myadura, ii. 556
Mycterillus, ii. 471
Myocobus, ii. 284
Myotis, ii. 175
Myctophilus, ii. 178
Myctotherus, ii. 534
Mydus, ii. 199
Mylochera, ii. 539
Myliobates, ii. 278
Myliobates, ii. 271
Mylyctes, ii. 271
Myliobates, ii. 102, 291
Neotropical region, fresh-water fishes of, ii. 12
    summary of vertebrates of, ii. 13
  insects of, ii. 13
  land-shells of, i. 19
  marine shells of, i. 50
    summary of past history of, ii. 80
  tables of distribution of animals of, ii. 84
Neotropical sub-regions, ii. 21
  Neotropis, ii. 208
  Nephocetes, ii. 320
  Nep'tis, ii. 474
NERITID.E, ii. 510
  Nertina, ii. 510
  Neroophis, ii. 457
  Nesoeceleus, ii. 303
  Nesovchila, ii. 256
  Nesodon, S. American Pliocene, i. 147
  Nesopus, ii. 250
  Nesomys, ii. 364
  Nesogale, ii. 282
  Notiss, ii. 509
  Notodor, ii. 329
NESTORID.E, ii. 329
  Nettpus, ii. 363
  Neusterophis, ii. 376
  Newberry, Dr., on Cretaceous and Tertiary
    floras of N. America, ii. 155
  Newton, Professor, on position of Menuride
    and Atrichidor, i. 95
    on birds of Iceland, i. 198
    on Neotropical sub-regions, ii. 25
    on genus Campylolemus, ii. 39
    on peculiar genera of Nearctic and Neo-
      tropical birds, ii. 118
    on family Menuride, ii. 292
  Newtonia, ii. 370
  News, ii. 413
  New Caledonia, birds of, i. 444
  New Guinea, zoology of, i. 499
    mammalia of, i. 419
    birds of, ii. 411
    peculiarities of its ornithology, i. 413
    illustration of ornithology of, i. 414
    reptiles and amphibia of, i. 415
    insects of, i. 416
  New Zealand, objections to making a primary
    zoological region, i. 62
    extinct birds of, i. 164
    sub-region, description of, i. 449
    compared with British Isles, i. 449
    mammalia of, i. 451
    islands of, i. 453
    illustration of ornithology of, i. 455
    reptiles of, i. 456
    amphibia of, i. 457
    fresh-water fish of, i. 457
    insects of, i. 458
    Longicorns of, i. 458
    Myriapoda of, i. 458
    land-shells of, i. 459
    ancient fauna of, i. 460
    origin of fauna of, i. 460
    poverty of insects in, i. 462
    relations of insect-fauna and flora of, i. 472
  Nicador, ii. 272
  Nicobar Islands, their zoological relations, i.
    352
  Nightingale, migration of the, i. 21
  Night-Jars, ii. 319
  Nightjar, ii. 493
  Nightjar, ii. 286
  Nitisus, ii. 272
  Nitta, ii. 270
  Nixux, ii. 350
  Nisaleus, ii. 348
  Nioileus, ii. 348
Otaria, European Miocene, i. 118
Otariidae, ii. 262
Otididae, ii. 356
Otidiphora, ii. 333
Otilophus, ii. 415, 428
Olor, ii. 356
Oncoryx, ii. 289
Otocryptis, ii. 402
Otohyus, ii. 346
Otoumys, ii. 239
Otoumys, ii. 521
Ovis, American Post-Pliocene, i. 130
Ovis, ii. 224, 225
Owl-parrot, ii. 329
Owl's, ii. 350
Oxen, birth-place and migrations of, i. 155
Palaeartic, i. 182
ii. 221
Oxuderidae, ii. 431
Oxyaena, N. American Tertiary, i. 134
Oxyloros, ii. 445
Oxyloma, ii. 421
Oxyphoma, European Miocene, i. 158
Oxytates, ii. 156
Oxytobos, ii. 262
Ozyomycterus, in Brazilian caves, i. 145
S. American Pliocene, i. 147
ii. 230, 231
Ozyotus, ii. 269
Ozyronon, ii. 108
Oxyrhinophidae, ii. 292
Oxyrhinomys, ii. 292
Oxyrhynachus, ii. 391
Oxyrhynches, ii. 400, 492
Oxtherium, in Brazilian caves, i. 145
ii. 246
Oxytoc, ii. 191
Pachycnemus, ii. 328
Pachylus, ii. 429
Pogelius, ii. 427
Pogomys, ii. 204
Pogophilus, ii. 364
Pogophorus, ii. 294
Pogonioides, ii. 195
Palaicidae, ii. 298
Palaearctic region, ancient limits of, i. 157
defined, i. 171
subdivisions of, i. 71
general features of, i. 189
zoological characteristics of, i. 181
has few peculiar families, i. 181
mammalia of, i. 181
birds of, i. 182
high degree of speciality of, i. 184
reptiles and amphibia of, i. 186
fish, water fish of, i. 189
summary of vertebrata of, i. 186
insects of, i. 186
coleoptera of, i. 187
number of coleoptera of, i. 189
Palaearctic region, land-shells of, i. 190
sub-regions of, i. 190
general conclusions on the fauna of, i. 231
tables of distribution of animals of, i. 233
Paleacodon, N. American Tertiary, i. 133
Paleotus, European Miocene, i. 192
Palinthidae, European Eocene, i. 102
Palaeolodus, European Miocene, i. 162
Palaeocastor, N. American Tertiary, i. 140
ii. 254
Palaeoceras, European Miocene, i. 162
Palaeocharus, European Miocene, i. 119
ii. 215
Palaeocyon, ii. 198
Palaeochirus, European Miocene, i. 162
Palaeolagus, N. American Tertiary, i. 140
Palaeolama, S. American Pliocene, i. 147
ii. 217
Palaeomysticetus, European Miocene, i. 118
ii. 230
Palaeomys, European Miocene, i. 120
ii. 230
Palaeomys, European Miocene, i. 121
ii. 230
Palaeontias odolica, Oolitic insect, i. 167
Palaeontology, i. 107
how best studied in its bearing on
geographical distribution, i. 168
as an introduction to the study of geo-
 graphical distribution, concluding re-
 marks on, i. 169
Palaeoptychis, European Eocene, i. 125
Palaeopterus, European Eocene, i. 161
Palaeophynus, European Miocene, i. 166
Palaeoros, Miocene of Greece, i. 116
Palaeorops, i. 329
Palaebornithidae, ii. 296
Palaeonticetus, ii. 196, 206
Palaeorictus, European Miocene, i. 161
Palaeoryctis, Miocene of Greece, i. 116
Palaeoselus, i. 111
European Miocene, i. 117
ii. 199
Palaeosyops, N. American Tertiary, i. 136
Palaeotherium, European Eocene, i. 125
Palaeotherium, European Eocene, i. 125
S. American Eocene, i. 148
Palaeotragus, Miocene of Greece, i. 116
Palaeotrians, N. American Orctaceous, i. 164
Palaemylodon, ii. 301
Palaemedidae, ii. 361
Palaeoprytidae of New Zealand, i. 104
Palapertygidae, ii. 570
Palaeorictus, ii. 370
Palestine, birds of, i. 203
Palassio, ii. 289
Palaeothalamus, European Miocene, i. 119
European Eocene, i. 125
Palaeodictola, ii. 416
Paludicina, Eocene, i. 169
European Secondary, i. 169
* Paludina, Eocene, i. 169
ii. 510
Paludinidae, ii. 510
Pampas, Pliocene deposits of, i. 146
Pampusa, ii. 480
Panda, of Nepal and E. Thibet, i. 222
Himalayas, figure of, i. 331
ii. 204
Pandion, ii. 349
Pandionidae, ii. 349
Papaganeia, ii. 442
Papilionina, ii. 245
Pandal, N. American Tertiary, i. 140
Panauroidea, i. 536
Papillipes, ii. 107
Pantheridae, ii. 109
GENERAL INDEX.

Persia, birds of, i. 204
Petasophora, ii. 108
Petastura, ii. 222
Petenia, ii. 438
Petrochelidon, ii. 281
Petrorhynchus, ii. 186
Petrels, ii. 365
Petruza, ii. 260
Petropale, ii. 251
Petreynis, ii. 239
Petropolitanus, ii. 333
Petrorhynchus, ii. 208
Petrosciurus, ii. 431
Pescora, ii. 254
Pecophaps, ii. 334
Pecoptera, ii. 323
Pefiaferia, ii. 516
Phacellodomysis, ii. 499
Phalangers, ii. 306
Pluilacrocorax, ii. 497
Phaiton, ii. 421
Phaethornis, ii. 418
Phanicothraupis, ii. 402
Phacellodomysis, ii. 421
Pezoponts, ii. 516
Petrophassa, ii. 502
Petrogaies, ii. 365
Phascogale, ii. 284
Petihrista, ii. 350
Phascolarctos, ii. 281
Pharomacrus, ii. 257
Phasianidae, ii. 239
Phedina, ii. 227
Pheasants, ii. 333
Phaeodra, ii. 107
Phaeton, ii. 325
Phalacrocorax, ii. 365
Phalangers, ii. 251
Phalangistis, ii. 252
Phalangistiidae, ii. 251
Phalaropus, ii. 353
Phalacrocorax, ii. 333
Theps, ii. 333
Phalaromacrus, ii. 314
Phasocola, ii. 249
Phascolarctos, ii. 252
Phascolomyidae, ii. 252
Phascolomyus, Australian Post-Tertiary, ii. 157
Phasianidae, ii. 350
Phasianinae, ii. 340
Phasianus, Mioecene of Greece, i. 116
European Post-Pliocene, i. 161
ii. 340
Phasites, ii. 340
Phagophila, ii. 245
Phasians, in European Mioecene, i. 161
golden, of N. China, ii. 229
eared, of Mongolia, i. 226
ii. 339
Phedina, ii. 281
Phelaxma, ii. 400
Phacoculus, N. American Tertiary, i. 138
Pherecydopsis, ii. 489
Phenicetus, ii. 285
Phibalura, ii. 102
Phalangistes, ii. 502
Philemon, ii. 276
Phileptomys, ii. 271
Philepita, ii. 298
Philetillus, ii. 286
Phileobryus, ii. 376
Philippine Islands, mammals of, i. 345
birds of, i. 346
origin of peculiar fauna of, i. 448
Philetella, ii. 553
Philemyctes, ii. 517
Philydrus, ii. 103
Philydor, ii. 103
Philydorinae, ii. 295
Philydorini, ii. 290
Philydorini, ii. 103
Philydorinae, ii. 333
Philydorini, ii. 108
Philydorini, ii. 104
Philydorinae, ii. 98, 253
Phaco, ii. 294
Phacornys, ii. 209
Phactyr, N. American Tertiary, i. 140
Phaciomys, ii. 203
Phactynura, ii. 350
Phaeocolius, ii. 102, 293
Phaeocolius, ii. 505
Phenocopteridae, ii. 361
Phenococcyx, ii. 507
Phalomedusa, ii. 536
Phalocryptes, ii. 350
Phalocryptes, ii. 493
Phalornys, ii. 284
Phorius, ii. 510
Phasianidae, ii. 507
Pharticophalus, ii. 442
Phrygilus, ii. 284
Phryniscidae, ii. 414
Phrymilus, ii. 414
Phrynatrichas, ii. 421
Phrynomolops, ii. 402
Phrynomylus, ii. 421
Phrynorhynchos, ii. 441
Phrynomys, in Brazilian caves, i. 115
ii. 239
Phyllonorycter, ii. 267
Phyllornithidae, ii. 237
Phyllotricota, ii. 101
Phylloscopinae, ii. 257
Phyllostomidae, ii. 258
Phyllostominae, in Brazilian caves, i. 144
Phyllotomidae, ii. 181
Phyllurus, ii. 400
Phyllirhynchus, ii. 530
Phyton, ii. 401
Physa, ii. 518
Physalis, ii. 267
Physater, European Pliocene, i. 112
ii. 298
Physical changes affecting distribution, i. 7
Physignathus, ii. 402
Physostomidae, ii. 441
Physostomus, ii. 477
Physostomus, ii. 294
Phytotomidae, ii. 294
Phytos, ii. 502
Phytocoris, ii. 445
Phytoptera, ii. 445
Pityusa, ii. 309
Pica, ii. 273
Picae, arrangement of, i. 95
range of Palaearctic genera of, i. 247
range of Ethiopian genera of, i. 309
range of Oriental genera of, i. 381
range of Australian genera of, i. 482
PICARIE, ii. 302
general remarks on the distribution of,
ii. 322
Picathartes, ii. 274
Picis, ii. 273
Picidae, ii. 302
Picoides, ii. 303
Picoloapes, ii. 103
Picumnus, ii. 303
Picae, European Mioecene, i. 161
ii. 303
PIERIDÆ, ii. 473
Pieris, ii. 475
P.Livea, ii. 491
Pigeons, classification of, i. 96
   remarkable development of, in the Aus-
   tralian region, i. 357
   erected, of Australia, figure of, i. 441
   ii. 331
   abundant in islands, i. 335
Figs, power of swimming, i. 15
Pikas, ii. 214
Pike, ii. 449
Pikermi, ii. 438
Pike, ii. 372
Pillar, ii. 414
Pillows, ii. 236
Pimelodus, ii. 504
Pimephales, ii. 452
Pinacodera, ii. 499
Pinicox, ii. 318
Pinicola, ii. 225
Pindia, ii. 191
Pipteryx, ii. 328
Pippa, ii. 422
Pippite, ii. 421
Pipile, i. 343
Pipilo, ii. 284
Piping Plovers, ii. 102, 292
Pipreola, ii. 102
Pippa, ii. 102, 292
Piprites, ii. 222
Pithecops, ii. 443
Pithecus, ii. 103
Pithecus, ii. 102
Pithecus, ii. 102, 292
Piramutana, ii. 442
Piratanga, ii. 443
Piranga, ii. 443
Pithecus, ii. 101
Pithecia, ii. 175
Pithecus, ii. 420
Pithys, ii. 104
Pithecus, ii. 268
Pittas, ii. 297
Pitta, ii. 328
Pittidae, abundant in Borneo, i. 325
PITTIDE, ii. 297
Pithecus, ii. 375
Pit-vipers, ii. 384
Pitylus, ii. 99
Pityricus, ii. 273
Pityres, ii. 273
Plagiodonta, ii. 238
Plagiolepis, European Eocene, i. 126
Plagiodontium, ii. 492
PLAGIOSTOMATA, ii. 469
Plancton, ii. 490
Planorbis, European Secondary, i. 169
   Eocene, i. 169
   ii. 518
Platylomae, ii. 307
Plantain-eaters, ii. 307
Plant-cutters, ii. 224
Plants, distribution of, probably the same
   fundamentally as that of animals, ii.
   102
Platanthera, ii. 330
Platanus, ii. 330
Platanista, ii. 299
Platamysis, ii. 408
Platanura, ii. 384
Platycercus, ii. 468
Platycercidae, gorgeously-coloured Australian
   parrots, ii. 394
   ii. 215
Platycercidae, ii. 325
Platycerus, ii. 325
Platychilus, ii. 487
Platyrhynchus, N. American Post-Pliocene, i.
   330
   ii. 215
Platylopus, ii. 273
Platymantis, ii. 419
Platynematichtys, ii. 447
Platynus, ii. 489
Platypsytus, ii. 450
PLATYRHYNCHINÆ, ii. 291
Platyrhynchus, ii. 101
Platygnathus, ii. 352
Platymomys, ii. 439
Platyrrhini, ii. 271
Platystoma, ii. 442
Platymysoma, ii. 442
Plecoptera, ii. 447
Plecostomus, ii. 444
Plecoptera, ii. 189
PLECTOGNATHIDÆ, ii. 457
PLECTROMANTIDÆ, ii. 417
Pleuronectidae, ii. 417
Pleurochir, ii. 286
Pleuropterus, ii. 363
Plectromantis, ii. 519
Plectrus, ii. 374
Plesiarchomys, European Eocene, i. 126
   ii. 256
Plesiarchomys, European Eocene, i. 126
   Plectron in, European Miocene, i. 118
   Plectrodon, ii. 397
   Plectron, ii. 413
PLEUROBRANCHIDÆ, ii. 530
Pleoidea, ii. 415
Pleurodema, ii. 420
Pleurodema, ii. 441
PLEURONECTIDÆ, ii. 440
Pleurodriechus, ii. 392
Pleurotomus, ii. 508
Pleurotomaria, ii. 559
Pliocene period, Old World, mammalia of,
   i. 112
Pliocene and Post-Pliocene faunas of Europe,
   general conclusions from, i. 113
   of N. America, i. 132
   of S. America, i. 146
   of Australia, i. 157
   Pliokypnos, N. American Tertiary, i. 135
   Pliolophus, European Eocene, i. 126
   ii. 216
   Pliopithecus, European Miocene, i. 17
   II. 178
PLOCERIDÆ, ii. 286
Plocopithecus, ii. 286
Ploeus, ii. 286
Plopes, ii. 441
Plopes, ii. 365
Plovers, ii. 355
Pleurania, ii. 356
Pleuranus, ii. 355
PLYCTOLEPHIDÆ, ii. 324
Pleuroptera, ii. 263
Podabrus, ii. 449
Podiceps, ii. 320
PODARGIDÆ, ii. 318
Podarcis, ii. 318
Podpica, ii. 392
Podiceps, ii. 367
PODICIPIDÆ, ii. 366
Podilymbus, ii. 367
Podocnemis, ii. 408
Podocnemid, N. American Tertiary, i. 138
   ii. 217
Podocnemis, ii. 392
Podicipitidae, ii. 367
Podiceps, ii. 222
Podophila, ii. 287
Pogonostomus, ii. 271
POGONORHYNCHIDÆ, ii. 396
Pogonomyrnchus, ii. 396
Pogonornis, ii. 275
GENERAL INDEX.

Primates, range of Oriental genera of, i. 571
range of Australian genera of, i. 475
Primates, European Pliocene, i. 112
Miocene of Greece, i. 115
European Miocene, i. 117
Indian Miocene, i. 121
European Eocene, i. 124
N. American Tertiary, i. 192
of Brazilian caves, i. 144
PRIMATES, distribution of, i. 170—180
general remarks on the distribution of, i. 179
summary and conclusion, ii. 549
Prince’s Island, birds of, i. 266
Prince, ii. 265
Proners, ii. 478
PRONID.E, ii. 498
PRONIDUUM, Oolitic Insects, i. 167
PRONIHYCUS, ii. 213
Proniturus, ii. 226
Pronichthys, ii. 277
Pronodontes, ii. 246
Pronops, ii. 272
Prochilocetes, ii. 349
PRISTID.E, ii. 462
PRISTIMPANTIS, ii. 419
PRISTIOPHORID.E, ii. 462
Pristiphosa, in European Pliocene, i. 112
ii. 204
PRISTIOPRATID.E, ii. 426
PRISTUBRUS, ii. 461
PRISTYCHUS, ii. 489
Proboscidea, classification of, i. 90
range of Ethiopian genus, i. 303
range of Oriental genus, i. 374
Proboscidea, European Pliocene, i. 113
Miocene of Greece, i. 110
European Miocene, i. 120
Indian Miocene, i. 122
N. American Post-Pliocene, i. 130
N. American Tertiary i. 128
of Brazilian caves, i. 144
S. American Pliocene, i. 147
PROBOSCIDEA, ii. 227
summary and conclusion, ii. 542
Procacetus, N. American Post-Pliocene, i. 130
N. American Tertiary, i. 133
ii. 217
Procaps, ii. 293
Procavum, ii. 283
Procera, ii. 365
PROCELLARIID.E, ii. 365
Procera, ii. 488
i. 489
Procilodius, ii. 445
Procilius, ii. 292
Procnis, ii. 98
Procis, ii. 491
Prococet, ii. 488
ii. 489
Procotocys, ii. 401
Procogon, N. American Post-Pliocene, i. 130
ii. 290
Procogonae, in Brazilian caves, i. 144
PROCYNID.E, ii. 200
PRODUCTID.E, ii. 552
Procopae, ii. 291
Prococetus, ii. 499
Procopitus, Miocene of Greece, i. 115
European Miocene, i. 115
ii. 200
Promerops of East Africa, figure of, i. 261
Promerops, ii. 276
Promophilus, ii. 471
Prococetobranchius, European Eocene, i. 126
Psittaci, classification of, i. 96
range of Ethiopian genera of, i. 311
range of Oriental genera of, i. 383
range of Australian genera of, i. 484

PSITACI, ii. 324
general remarks on the distribution of, ii. 329

PSITACIDÆ, ii. 328
Pittacoæ, ii. 328
Pithecusæ, European Miocene, i. 161
ii. 328
Pittonius, ii. 320
Pittirostræ, ii. 277
Pitthius, ii. 290
Psophus, ii. 358
PSOPHIDÆ, ii. 358
Psophodæ, ii. 356

PSYCHROLUTIDÆ, ii. 456
Pterocles, European Miocene, i. 161
ii. 337

PTEROClidÆ, ii. 337
Pteronnæus, ii. 320
Pterocles, European Miocene, i. 125
Pteroplosæmus, ii. 307
Pteronæus, ii. 239
Pteronæus, ii. 463
Pteronymzontidæ, ii. 463
Pteronura, ii. 399
Pteropodes, ii. 356
Pteropodia, ii. 359
Pteropodidae, ii. 357
Pteropodocæ, ii. 269
Pteropotes, ii. 267
Pterorhinus, ii. 361
Pterotherium, ii. 452
Pterotis, ii. 459
Pterotherium, ii. 181
Pteropoda, ii. 531
Pteropodocæ, ii. 269
Pteropothochidæ, ii. 297
Pteropodæ, ii. 320
Pterorhinus, ii. 463
Pterophylax, ii. 439
Pteron ймophidæ, ii. 377
Pteronurus, ii. 577
Ptermyxanornis, ii. 389
Pterodactylus, ii. 265
Pteropus, ii. 418
Pteropus, European Miocene, i. 125

PSEUDOCOYON, European Miocene, i. 131
ii. 392
Pseudocrepidinæ, ii. 444
Pseudodigenus, ii. 383
Pseudodugès, ii. 442
Pseudodactylus, ii. 415
Pseudodactylus, ii. 445
Pseudodactylus, ii. 312
Pseudocarpalipes, ii. 103
Pseudocarpalipes, ii. 392
Pseudodactylus, ii. 107
Pseudodactylus, ii. 198
Pseudodactylus, ii. 477
Pseudodactylus, ii. 432
Pseudodactylus, ii. 346
Pseudodactylus, ii. 349
Pseudodactylus, ii. 333
Pseudodactylus, ii. 343
Pseudodactylus, ii. 328
Pseudodactylus, ii. 490
Pseudodactylus, ii. 239
Pseudodactylus, ii. 383
Pseudodactylus, ii. 452
Pseudodactylus, ii. 411
Pseudophryne, ii. 414
Pseudophryne, ii. 478
Pseudophryne, ii. 392
Pseudophryne, ii. 452
Pseudophryne, ii. 369
Pseudophryne, ii. 350
Pseudophryne, ii. 450
Pseudophryne, ii. 306
Pseudophryne, ii. 497
Pseudophryne, ii. 104
Pseudophryne, ii. 273
Pseudophryne, ii. 453
PYRAMIDELLIDÆ, ii. 509
Pyramis, ii. 474
Pyranka, ii. 98
Pyrenestes, ii. 286
Pyrgioma, ii. 284
Pyrgilla, ii. 284
Pyrgilena, ii. 104
Pyrocephalus, i. 101, 291
Pyroderus, i. 165
Pyromelana, ii. 286
Pyrophalma, ii. 259
Pyrrhocoma, ii. 99
Pyrrhospiza, ii. 285
Pyrrhula, ii. 285
Pyrrhulaula, ii. 280
Pyrrhulina, i. 445
Pyrrhulopsis, ii. 325
Pyrrhuloxia, ii. 285
Pyrrhura, ii. 328
Pytaxia, ii. 287
Python, ii. 351
Pythonidotera, European Miocene, i. 165
PYTHONIDÆ, ii. 381
Pythonodipsas, ii. 379
Pythonopsis, ii. 376
Pythons, ii. 381
Pyxicephalus, ii. 429
Pyzopyga, ii. 408

Q.
Quadruman, fossil, ii. 178
Quail-snipes, ii. 354
Querquedula, ii. 363
Querula, ii. 102
Quiscalus, ii. 282

R.
Rachis, ii. 524
Raccoon-dog of N. China, i. 226
Raccons, ii. 290
Rato, ii. 452
RAIDÆ, ii. 492
Rails, ii. 351
RAILDÆ, ii. 351
Rollina, ii. 352
Rollus, ii. 352
Roma, European Miocene, i. 166

ii. 420
Ramiega, ii. 439
RANIDÆ, ii. 420
Ramdon, ii. 413
Rannia, ii. 419
Rasborha, ii. 452
Rasborichthys, ii. 453
Rattle-snakes, ii. 384
Rays, ii. 402
Reites, ii. 521
Retes, ii. 272
Rheinrurostra, ii. 353
Regalecusa, ii. 452
Region, the best term for the primary zoological divisions, i. 68
Arctic, why not adopted, i. 69
Palaearctic, defined, i. 71
Palaearctic, subdivisions of, i. 71
Ethiopian, defined, i. 75
Ethiopian, subdivisions of, i. 73
Oriental, defined, i. 75
Oriental, subdivisions of, i. 75
Australian, defined, i. 77
Australian, subdivisions of, i. 77

Region, Neotropical, defined, i. 78
Neotropical, subdivisions of, i. 78
Nearctic, defined, i. 79
Nearctic, distinct from Palaearctic, i. 79
Nearctic, subdivisions of, i. 80
zoological, how they should be formed, i. 53
zoological, may be defined by negative or positive characters, i. 54
zoological, by what class of animals best determined, i. 56
for each class of animals, not advisable, i. 58
zoological, proposed since 1857, i. 58
zoological, Mr. Selcater's, i. 59
zoological, discussion of those proposed by various authors, i. 61
zoological, proportionate richness of, i. 61
comparative richness of, i. 81
and sub-regions, table of, i. 81
order of succession of the, i. 173
Registona, ii. 521
Regulidae, ii. 238
Reptiles, ii. 258
Reinwardtiana, ii. 333
Reinwardtipicus, ii. 503
Reithrodon, ii. 230
Representative species, i. 4
Reptiles, means of dispersal of, i. 28
classification of, i. 98
Miocene of Greece, i. 116
of Indian Miocene deposits, i. 123
extinct Tertiary, i. 165
cosmopolitan groups of, i. 176
peculiar to Palaearctic region, i. 186
of Central Europe, i. 195
of the Mediterranean sub-region, i. 204
of the Siberian sub-region, i. 220
of the Manchurian sub-region, i. 227
table of Palaearctic families of, i. 230
of the Ethiopian region, i. 294
of the E. African sub-region, i. 260
of W. Africa, i. 264
S. African, i. 268
of Madagascar, i. 279
of Ethiopian families of, i. 297
of the Oriental region, i. 317
of the Indian sub-region, i. 326
of Ceylon, i. 297
of the Indo-Chinese sub-region, i. 331
of the Indo-Malay sub-region, i. 340
table of Oriental families of, i. 368
of the Australian region, i. 396
of New Guinea, i. 415
of the Moluccas, i. 420
of the Polynesian sub-region, i. 447
of New Zealand, i. 450
of Australian families of, i. 472
Neotropical, i. 472
of S. Temperate America, i. 40
of the Mexican sub-region, i. 54
of the Antilles, i. 72
of Neotropical families of, i. 88
of the Nearctic region, i. 119
of California, i. 128
of Central N. America, i. 131
of Eastern United States, i. 133
of Canada, i. 137
table of Nearctic families of, i. 142
summary and conclusion, ii. 547
REPTILIA, ii. 572
Reptiliana, ii. 447
Revillelsgeddo Islands, zoology of, ii. 60
Rhadoris, ii. 265
Rhadosoma, ii. 574
RACHIODONTIDÆ, ii. 377
Rhacophorus, ii. 419
Rhannophis, ii. 576
RHAMPHASTIDÆ, ii. 300
Rhamephastos, ii. 307
Rhamphichthys, ii. 455
Rhamphocerus, ii. 104
Rhamphococcyx, ii. 399
Rhamphocinclus, ii. 256
Rhamphococcus, ii. 98
Rhamphomeron, ii. 108
Rhamphothus, ii. 520
Rhæo, in Brazilian caves, i. 194
ii. 368
Rhinaster, ii. 213
Rhinaulæma, ii. 411
Rhinechis, ii. 376
Rhinelepis, ii. 444
Rhinechrophis, ii. 452
RHINIDÆ, ii. 462
RHINOBATIDÆ, ii. 462
Rhinoceros, Post-Pliocene, i. 112
European Pliocene, i. 129
Miocone of Greece, i. 116
Indian Miocene, i. 122
fossil remains of, at 16,000 ft elevation
in Tibet, i. 123
fossil in N. China, i. 123
N. American Tertiary, i. 136
ii. 213
Rhinecros-bornbill, figure of, i. 339
Rhinocerotidae, N. American Tertiary, i. 136
RHINOCEROTIDÆ, ii. 213
Rhinocetus, ii. 354
Rhineocercus, ii. 300
Rhineocrypta, ii. 297
Rhinoseropus, ii. 416
RHINODONTIDÆ, ii. 461
Rhinoselurus, ii. 445
Rhinoele, ii. 195
Rhinoelaps, ii. 443
RHINOLOPHIDÆ, ii. 182
Rhinolophus, ii. 253
Rhinops, ii. 374
RHINOPHYRIDÆ, ii. 414
Rhinophrinus, ii. 414
Rhinophax, ii. 317
Rhinops, ii. 183
Rhinorhina, ii. 309
Rhinotragura, ii. 271
Rhinomys, ii. 231
Rhopus, ii. 452
Rho. nitocincla, ii. 256
Rhodora, ii. 397
Rhodopyga, ii. 168
Rhodostethis, ii. 364
Rhombomys, ii. 320
Rhombus, ii. 441
Rhodea, ii. 509
Rhodopetes, ii. 194
Rhynchocne, ii. 353
RHYNCHOCEPHALIDÆ, ii. 465
RHYNCHOCEPHALIDÆA, ii. 465
Rhynchocalyx, ii. 136
Rhynchocyclus, ii. 101
Rhynchonella, ii. 539
RHYNCHONELLIDÆ, ii. 532
Rhynchopus, ii. 365
Rhynchopitta, ii. 325
Rhynchos, ii. 344
Rhynthis, ii. 216, 211
Rhyniostus, ii. 445

Vol. II.—39

Ricinula, ii. 507
Rinoroct, ii. 263
Rinula, ii. 511
Ri. oso, ii. 364
Ristus, ii. 510
Rito, ii. 442
River-lok, of West Africa, figure of, i. 264
of Madagascar, figure of, i. 278
Riveria, limiting the range of mammalia, i. 12
limiting the range of birds, i. 17
River-scene in West Africa, i. 264
River-snails, ii. 510
Rinalus, ii. 450
Rock-snakes, ii. 381
Rocky mountain sub-region, ii. 129
mammalia of, ii. 129
birds of, ii. 130
reptiles, amphibia, and fishes of, ii. 130
Rodentia, classification of, i. 90
range of Palæartic genera of, i. 242
range of Ethiopic genera of, i. 304
range of Oriental genera of, i. 374
range of Australian genera of, i. 476
Rodentia, European Pliocene, i. 113
Mccone of Greece, i. 116
European Miocene, i. 129
European Eocene, i. 126
N. American Post-Pliocene, i. 130
N. American Tertiary, i. 139
of Brazilian caves, i. 144
S. American Pliocene, i. 147
of S. American Eocene, i. 148
RODENTIA, ii. 229
Rodentia, general remarks on the distribution
of, ii. 243
Rodentia, summary and conclusion, ii. 543
Roblechthys, ii. 452
Rolleri, ii. 311
Rollulus, ii. 339
Romaleosoma, ii. 474
Rose-chafers, ii. 494
Roothamys, ii. 349
Rough-tailed burrowing snakes, ii. 374
Ruff, figure of, i. 195
Rupicapra, ii. 224, 225
RUPICAÎRIÆ, ii. 224
Rupicola, ii. 163, 265
RUPICOLINÆ, ii. 293
Ruticilla, ii. 259
RUTICILLINÆ, ii. 257

S.
Saccobranchus, ii. 441
Saccodon, ii. 445
SACCIDÈMIDÆ, ii. 233
Saccoxyphus, ii. 223
Saccostomus, ii. 230
Saga, ii. 516
Sahara, a debatable land, i. 251
Saiga, antelope of W. Tartary, i. 218
Salga, ii. 228
Salmiria, ii. 175
Sakis, ii. 175
Salamandra, ii. 413
SALAMANDRIDÆ, ii. 413
Salamandrina, ii. 413
Salaria, ii. 448
Salminus, ii. 445
Salmo, ii. 447
SALMONIDÆ, ii. 447
Salpinches, ii. 264
Salperis, ii. 364
Salpa, ii. 498
Salutum,
Salvin, Mr., on birds of Galapagos, ii. 30
Sambus, ii. 496
Samoa Islands, birds of, i. 443
Sand-grouse, Pallas', of Mongolia, i. 226
 ii. 337
Sand-lizards, ii. 398
Sandpipers, ii. 353
Sandwich Islands, birds of, i. 445
 probable past history of, i. 446
 mountain plants of, i. 446
 depth of ocean around, i. 447
Sanziera, ii. 581
S perdta, ii. 501
Sapphirina, ii. 109
Sarcodacys, ii. 445
Sarcophilus, ii. 249
Sarcophagine, ii. 346
Sarcophagophorus, ii. 346
Saurus, ii. 427
Sarcokephalas, ii. 353
Sarcopteryx, ii. 288
Sarcorhodon, ii. 438
Sasia, ii. 303
Solanodon, ii. 439
SARCYRIADE, ii. 471
Sattyrus, ii. 471
Saucevrotis, ii. 109
Saunders, Mr. Edward, on the Buprestidae of
Japan, i. 229
Sauroctonos, ii. 210
Saurodactylo, ii. 392
Saurothera, ii. 309
Sazicola, ii. 260
Saxicola, ii. 257
Sagoronic, ii. 190, 291
Scalops, ii. 533
Scalops, ii. 190
Scaphops, ii. 190
Scaphipodia, ii. 417
Scaphiphax, ii. 459
Scaplocherus, ii. 190
Scapulonyx, ii. 190
Scaphiphiles, ii. 490
Scardophila, ii. 333
Searles, ii. 489
Scelidotherium, in Brazilian caves, i. 145
S. American Pliocene, i. 147
 ii. 245
Scelodonta, ii. 490
Sceloporus, ii. 401
Scelotes, ii. 398
Schoena, ii. 432
Schizochela, ii. 422
Schizophorina, ii. 102
Schilbe, ii. 442
Schillichthys, ii. 442
Schizacherma, ii. 415
Schistes, ii. 108
Schistopterus, S. American Pliocene, i. 147
Schizodon, ii. 238
Schizogenius, ii. 490
Schizobipeda, ii. 452
Schizorhina, ii. 491
Schizorhys, ii. 307
Schistothorax, ii. 452
Schenckia, ii. 502
Schweinfurth, Dr., on natural history of Cen-
tral Africa, i. 292
 on limits of W. African sub-region, i. 262
 (note)
Scincius, ii. 443
Scias, ii. 428
SCLENIDAE, ii. 428
SCINCIDE, ii. 396
Sclerurus, ii. 457
Sclerophyllum, ii. 451
Sclerohyrid, ii. 295
Sclerurus, ii. 103
Scolopophagus, ii. 282
SOLOPACIDE, ii. 353
Scolopax, ii. 353
Scombridae, ii. 429
SCOMBRESOCIDE, ii. 449
Scombridae, ii. 449
SCOMBRED, ii. 429
SCOPENIIDE, ii. 446
Scops, ii. 350
Scorpia, ii. 360
Scorpiurus, ii. 320
Scoropeltes, ii. 350
Scorpiulus, ii. 183
Scorpiolus, ii. 391
Screwers, ii. 301
Scrub-birds, ii. 299
SCYLLIDE, ii. 461
Scyllium, ii. 461
Scylla, ii. 379
SCYTOPHIALADE, ii. 379
Scytopus, ii. 297
Scythrops, ii. 310
Sea, as a barrier to mammalia, i. 13
Sea-devils, ii. 469
Seals, fossil in European Miocene, i. 118
 of Lake Baikal, i. 218
 ii. 293
Sea-pens, ii. 505
Sea-snails, ii. 508
Sea-snakes, ii. 384
Schistes, ii. 428
Secondary formations, mammalian remains in.
i. 169
Secretary bird of Africa, figure of, i. 261
 ii. 346
Seemann, Dr., on protective resemblance of
sloths, ii. 24
Sekura, ii. 270
Selache, ii. 460
Selachipus, ii. 108
Selena, ii. 307
Selenauchen, ii. 490
Seleneclides, ii. 275
Semioptera, ii. 275
Seimiophius, ii. 452
SEMPONIPHYTECIDE, ii. 171
SEMMENOPHYTECUS, European Pliocene, i. 112
Miocene of Greece, i. 115
European Miocene, i. 117
Indian Miocene, i. 121
 ii. 171
 ii. 178
Semper, Dr., on Philippine mammalia, i. 345
Sena, ii. 397
GENERAL INDEX.

SEPIADÆ, ii. 506
SEPIDÆ, ii. 398
Seps, ii. 398
Sepsina, ii. 398
Scricinus, ii. 479
Sicotornis, ii. 238
Sericulius, ii. 275
Sericulus, ii. 295
Serpentaria, European Miocene, i. 162
Serphiphage, ii. 101
Serrana, ii. 425
Serraulmo, ii. 445
Sesia, ii. 482
Septophaga, ii. 279
Seychelle Islands, zoology of, i. 251
Shad, ii. 454
Sharks, ii. 460
Sharp, Dr., on Japan beetles, i. 229
Sharpe, Mr. R. H., his arrangement of Acci-
plices, i. 97
Sheep, Palaearctic, i. 182
Sicamanga, ii. 171
Siephos, ii. 397
Siberian climate of, i. 217
Siberian sub-region, description of, i. 216
Siberia, climate of, i. 217
Siberia, large propor-
tion of, i. 216
insects of, i. 220
Sibia, ii. 262
Siderone, ii. 474
Silcloidia, ii. 412
Sierodon, ii. 230
Silodinia, ii. 442
Silphomorpha, ii. 499
Silbasonurus, ii. 397
Siluranaudon, ii. 442
Silurichthyus, ii. 441
Siluridae, ii. 441
Silurus, ii. 441
Silvabara, ii. 374
Simcia, ii. 197
Simia, ii. 171
SIMIDÆ, ii. 170
Simocaphalus, ii. 380
Simocyon, Miocene of Greece, i. 115
Simoa, ii. 198
Simokynochus, ii. 367
Simotes, ii. 275
Simoplatea, ii. 516
Simpa, N. American Tertiary, i. 134
Simpha, ii. 270
Simpnea, ii. 250
Siphonogaster, ii. 411
Siphonorhiza, ii. 320
Siphonostoma, ii. 457
Siren, ii. 411
Sirenia, classification of, i. 89
Siren, range of Ethiopian genera of, i. 303
range of Oriental genus, i. 374
range of Australian genus of, i. 476
Sirenia, European PlIOCene, i. 379
European Miocene, i. 119
SIRENIA, ii. 216
SIRENIDÆ, ii. 411
SIRENOIDEI, ii. 458
Sirgates, ii. 101
Sisor, ii. 444
Sita, ii. 402
Sitta, ii. 265
Sittisymmes, ii. 103
Sittella, ii. 265
SITTLIDÆ, ii. 265
Sivusa, ii. 279
Sivus, ii. 296
Sivatherium, Indian Miocene, i. 122
Sivatherium, ii. 226
Sivalk Hill, Miocene deposits of, i. 121
Sloca, ii. 310
Sloth, ii. 244
Slugs, ii. 517
Smuraglockysis, ii. 109
Smirnithus, ii. 483
Smittogaster, ii. 453
Smittus, ii. 260
Smith, Mr. Frederick, on Hymenoptera of
Japan, i. 260
Smithsonias, ii. 270
Smutsia, ii. 245
Snails, ii. 512
Snake, at great elevation in Himalayas, i. 229
Snakes, classification of, i. 99
Snakes, of, i. 547
Snakes, of, i. 226
Socorro, ii. 296
Socorro, i. 266
Societis, European Miocene, i. 118
Societis, ii. 196
Societis, European Miocene, i. 118
SOCIURIDÆ, ii. 191
Soritis, ii. 397
Sororhynchus, ii. 442
Some, ii. 269
South African sub-region, description of, i.
266
Society Islands, birds of, i. 443
Socorro, zoology of, ii. 69
Soft-tortoises, ii. 499
Solari, ii. 510
Solenodon, ii. 441
Solenidœ, ii. 536
Solenodonta, ii. 188
SOLENOSTOMIDÆ, ii. 456
Solenotheridae, ii. 264
Somateria, ii. 304
Soricidae, ii. 412
Soricia, European Miocene, i. 118
Sorinia, ii. 146
Sorinia, ii. 122
Sorocirrus, ii. 121
Soroto, ii. 497
Sorubim, ii. 296
Sorubim, European Miocene, i. 122
Species, representative, i. 4
Sub-regions, Nearctic, ii. 125

Sugar-birds, ii. 273

Swainson, European Moicene, i. 119

SUIDE, ii. 214

Sula Islands, fauna of, i. 433

Sula, ii. 355

Summary of relations of regions, ii. 155

Sun-birds, ii. 276

Sun-bitters, ii. 358

Suricata, ii. 195

Suria, ii. 359

Surusculus, ii. 310

Ses, European Pliocene, i. 113

Miocene of Greece, i. 116

European Moicene, i. 119

Indian Moicene, i. 122

ii. 215

Atherina, ii. 262

Suya, ii. 258

Swallow, ii. 581

Swallow-shrikes, ii. 258

Swifts, ii. 320

Swine, ii. 214

Swine, Mr., on zoology of Formosa and Hainan, i. 332

Sycalis, ii. 294

Sylia, ii. 259

Subietta, ii. 254

SYLVIDE, ii. 255

SYLVINI, ii. 257

Sylviorthorhynchus, ii. 103

Sylvipusio, ii. 256

Syma, ii. 516

Symboroton, N. American Tertiary, i. 137

SYMBRANCHIDE, ii. 455

Symbanchus, ii. 455

Symmachus, ii. 475

Symmorphyus, ii. 269

Symphedia, ii. 474

Symphodinon, ii. 439

Symplecten, ii. 265

SYNALLAXINE, ii. 295

Synallaxis, ii. 103

Synaphodus, European Moicene, i. 119

Synaptura, ii. 441

Synchlo, ii. 474

Syndesus, ii. 493

Synechosomus, ii. 451

Synamuthus, ii. 457

SYNGNATHIDE, ii. 457

Synodontis, ii. 443

Synopolarthium, N. American Tertiary, i. 134

Synostomus, ii. 481

Spyrunis, ii. 250

Syrripus, ii. 337

Syzygopus, ii. 101

T.

Tables of distribution of families and genera explained, i. 177

Taenocina, ii. 269

Tachodyrannus, ii. 391

Tachyphonus, ii. 98

Tachyrhis, ii. 478

Tachytyrorchis, ii. 348

Tadorna, ii. 365

Tanaioptera, ii. 100, 291

TENOPPERINE, ii. 261

Tenura, ii. 483

Telegallus, ii. 342

Tupia, European Moicene, i. 117

ii. 190

TALPIDE, ii. 190

Tomandua, ii. 247

Tomias, ii. 235, 236

Tanaeo, ii. 474

Tanagor, ii. 353

Tanagra, ii. 98

Tanagrella, ii. 98

TANAGRIDE, ii. 283

Tanaitoidea, ii. 261

Tannagnthus, ii. 326

Tannagthoidea, ii. 318

Tamoicinus, ii. 344

Taphronotus, ii. 333

Tapir, fossil in N. China, i. 123

Tapir, Malay, figure of, i. 337

Topiridae, European Eocene, i. 125

TAPIRIDE, ii. 212

Tapiroidea, birthplace and migrations of, i. 154

ii. 212

Tapiroidea, European Pliocene, i. 113

Indian Moicene, i. 122

in Brazilian caves, i. 144

Tororornis, ii. 219

Tortola, i. 400

Tarsier, Malayan, figure of, i. 337

Tarsiidae, ii. 239

TARSIDE, ii. 177

Tarsipes, ii. 252

Tarsius, ii. 177

Tasmania, comparative zoological poverty of, i. 441

Tateara, ii. 258

Tatua, ii. 246

Tazidea, ii. 190

Tazius, ii. 475

Taxodon, European Moicene, i. 118

ii. 200

Tegypitis, ii. 471

Tachyphorus, ii. 271

TECTONARCHINE, ii. 275

Tegecixus, ii. 390

TEIDE, ii. 390

Telenoglyptus, ii. 479

Tetra, ii. 391

Teites, ii. 390

Teleopsis, ii. 575

Telsonostei, ii. 424

Telephonus, ii. 272

Tellina, ii. 450

TELLINIDE, ii. 506

Telmatoctes, N. American Cretaceous, i. 164

ii. 417

Telmatocestes, N. American Tertiary, i. 133

Tennaroconus, ii. 314

Temnurus, ii. 275

Tephrorhyncus, ii. 269

Tephrorhinus, ii. 272

Terechus, ii. 478

Terebratula, ii. 339

TEREBRATULIDE, ii. 532

Tereka, ii. 533

Terebrata, ii. 104

Teretris, ii. 279

Teritos, ii. 475

Terinos, ii. 474

Terns, ii. 364

Terrafermen, ii. 408

Terrestrial Mollusca, ii. 512

Terrestrial Mollusca, summary and conclusion, i. 551

lines of migration of, ii. 552

Tertia, ii. 263

Tetraclade, ii. 516

ii. 517

TESTUDINIDE, ii. 407

Testudo, Moicene of Greece, i. 116

Indian Moicene, i. 123
Testudo, great antiquity of the genus, i. 2s9
Testudo, ii. 408
Testonera, ii. 501
TETRABRANCHIATA, ii. 506
Tetrach, ii. 486, 487
Tetrachus, European Miocene, i. 117
Tetracerus, ii. 224
Tetracus, ii. 188
Tetractylius, ii. 597
Tetragonocerus, ii. 490
Tetragonus, ii. 306
Tetragonopterus, ii. 445
Tetragonosoma, ii. 389
Tetramichthys, ii. 443
Tetrao albus, in Italian caverns, i. 161
Tetrao, ii. 339
Tetrapallidus, ii. 339
TETRAONIDÆ, ii. 338
Tetraophasis, ii. 340
Tetradon, ii. 457
TEUTHIDÆ, ii. 505
TEUTHIDIDÆ, ii. 433
Tezar, ii. 288
Thaís, ii. 479
Thalassoceris, ii. 201
Thalassiscis, Miocene of Greece, i. 115
European Miocene, i. 118
ii. 195
ii. 197
Thalassornis, ii. 364
Thalassichthys, ii. 447
Thalaturus, ii. 107
Thannistis, ii. 104
Thaumobius, ii. 260
Thaumomystes, ii. 379
Thaumostoma, ii. 164
THAMNOPHILINÆ, ii. 297
Thamnophilus, ii. 104
Thaumalea, ii. 340
Thaumastus, ii. 472
Thaumastura, ii. 108
Thaumatias, ii. 109
Thecla, ii. 477
Thelederamus, ii. 419
Theope, ii. 476
Theorema, ii. 477
Thersaps, ii. 438
Thyracites, ii. 456
Thermopyrnus, European Miocene, i. 126
European Eocene, i. 120
S. American Eocene, i. 148
ii. 239
Theropithoicus, ii. 173
Ihestias, ii. 478
Ihestor, ii. 477
Thetis, ii. 391
THINOCORIDÆ, ii. 354
Thinoropus, ii. 354
Thinophagus, ii. 354
European Tertiary, i. 137
ii. 215
Thinolestes, N. American Tertiary, i. 133
Thinonyx, ii. 256
Thomomys, ii. 233
Thous, ii. 197
Thraseus, ii. 348
Thremetis, ii. 107
Thripadectes, ii. 103
Thripophaga, ii. 103
Thripophilus, ii. 263
Thripotherus, ii. 268
Thrushes, ii. 255
Thyosa, ii. 471
Thylocynus, Australian Post-Tertiary, i. 157
ii. 249
Thylacinus, Australian Post-Tertiary, i. 157
ii. 252
Thymallus, ii. 447
Thynniichthys, 452
Thynnus, ii. 429
Thyrisopterus, ii. 491
Thyrax, ii. 393
Tigris, ii. 284
ii. 402
Tichodroma, ii. 264
Tigó, ii. 303
Tiger-beetles, ii. 466
Tigrisoma, ii. 359
Tijuca, ii. 102
Tillolodion, N. American Eocene, i. 129
Tilloloderus, N. American Eocene, i. 139
Tillolothium, N. American Eocene, i. 139
TinamorEu, ii. 108
Timaliela, ii. 261
TINALIDÆ, ii. 260
Timetet, ii. 474
Timor, physical features of, i. 389
birds of, i. 422
effects of, i. 426
TINAMIDÆ, ii. 343
TINAMINÆ, ii. 344
Tinamous, ii. 345
TINAMOTINÆ, ii. 344
Tinamota, ii. 344
Tinus, ii. 452
Tinoceras, N. American Eocene, i. 139
Titanomys, European Miocene, i. 121
ii. 242
Titanotherium, N. American Tertiary, i. 137
Tilik, ii. 265
Tityra, ii. 102
TITRRINÆ, ii. 293
Tmesisternus, ii. 501
Tons, ii. 415
Toxus, ii. 317
TODIDÆ, ii. 313
Todius, ii. 313
Todirhamnus, 316
Todirostrum, ii. 101
Toxoptis, ii. 271
Todus, ii. 313
Toxotes, ii. 246
Toxarchos, N. American Tertiary, i. 135
Tomistoma, ii. 405
Tomodon, ii. 175
Tonga Islands, birds of, i. 443
Topaza, ii. 107
TORNATELLIDÆ, ii. 530
TORPEDINIDÆ, ii. 462
Tortoises, classification of, i. 160
of Mascarene Islands and Galapagos, i. 289
ii. 407
TORTRICIDÆ, ii. 573
Tortrix, ii. 373
Totonus, ii. 553
Toucanas, ii. 306
Touraco of W. Africa, figure of, i. 354
Toxodon, S. American Pliocene, i. 137
Toxodontiodor, S. American Pliocene, i. 147
Toxotes, ii. 502
Trachelopus, ii. 443
TRACHIDÆ, ii. 428
Trachinus, ii. 428
Trachurus, ii. 429
Trachycepha/us, ii. 401
ii. 418
Trachydosmus, ii. 397
Trachyphonea, ii. 306
TRACHYPHERIDÆ, ii. 432
Trachytherium, European Miocene, i. 119
GENERAL INDEX.

TRAGELAPHINÆ, ii. 223
Tragelaphus, ii. 223
Tragocerus, Mioeoc. of Greece, i. 116
European Mioeoc., i. 120
Tragopy, Himalayan, figure of, i. 331
Tragop, ii. 379
TRAGULIDÆ, ii. 218
Tragulus, ii. 218
Tragulus, ii. 402
Tragulus, ii. 489
Tree-crows, ii. 273
Tree-kangaroo, figure of, i. 415
Tree-shrew of Borneo, figure of, i. 337
Tree-snakes, ii. 378
Tremex, ii. 202
Treset, ii. 322
Tres Marias, zoology of, ii. 59
Tridentonotus, ii. 307
Tribranichor, ii. 517
Trilobus, ii. 322
Trichostoma, ii. 261
TRICHECHIDÆ, ii. 203
Trichechus, N. American Post-Pliocene, i. 130
ii. 203
TRICHIURIDÆ, ii. 429
Trichurus, ii. 293
TRICHOGLOSSIDÆ, ii. 337
Trichoglossidg, birds specially adapted to
Australia, in. 395
Tricholopseus, ii. 327
Tricholomis, ii. 296
Trichogaster, ii. 444
Trichogaster, ii. 485
Trichognis, ii. 477
TRICHONOTIDÆ, ii. 435
Trichonotropis, ii. 99
Trichonotropis, ii. 507
Trichorhina, ii. 328
TRIDACNIDÆ, ii. 533
Tridacna, ii. 428
TRIGLIDÆ, ii. 427
Trigona, ii. 536
TRIGONIADÆ, ii. 534
Trigonoptera, ii. 501
Trimerorhachis, ii. 385
Triunguis, ii. 253
Triungulidae, ii. 353
TRIONYCHIDÆ, ii. 409
Trionyx, Indian Miocene, i. 123
Miocene and Eocene, i. 165
ii. 409
Triprotodon, ii. 418
Triporus, ii. 297
Tristan d'Acunha, zoology of, ii. 271
Tristram, Canon, summary of the birds of
Palestine, i. 203
on the arrangement of the Sylvide, ii. 257
Trodon, ii. 413
TROJANIDÆ, ii. 530
Trochopterous, ii. 261
Trochelotis, ii. 522
TROCHILIDÆ, ii. 321
Trochilus, ii. 108
Trochus, ii. 510
Troglochites, ii. 170
ii. 263
TROGLODYTIDÆ, ii. 265
Trogon, European Mioeoc., i. 161
ii. 314
Trogon, ii. 314
Trogonidg, ii. 314
TROGONOPHIDÆ, ii. 388
Trogonophis, ii. 388
Trogonothem, Post-Pliocene of Europe, i. 111
ii. 214
Tropidocorys, ii. 379
Tropidodipsus, ii. 379
Tropidolepis, ii. 401
Tropidolepisina, ii. 397
Tropidodonus, ii. 375
Tropidophorus, ii. 397
Tropidopterus, ii. 490
Tropidohyoscopus, ii. 476
Tropicalis, New American Post-Pliocene, i. 129
Trogoc, ii. 333
Trumpeters, ii. 353
Truncatella, ii. 519
Trogod, ii. 463
TRIGÔNIDÆ, ii. 463
Tutara, ii. 405
Tudor, ii. 521
Tundras of Siberia, greatest extent of, i. 216
Tupai, ii. 186
TUPAIIDÆ, ii. 186
Tupaiidae, European Miocene, i. 118
Turaco, ii. 233
Turacos, ii. 307
Turcas, ii. 307
TURBINIDÆ, ii. 510
TURIDÆ, ii. 235
Turdina, ii. 362
Turdus, ii. 256
Turagra, ii. 262
Turner, Mr., on classification of Edentata, i.
90
TURNICIDÆ, ii. 341
Turnix, ii. 451
TURRITELLIDÆ, ii. 509
Turritolepis, ii. 374
Turritolepis, ii. 372
Typhlops, ii. 572
Typhloscincus, ii. 399
Typhotherium, S. American Pliocene, i. 147
Ti RANNIDÆ, ii. 290
TYRAN妮IDÆ, ii. 291
Tyranniscus, ii. 101
Tyrannus, ii. 101
Tyrannus, ii. 192, 291
Tyrant-Shrikes, ii. 290

U.

Uitis, ii. 459
Uinacelon, N. American Tertiary, i. 134
Uinavaterium, N. American Eocene, i. 139
Uinavaturn, N. American Eocene, i. 163
Um, ii. 481
UMBRIDÆ, ii. 449
Umbrina, ii. 428
Ungulata, ii. 381
Ungulata, classification of, i. 89
antiquity of, i. 154
of the Palearctic region, i. 182
range of Palearctic genera of, i. 241
range of Ethiopian genera of, i. 293
range of Oriental genera of, i. 374
range of Australian genera of, i. 476
Ungulata, European Pliocene, i. 112
Miocene of Greece, European Miocene, i. 119
INDEX.

**UNGULATA.** Indian Miocene, i. 121
European Eocene, i. 125
N. American Post-Pliocene, i. 139
N. American Tertiary, i. 135
of Brazilian caves, i. 144
S. American Pliocene, i. 146

**UNGULATA.** ii. 211
general remarks on the distribution of,
ii. 226
summary and conclusion, ii. 542

**UNIONIDE.** ii. 534

**Upupidae.** ii. 103

**UPUIIDAE.** ii. 517

**Uraus.** ii. 285
Urania of Madagascar, i. 282

**Uranidae.** ii. 482

**Urea,** ii. 367
Urocistus, ii. 345
Urocyon, ii. 328
Urocyon, ii. 197

**Urodela.** ii. 411

**Uropygidae.** ii. 511

**Urolestes.** ii. 272

**Uromastiz.** ii. 492

**Uropeltidae.** ii. 373

**Uropygidae.** ii. 374

**Uropodidae.** ii. 284

**Uropodida.** ii. 190

**Uropodidae.** ii. 285

**Uropos.** ii. 355

**Uropatina.** ii. 313

**Uropeltis.** ii. 285

**Uromastiz.** ii. 382

**Urotrichus.** ii. 190

**Urotiorchis.** ii. 247

**Usidae.** N. American Tertiary, i. 135
in Brazilian caves, i. 114

**URSIDAE.** ii. 201

**Ursitaxus, Indian Miocene, i. 121
ii. 200
**Ursus, Post-Pliocene, i. 112
**Indus, Miocene, i. 121
ii. 201

**Trabutinae.** ii. 348

**Trecina.** ii. 195

**Tetra.** ii. 401

**Tetraonidae.** ii. 477

**V.**

**Vaginatus.** ii. 518

**Valgus.** ii. 495

**Valentia.** ii. 510

**Vanga of Madagascar, figure of, i. 278
**Vanga.** ii. 372

**Vanellidae.** ii. 444

**Vanelluses.** ii. 336

**Vanessa.** ii. 474

**VARANIDAE.** ii. 389

**Varanus, Miocene of Greece, i. 116
**Indian Miocene, i. 123

**VENERIDAE.** ii. 556

**Versilia.** ii. 303

**Vermicella,** ii. 383

**Vertebrata, summary of Palearctic, i. 186
**summary of Ethiopian, i. 255
**summary of Oriental, i. 318
**summary of Australian, i. 397
**summary of Neotropical, ii. 13
**summary of Neartic, ii. 129

**Vespertilio, European Eocene, i. 125
ii. 183
**VESPERTILIONIDAE.** ii. 183

**Vidua.** ii. 286

**Vipera.** ii. 385

**Viperidae.** ii. 385

**Vipers, European Miocene, i. 165
**Vipers, ii. 385

**Vireo.** ii. 280

**Vireonidae.** ii. 279

**Viridiplata.** ii. 280

**Virigalea.** ii. 290

**Vissac, ii. 237

**Fritiss.** ii. 516

**Viverra, European Pliocene, i. 112
**European Miocene, i. 118
ii. 195

**Viverricula.** ii. 195

**Viverridae.** European Miocene, i. 118

**Viverridae.** ii. 135

**VIVERRIDAE.** ii. 194

**Vivia, ii. 303

**Volatilia.** ii. 284

**Voluta.** ii. 508

**Volutes, ii. 508

**VOLTIDAE.** ii. 508

**Volucella.** ii. 269

**Volutes, ii. 197
**Volutes, ii. 346

**Vulturidae.** ii. 345

**VULTURINAE.** ii. 346

W.

Wagtail, ii. 290

Walden, Viscount, on birds of Philippine islands, i. 246

on birds of Celebes, i. 428

on arrangement of the Timaliidae, ii. 261

Wallago, ii. 441

Wall-lizards, ii. 309

Walrus, ii. 203

Wart-snakes, ii. 382

Washakius, N. American Tertiary i. 134

Waterhouse, Mr. G. R., on classification of rodents, i. 90

on classification of marsupials, i. 91

Water-lizards, ii. 389

Weaver-finches, ii. 286

West African sub-region, description of, i. 262
mammalia of, i. 262
birds of, i. 262
Oriental or Malayean element in, i. 263
river scene with characteristic animals, i. 264
reptiles of, i. 264
amphibia of, i. 264
Oriental and Neotropical relations of, i. 265
insects of, i. 265
land-shells of, i. 265
islands of, i. 265

West Australia, peculiar birds of, i. 441

Wheelers, ii. 507

Whip-snakes, ii. 379

Whylah finch of W. Africa, figure of, ii. 264

Wing-shells, ii. 507

Wollaston, Mr. T. V., on the Coleoptera of the Atlantic Islands, i. 509

on the wings of the Madiran beetles, i. 511

on the origin of the insect fauna of the Atlantic Islands, i. 214

on the Coleoptera of the Cape Verd Islands,
ii. 215
| Xanthocephalus, ii. 282 |
| Xantholoma, ii. 306 |
| Xanthomelas, ii. 275 |
| Xanthopygia, ii. 270 |
| Xanthosomus, ii. 292 |
| Xanthotis, ii. 275 |
| Xema, ii. 364 |
| Xenaphilus, ii. 375 |
| Xenica, ii. 471 |
| Xenicus, ii. 265 |
| Xenocrocephus, ii. 375 |
| Xenoecarpius, ii. 452 |
| Xenodermus, ii. 375 |
| Xenodon, ii. 375 |
| Xenopeltidae, ii. 373 |
| Xenopeletis, ii. 373 |
| Xenopis, ii. 493 |
| Xenopoio, ii. 162 |
| Xenops, ii. 103 |
| Xenorothis, ii. 415 |
| Xenoehinidae, ii. 415 |
| Xenospingus, ii. 284 |
| Xenurelops, ii. 333 |
| Xenurus, in Brazilian caves, i. 145 |
| Xiphias, ii. 430 |
| Xiphidiopicus, ii. 303 |
| Xiphidium, ii. 430 |
| Xiphina, ii. 298 |
| Xiphoclaeops, ii. 103 |
| Xiphodontidae, European Miocene, i. 119 |
| Xiphodera, ii. 102 |
| Xiphorkanopus, ii. 445 |
| Xiphorkyphus, 103 |
| Xiphostoma, ii. 445 |
| Xistrodera, ii. 501 |

| Y. |
| Yphiana, ii. 471 |
| Yuhina, ii. 266 |
| Yungidæ, ii. 304 |
| Yungipicus, ii. 303 |
| Yunzi, ii. 304 |

| Z. |
| Zabrus, ii. 489 |
| Zalophus, ii. 293 |
| Zamia, ii. 375 |
| Zanclostomus, ii. 309 |
| Zelea, ii. 275 |
| Zebras, ii. 311 |
| Zebras, ii. 478 |
| Zenaidia, ii. 433 |
| Zenaida, ii. 332 |
| Zephyrhus, ii. 477 |
| Zengsbolus, ii. 210 |
| Zengladontidae, N. American Tertiary, i. 140 |
| X. |
| Zeugen, ii. 103 |
| Zevotina, ii. 472 |
| Zeitna, ii. 433 |
| Zeupestes, ii. 416 |
| Zezites prisca, Palaeozoic, i. 169 |
| Zonotrichia, ii. 284 |
| Zonuridae, ii. 391 |
| Zonura, ii. 362 |
| Zoothera, ii. 256 |
| Zootoca, ii. 391 |
| Zoothera, ii. 477 |
| Zygoporus, ii. 453 |
| ZygiEnidae, ii. 481 |
| Zygnepis, ii. 398 |
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