ZOOGEOGRAPHY

PHYSICAL ATLAS

VOLUME V

Bartholomew's Physical Atlas—Volume V

ATLAS

OF

ZOOGEOGRAPHY

A Series of Maps illustrating the Distribution of over Seven Hundred Families, Genera, and Species of Existing Animals

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TO HIS GRACE

THE DUKE OF BEDFORD, K.G., F.R.S., ETC.

PRESIDENT OF THE ZOOLOGICAL SOCIETY OF LONDON

This Atlas is Dedicated

IN APPRECIATIVE RECOGNITION

OF HIS SERVICES TO

ZOOLOGICAL SCIENCE

PREFACE

HE object of the present volume is to delineate and describe, so far as the state of our knowledge permits, the present distribution of the higher animals over the surface of the Earth. This undertaking, with the exception of Plate 36, is not based upon any previous work of a similar nature, but is entirely the result of original researches into the zoological literature of all countries. All the families of Mammals, Birds, Reptiles and Amphibians, together with several of the more important genera and species, have been dealt with, while the work embraces in addition most of the families of Fishes and a selection of families and genera of Molluscs and Insects.

The authors fully realise that in a work of this kind it is impossible to attain absolute accuracy. Zoological literature has assumed such enormous proportions that a complete survey is quite impracticable. No pains have been spared, however, to lay under contribution all the more important publications relating to the faunas of the various countries. The distribution of animal life in many areas has not been investigated in sufficient detail to afford the necessary data, and the range is then impossible to define with precision. This applies particularly to countries like Siberia, and in such instances the authors have been unable to do more than indicate the known outposts and join them by a more or less hypothetical line. But they venture to think that, for all practical purposes, the work is sufficiently accurate.

In the mapping of the distributions it has been thought desirable, for the sake of clearness, to have numerous small maps, rather than risk confusion by crowding too many families on one Plate. Thus, by the use of over two hundred maps, together with distinctive colouring, it is hoped that all complexity has been avoided. In each case the data have been drafted on large-scale maps and then carefully reduced to the smaller scale for the Atlas.

In the Text, a short historical account is given of the various systems propounded for the subdivision of the World into Zoo-geographical Regions, wherein the views of the leading authorities are considered. Their schemes are shown on a special Plate. Most of these are based upon the study of particular groups of animals—such as Mammals—but that of Dr Alfred Russel Wallace has a wider bearing, and hence has been accepted as a basis for the text of the present volume. In Part II. the various Regions and Sub-Regions of this author are defined, and an account given of their characteristic and peculiar animals, with original Tables, giving a numerical summary of the families of terrestrial Vertebrates occurring in these areas.

The main portion of the Text is designed to afford concise information regarding the groups of animals whose distribution is shown on the Plates. A census has been given, where possible, of the number of known species in each family, based upon the latest information. The nature of the haunts frequented, a general statement as to the constituent animals of the various groups, the peculiarities in their distribution, and other desirable particulars have been furnished.

The Part devoted to Bibliography contains a list, limited to about a thousand titles, of the more important books and papers dealing with the animals of the various Regions. The titles are arranged alphabetically under the authors' names, and are then grouped primarily under the Regions, and secondarily under the various classes of animals.

Lastly, in a work of this nature, where so many animals and countries have been passed in review, a full and comprehensive Index has been deemed a necessary adjunct.

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,, iii. **Hemiphractidæ** — Hemiphractus, etc. **Hylidæ** — Typical Tree-Frogs. **Amphignathodontidæ**—Amphignathodon, etc. **Bufonidæ**—Toads.
,, iv. **Pelobatidæ**—Pouched Tree-Frogs. **Discoglossidæ**—Disc-Tongued Frogs. **Pipidæ**—Surinam Toad, etc. **Dactylethridæ**—Clawed Toads.

URODELA—*TAILED AMPHIBIANS.*

Map v. **Sirenidæ**—Mud-Eels. **Proteidæ** — Proteus or Gilled Salamander, etc. **Salamandridæ**—Typical Salamanders. **Amblystomatidæ**—Axolotls.
,, vi. **Plethodontidæ**—Spelerpes, etc. **Desmognathidæ**—Desmognathus, etc. **Amphiumidæ**—Fish-like Salamanders.

APODA—*LIMBLESS AMPHIBIANS.*

Map vi. **Cœciliidæ**—Cœcilia.

Pisces—Fishes.

22. DIPNEUSTI—*DIPNOI.*

Map i. **Lepidosirenidæ**—Mud-Fishes. **Ceratodontidæ**—Lung-Fish.

TELEOSTEI—

Map i. **Molidæ**—Sun-Fishes. **Diodontidæ** and **Allies**—Porcupine-Fishes. **Tetrodontidæ**—Globe-Fishes.
,, ii. **Balistidæ** and **Allies**—File-Fishes, etc. **Lophiidæ** and **Allies**—Angler-Fish, etc. **Mastacembelidæ**. **Lophotidæ**—Unicorn-Fishes. **Trachypteridæ**—Ribbon-Fishes.
,, iii. **Ophidiidæ** and **Allies**—Snake-Fishes, etc. **Zoarcidæ**—Viviparous Blennies, etc. **Batrachidæ**—Frog-Fishes. **Blenniidæ** and **Allies**—Blennies, etc.
,, iv. **Gobiesocidæ**—Sucker-Fishes. **Trichonotidæ**—Hairy-Backs. **Trachinidæ** and **Allies**—Weavers, etc. **Dactylopteridæ**—Flying Gurnards.
,, v. **Triglidæ**—Gurnards. **Agonidæ**—Armed Bullhead, etc. **Cyclopteridæ**—Lumpsuckers. **Cottidæ** and **Allies**—Bullheads, etc.
,, vi. **Hexagrammidæ**. **Scorpænidæ**—Scorpænoids. **Echeneididæ**—Sucking-Fishes. **Gobiidæ** and **Allies**—Gobies, etc.

23. TELEOSTEI—

Map i. **Kurtidæ** and **Allies**. **Pleuronectidæ**—Flat-Fishes. **Zeidæ**—Dories. **Bramidæ**. **Coryphænidæ**—Dolphins.
,, ii. **Xiphiidæ** and **Allies**—Sword-Fishes. **Trichiuridæ**—Scabbard-Fishes, etc. **Scombridæ** and **Allies**—Mackerels, etc. **Carangidæ** and **Allies**—Horse-Mackerels, etc.
,, iii. **Labridæ** and **Allies** — Wrasses, etc. **Pomacentridæ** — Coral-Fishes. **Cichlidæ**—Chromides. **Embiotocidæ**—Surf-Fishes. **Osphromenidæ**—Paradise-Fish, etc.
,, iv. **Teuthididæ**. **Acanthuridæ**—Surgeon-Fishes. **Chaetodontidæ**—Butterfly-Fishes. **Caproidæ**—Boar-Fish, etc.
,, v. **Mullidæ**—Red-Mullets. **Sparidæ** and **Allies**—Sea-Breams, etc. **Sciænidæ**—Croakers, etc. **Hoplognathidæ**—Knife-jawed Fishes.
,, vi. **Cepolidæ** — Band-Fishes. **Serranidæ** and **Allies** — Sea-Perches, etc. **Percidæ**—Fresh-Water Perches. **Nandidæ**.

24. TELEOSTEI—

Map i. **Centrarchidæ**—Black Bass, etc. **Berycidæ** and **Allies**—Slime-Heads, etc. **Gadidæ** and **Allies**—Codfishes, etc. **Macruridæ**—Longtails.
,, ii. **Anabantidæ** — Climbing Perches. **Ophiocephalidæ** — Serpent-Heads. **Stromateidæ** — Butter-Fishes. **Sphyraenidæ**—Barracudas. **Polynemidæ**—Threadfins.
,, iii. **Mugilidæ**—Grey Mullets. **Atherinidæ** and **Allies**—Sand-Smelts, etc. **Ammodytidæ**—Sand-Eels. **Scombresocidæ**—Gar-Pike, Flying-Fish, etc. **Pegasidæ**—Dragon-Fishes.
,, iv. **Syngnathidæ**—Pipe-Fishes, etc. **Centriscidæ** and **Allies**—Trumpet-Fishes, etc. **Fistulariidæ** and **Allies**—Flute-Mouths, etc. **Gastrosteidæ**—Sticklebacks.
,, v. **Lampridiidæ** — The Opah or King-Fish. **Pierasferidæ** — Pearl-Fishes. **Notacanthidæ**—Thornbacks. **Percopsidæ**—Trout-Perches.
,, vi. **Amblyopsidæ**—Blind-Fishes. **Cyprinodontidæ**—Killifishes. **Kneriidæ**. **Scopelidæ** and **Allies**—Lantern-Fishes, etc.

25. TELEOSTEI—

Map i. **Esocidæ** — Pikes. **Haplochitonidæ** — Southern Salmon. **Galaxiidæ**—Pikelets. **Murænidæ** and **Allies**—Murænoid Eels, etc.
,, ii. **Anguillidæ**—Typical Eels. **Symbranchidæ** and **Allies**—Single Slit Eels. **Loricariidæ**—Mailed Cat-Fishes. **Siluridæ** and **Allies**—Cat-Fishes, etc.
,, iii. **Cyprinidæ**—Carps, etc. **Gymnotidæ**—Electric Eels. **Characinidæ**. **Gonorhynchidæ**—The Beaked Salmon. **Stomiatidæ** and **Allies**.
,, iv. **Alepocephalidæ** — Smooth-Heads. **Salmonidæ** — Salmon, Trout, etc. **Clupeidæ** and **Allies**—Herrings, etc. **Chirocentridæ**—The Dorab. **Pantodontidæ**—The Chisel-Jaw.
,, v. **Osteoglossidæ**—Arapaimas. **Notopteridæ**—Feather-backs. **Hyodontidæ**—Moon-Eyes. **Mormyridæ**—Beaked Fishes. **Elopidæ**—The Tarpon, etc.

HOLOSTEI—

Map vi. **Lepidosteidæ**—Bony Pike, etc. **Amiidæ**—Bow-Fin, etc.

CHONDROSTEI—

Map vi. **Acipenseridæ**—Sturgeons. **Polyodontidæ**—Toothed Sturgeons.

Pisces—*Continued.*

26. CROSSOPTERYGII—

Map i. **Polypteridæ**—The Bichir, etc.

HOLOCEPHALI—

Map i. **Chimæridæ**—Chimæras.

PLAGIOSTOMI—

Map i. **Myliobatidæ**—Eagle-Rays. **Trygonidæ**—Sting-Rays.
,, ii. **Torpedinidæ**—Electric-Rays. **Raiidæ**—Rays or Skates. **Rhinobatidæ**—Beaked Rays.
,, iii. **Pristidæ**—True Saw-Fishes. **Pristiophoridæ**—Side-gilled Saw-Fishes. **Rhinidæ**—Angel-Fishes. **Spinacidæ**—Spiny Dog-Fishes.
,, iv. **Rhinodontidæ** — Whale-Sharks. **Cetorhinidæ** — The Basking Shark. **Lamnidæ** — The Porbeagle, etc. **Sphyrnidæ** — Hammer-Head Sharks.
,, v. **Carchariidæ** — The Blue Shark, etc. **Scyliidæ** — Dog-Fishes, etc. **Heterodontidæ**—Bullhead-Sharks. **Notidanidæ**—Comb-tooth Sharks.

CYCLOSTOMATA—

Map vi. **Petromyzontidæ**—Lampreys. **Bdellostomatidæ**—Hag-Fishes. **Myxinidæ**—Hag-Fishes.

CEPHALOCHORDATA—

Map vi. **Branchiostomatidæ**—Lancelets.

Mollusca—Molluscs.

27. CEPHALOPODA—*SQUIDS, CUTTLE-FISHES, Etc.*

Map i. **Octopodidæ** — Octopus, etc. **Argonautidæ** — The Paper-Nautilus. **Loliginidæ**—Squids. **Sepiidæ**—Cuttle-Fishes.
,, ii. **Spirulidæ**—Spirula. **Nautilidæ**—Nautili.

PULMONATA—*LAND-SNAILS, FRESH-WATER SNAILS, Etc.*

Map ii. **Testacellidæ**—Shelled Slugs. **Limacidæ**—True Slugs.
,, iii. **Helicidæ**—Typical Land-Snails. **Orthalicidæ**—Orthalicus. **Bulimulidæ**—Bulimulus, etc. **Urocoptidæ**—Urocoptis, etc. **Pupidæ**—Pupa, etc.
,, iv. **Stenogyridæ** — Agate-Snails, etc. **Succineidæ** — Amber-Snails, etc. **Limnæidæ**—Fresh-water Limpets, etc. **Physidæ**—Physa, etc.

PROSOBRANCHIATA—*FRONT-GILLED GASTROPODS.*

Map v. **Conidæ**—Cones. **Olividæ**—Olives. **Volutidæ**—Volutes. **Buccinidæ**—Whelks, etc.
,, vi. **Muricidæ**—Murex, etc. **Cassididæ**—Helmet-Shells. **Cypræidæ**—Cowries.

28. PROSOBRANCHIATA—*FRONT-GILLED GASTROPODS.*

Map i. **Strombidæ**—Wing-Shells. **Melaniidæ**—Melania, etc. **Hydrobiidæ**—Hydrobia, etc. **Paludinidæ**—Viviparous Pond-Snails.
,, ii. **Valvatidæ**—Valvata, etc. **Ampullariidæ**—Ampullaria, etc. **Cyclophoridæ**—Cyclophorus, etc. **Cyclostomatidæ**—Cyclostoma, etc.
,, iii. **Aciculidæ**—Acicula. **Proserpinidæ**—Proserpina. **Helicinidæ**—Helicina, etc. **Trochidæ**—Trochus, etc.
,, iv. **Haliotidæ**—Ormers. **Patellidæ**—Limpets.

POLYPLACOPHORA—*CHITONS.*

Map iv. **Chitonidæ**—Chitons.

PELECYPODA—*BIVALVES.*

Map iv. **Ostreidæ**—Oysters.
,, v. **Pectinidæ**—Scallop-Shells. **Aviculidæ**—Pearl-Oysters, etc. **Meleagrina**—The Pearl-Oyster.
Mytilidæ—Mussels (Fresh water forms = Dreissensia and Mytilopsis).
,, vi. **Unionidæ** — Fresh-water Mussels. **Ætheriidæ** — Fresh-water Oysters. **Cardiidæ**—Cockles. **Cyrenidæ**—Cyrena, etc.

Lepidoptera—Butterflies and Moths.

29. RHOPALOCERA—*BUTTERFLIES.*

Map i. **Papilionidæ**—Swallow-Tails. **Ornithoptera. Papilio.**
,, ii. **Thais. Parnassius. Pieridæ**—Whites, Clouded Yellows, etc.
,, iii. **Dismorphia. Pieris. Delias.**
,, iv. **Terias. Catopsilia. Gonopteryx.**
,, v. **Colias**—Clouded Yellows. **Danaidæ. Euploea.**
,, vi. **Amauris. Neotropidæ. Acræidæ. Acræa.**

30. RHOPALOCERA—*BUTTERFLIES.*

Map i. **Heliconidæ. Nymphalidæ**—Fritillaries, Tortoise-Shells, etc.
,, ii. **Argynnis. Phyciodes. Vanessa.**
,, iii. **Precis. Kallima. Hypolimnas.**
,, iv. **Neptis. Limenitis. Euphædra.**
,, v. **Euthalia. Apatura. Charaxes.**
,, vi. **Morphidæ. Morpho. Brassolidæ.**

31. RHOPALOCERA—*BUTTERFLIES.*

Map i. **Satyridæ**—Ringlet Group. **Pararge. Mycalesis.**
,, ii. **Melanitis. Euptychia. Cœnonympha.**
,, iii. **Erebia. Satyrus. Xenica.**
,, iv. **Œneis. Pedaliodes. Elymniidæ.**
,, v. **Libytheidæ. Nemeobiidæ. Euselasiidæ.**
,, vi. **Lemoniidæ. Lycænidæ**—Blues and Coppers. **Hesperiidæ**—Skippers.

Lepidoptera—*Continued.*

32. HETEROCERA—*MOTHS.*

Map i. **Castniidæ**. **Saturniidæ**—Emperor-Moths, etc. **Bombycidæ**—Silk-Moths.
,, ii. **Sphingidæ** — Hawk-Moths. **Notodontidæ** — Prominents, etc. **Sesiidæ** (**Ægeriidæ**)—Clear-Wings.
,, iii. **Syntomidæ**. **Zygænidæ**—Burnet-Moths. **Cossidæ**—Goat-Moth Group.
,, iv. **Hepialidæ**—Ghost-Moths, etc. **Lasiocampidæ**—Lappet-Moths, Eggars, etc. **Lymantriidæ** (**Liparidæ**)—Tussock-Moths, etc.
,, v. **Hypsidæ** (**Aganaidæ**), **Arctiidæ**—Tiger-Moths, etc. **Agaristidæ**.
,, vi. **Geometridæ**—Loopers. **Noctuidæ**—Noctuid-Moths. **Uraniidæ**.

Coleoptera—Beetles.

33. LAMELLICORNIA.

Map i. **Passalidæ**. **Lucanidæ**—Stag-Beetles, etc. **Lamprima**. **Lucanus**—Typical Stag-Beetles. **Odontolabis**.
,, ii. **Scarabæidæ**—Dung-Beetles, Chafers, etc. **Scarabæus**. **Phanæus**.
,, iii. **Trox**. **Serica**. **Melolontha**—Cockchafers. **Gymnetis**.

ADEPHAGA.

Map iv. **Carabidæ** — Carnivorous Ground-Beetles. **Carabus** — Typical Ground-Beetles. **Graphipterus**. **Anthia**.

ADEPHAGA AND POLYMORPHA.

Map v. **Cicindelidæ** — Tiger-Beetles. **Dytiscidæ** — Carnivorous Water-Beetles. **Staphylinidæ**—Rove-Beetles.

POLYMORPHA.

Map vi. **Silphidæ**—Burying-Beetles, etc. **Coccinellidæ**—Lady-Birds. **Elateridæ**—Click-Beetles.

34. Map i. **Buprestidæ**. **Julodis**. **Chrysochroa**.
,, ii. **Psiloptera**. **Buprestis**. **Stigmodera**.

HETEROMERA.

Map iii. **Tenebrionidæ**—Meal-Worm Group. **Blaps**—Churchyard- or Cellar-Beetles. **Helops**.
,, iv. **Zophosis**. **Asida**. **Hopatrum**.

PHYTOPHAGA.

Map v. **Prionidæ** — Longicorns. **Cerambycidæ** — Longicorns. **Lamiidæ** — Longicorns.

PHYTOPHAGA AND RHYNCHOPHORA.

Map vi. **Chrysomelidæ**—Phytophagous Beetles. **Curculionidæ**—Weevils.

Hymenoptera.

35. Map i. **Apidæ**—Bees. **Vespidæ**—Social Wasps. **Formicidæ**—Ants.

Diptera.

,, ii. **Culicidæ** — Gnats or Mosquitoes. **Anopheles** — Malarial Mosquitoes. **Stegomyia**—Yellow Fever Mosquito, etc.
,, iii. **Tabanidæ**—Horse-Flies, Clegs, etc. **Syrphidæ**—Hoverer-Flies. **Glossina**—Tsetse-Flies.

Hemiptera.

,, iv. **Coccidæ**—Scale-Insects.

Neuroptera.

,, iv. **Myrmeleontidæ**—Ant-Lions. **Termitidæ**—Termites or White-Ants.
,, v. **Odonata**—Dragon-Flies.

Trichoptera.

,, v. **Trichoptera**—Caddis-Flies.

Orthoptera.

,, v. **Locustidæ**—Green Grasshoppers, etc.
,, vi. **Acrididæ** — Locusts. **Phasmidæ** — Stick and Leaf-Insects. **Mantidæ**—Praying-Insects.

Vertical and Latitudinal Distribution of Animal Life.

36. Sections across Australasia and Asia.
,, ,, Africa and Southern Europe.
,, ,, South and North America.
Section across Carpathians and Norway.
,, ,, Alps.
,, ,, Caucasus.
Three Sections showing vertical distribution of Marine Life.

ADDENDA ET CORRIGENDA

PLATE 2.	Map entitled "Lydekker—1896."	For **SONOGRAN** *read* **SONORAN.**
,, 10.	Map ii.—	**Sturnidæ.** Extend distribution to include Formosa, Japan, Andaman and Nicobar Islands. Delete Polynesian Islands.
,, ,,	Map ii.—	**Eulabetidæ.** Include Samoa, Fiji, Tonga, New Caledonia, Society Is., Caroline Is., S. Arabia, and New Zealand.
,, ,,	Map v.—	**Meliphagidæ.** Include Auckland and Chatham Is.
,, 12.	Map ii.—	For **Xeniscidæ** *read* **Xenicidæ.**
,, ,,	,, iv.—	For **Papridæ** *read* **Pipridæ.**
,, ,,	,, viii.—	**Pteroptochidæ.** Include Costa Rica.
,, 14.	,, v.—	Delete the words: **Pigmy Parrots.**
,, 15.	,, iv.—	For **Phætontidæ** *read* **Phaëthontidæ.**
,, 16.	,, iii.—	**Phœnicopteridæ.** Extend distribution to include Lake Baikal.
,, ,,	,, vi.—	For **Rhinochætidæ** *read* **Rhinochetidæ.**
,, 19.	,, i.—	After **Rattle-Snakes** *add* **Etc.**
,, ,,	,, ii.—	After **Coral-Snakes** *add* **Etc.**
,, ,,	,, iii. –	**Colubridæ.** Delete Scotland.
,, ,,	,, iv.—	For **Pouched Tree-Frogs** *read* **Spade-footed Toad,** &c.
,, 25.	,, vi.—	**Amiidæ.** Delete the "&c."
,, 31.	,, v.—	**Libytheidæ.** Extend distribution to Lake Ontario and New England.
,, 35.	,, vi.—	For **LEAP-INSECTS** *read* **PRAYING-INSECTS.**

NOTE.—In a few cases additional information has come to hand since the maps were prepared. Where possible, this has been referred to in the text.

PART I.

GENERAL PRINCIPLES OF DISTRIBUTION.

GENERAL PRINCIPLES OF DISTRIBUTION.

EVERY portion of our globe is the home of numerous forms of animal life. Each particular tract of land or water possesses a fauna of its own, and even the most arid desert, the densest forest, the highest and bleakest mountain summit, the shallowest lake, the swiftest stream or the deepest ocean abyss, has its own share of struggling inhabitants, all living in greater or less harmony with their surroundings. In past ages the fauna was almost equally prolific and diverse, as is shown by the innumerable remains which crowd the sedimentary rocks of all the great geological epochs.

But the distribution of animal forms upon the earth is by no means uniform or regular, and a casual reference to our Plates will at once reveal the fact. The Anthropoid Apes (Plate 1, Map i), for example, occur in isolated areas in West Africa and South-eastern Asia; the Cavies (Plate 6, Map iii) are exclusively South American; the Tenrecs (Plate 4, Map ii) are confined to Madagascar; the whole Order of Marsupials (with the exception of the Opossums) is practically restricted to Australia and New Guinea; while the Plantain-Eaters (Plate 13, Map iii) are exclusively African. On the other hand, the Dogs (Plate 5, Map v) and Mice (Plate 6, Map vi) among Mammals, the Thrushes (Plate 2, Map iv), Swallows (Plate 12, Map ii), and Plovers, (Plate 17, Map i) among Birds, and many families of Insects, are examples of almost universal distribution.

Again, when we study the subject from a geographical point of view, we find a corresponding lack of uniformity. All countries have a certain proportion of species peculiar to themselves, in addition to those which they harbour in common with other regions. In the early days of zoological science, the character of the fauna of any particular area was supposed to be entirely due to its climatic and physical peculiarities. This explanation, however, does not account for the numerous and interesting differences which present themselves when two countries of similar climate and physical conditions are compared. Brazil and West Africa, for instance, are both largely covered with dense tropical forest, while their climatic conditions are very similar. Yet the animal life of one is of a totally different character from that of the other. In West Africa we find Elephants, Antelopes, and Gorillas, while in Brazil these are all absent and replaced by Tapirs, Sloths, and Monkeys with long, prehensile tails. On the other hand, countries with a vastly different climate may possess the same actual species of animal. The Tiger, for example, ranges from the tropical jungles of India to the Caucasus, Altai Mountains and the frigid plains of Manchuria. Lastly, the features of distribution are not necessarily dependent upon a matter of distance. There is a much greater similarity between the faunas of Great Britain and Japan, countries situated at the extremes of the great Eurasian continent and many thousand of miles apart, than there is between those of the small islands of Bali and Lombock in the Malay Archipelago, which are separated by a strait only about 15 miles wide!

The study of the distribution of animals over the earth's surface is, therefore, not so simple as it may seem. For the full comprehension of the subject the accumulation of a large mass of facts and the formation of theories to account for the various phenomena which call for explanation become necessary. The zoologist must trace out in detail the exact area or areas inhabited by the several species, genera, and larger groups of animals, and this process to be reliable must be based upon a true and natural classification of the animals themselves. The latter can only be attained by a due consideration of the theory of evolution (or descent with modification) as generally understood at the present day. With this must be intimately associated a knowledge of extinct forms and their distribution in time and space, and this again depends upon an acquaintance with the extent and relative position of the various fossil-bearing strata which build up the huge series of sedimentary rocks.

In a work like the present it is obviously impossible to place before the reader anything like a complete account of this important subject. But an attempt may at least be made to indicate briefly the main features in the problem, such as, for example, the factors which make for or against the dispersal of animals, the actual methods of dispersal, the influence of temperature, vegetation, and so on. For a complete account of these and other phenomena, and for all subjects connected with the great branch of science known to the modern naturalist as "Zoögeography," reference must be made to one or more of the general works whose titles will be found in Section IV. (Bibliographical).

NECESSITY FOR DISPERSAL.

Owing to the rapid rate of multiplication of many animals, the struggle to procure sufficient food for all individuals in any particular area must always be a keen one. This competition affects not only individuals of the same species, but also allied species of the same genus, or even animals of different genera and families. Hence it may be assumed that an extension of geographical range is an advantage, if not an absolute necessity, in the case of the majority of animal forms.

CONDITIONS FAVOURING DISPERSAL.

Many factors are always at work either aiding or hindering dispersal, and it is necessary at the outset to enumerate the more important. Obviously those animals which possess a more rapid or perfect means of locomotion succeed best in establishing themselves over a wide area. The typical Bats of the family *Vespertilionidæ* (Plate 3, Map vi) have great powers of flight, and hence are well-nigh cosmopolitan. Two species at least which are natives of North America regularly visit the Bermudas, a distance of 600 miles from the mainland. Many birds again annually perform marvellous journeys in proceeding to and from their seasonal haunts—sometimes several thousands of miles. Insects, too, have a world-wide distribution, and some particular species, such as the Painted Lady Butterfly (*Pyrameis cardui*), have an enormous geographical range.

Many Mammals are accustomed to roam over wide areas, and some are even known to climb mountains, cross rivers, or swim over considerable tracts of sea. In the Himalayas, for instance, certain Monkeys ascend to a great height in the hot season, returning to lower levels in the winter, while Wolves in other regions and Lemmings in Scandinavia indulge in similar habits. Tigers and Pigs are examples of Mammals which can cross broad rivers and even narrow arms of the sea, the limit to such powers being apparently a width of about 20 miles. But the dispersal of Mammals, Reptiles, and many other purely terrestrial forms of life is materially aided in other ways. The masses of tangled vegetation, uprooted trees and driftwood which are often washed down the larger rivers are frequently tenanted by quite a miscellaneous assortment of living creatures such as Monkeys, Cats, Crocodiles, Snakes, and Molluscs. By means of strong winds and tidal currents, such animals may be transported to regions some hundreds of miles from their old home, and in this manner the range of many species has without doubt been considerably extended in the past. In Arctic Regions masses of floating ice may act in the same way, and indeed it is recorded that during a single winter no fewer than twelve Polar Bears were thus stranded upon the coast of Iceland.

Although, as we have seen, the wide distribution of Birds is chiefly due to their great powers of flight, yet to this factor we must add also that of the migratory instinct. But "for the purposes of the study of geographical distribution," as Wallace says, "we must, except in special cases, consider the true range of a species to comprise all the area which it occupies regularly for any part of the year, while all those districts which it only visits at more or less distant intervals, apparently driven by storms or by hunger, and where it never regularly or permanently settles, should not be included as forming part of its area of distribution." As an example of the tremendous area included within the migratory flights of a species, we may take the Curlew Sandpiper. This species breeds on the tundras of West Siberia, bordering the Arctic Ocean, and yet in winter travels to the Cape of Good Hope, Tasmania, and Patagonia. Such cosmopolitan distribution as is shown on Plate 17, Map i, where the *Tringinæ* (to which the Curlew Sandpiper belongs) are indicated by a blue line, may thus be accounted for. One of the main causes for the development of the migratory habit is the question of food-supply. Since many birds live on insects and their larvæ, it is absolutely necessary for them to leave their temperate haunts as winter approaches, and seek warmer climes. The intense love implanted in birds for their native land, and the fact that the tropical and sub-tropical regions do not afford a suitable nursery for the young of the hardy northern races, sufficiently account for the return of the migrants to summer haunts in the spring.

Considering now the lower Vertebrates, we find that they undoubtedly possess some means of crossing the sea. Whether they actually swim across, or are only transported in the egg-state or involuntarily on driftwood, as in the case of Mammals, is a disputed point. But that Reptiles do become accidentally transported to new homes is proved by the case, often quoted, of a Boa-constrictor which was found to have reached the island of St Vincent, fully a couple of hundred miles from its native country, by means of a floating cedar-tree. Amphibians may owe their dispersal, not only to this means, but also to the agency of birds, chiefly Waders and aquatic species, which carry the eggs attached to their feet from one pond or river to another.

Birds act in the same way as carriers of certain molluscs. A Mallard was once shot in the Sahara to whose feet adhered the eggs of some species of Snail, which, falling to the ground perhaps miles away, might hatch and thus extend its range. Rivers and torrents may carry Molluscan shells down to the sea, and since some forms are able to secrete a diaphragm which closes up the shell, these may float away some hundreds of miles and yet survive.

Insects owe their wide distribution, like birds, to their great powers of flight, but high winds also contribute not a little in this respect. The examples of insects having been met with far out of sight of land are very numerous, and one only must suffice to illustrate this method of dispersal. The ship *Pleione*, returning home some years ago from New Zealand, upon reaching a point some 960 miles south-west of the Cape Verde Islands, encountered some hundreds of Moths belonging to a species which is common in the Eastern Tropics, but not found in South America, which was the

nearest land. From the direction of the wind during the four days previous to the occurrence, it appeared to be beyond doubt that the insects had come from the islands named, and must therefore have crossed nearly a thousand miles of ocean! Large numbers of insects lay their eggs in timber, and hence the agency of floating logs in aiding dispersal must be taken into account, especially as such creatures in the egg-state may retain their vitality for a considerable time.

Marine animals live under more uniform conditions than those on the land, but their means of dispersal may be briefly touched upon. Mammals, such as Seals and Walruses, sometimes undertake long sea journeys, while the wanderings of the huge Cetaceans seem only to be limited by considerations of temperature. The same remark applies largely to fishes, but with them the depth of water may also have its influence on their dispersal. Fresh-water fishes may travel from one large river-system to another when the sources of the streams are near enough to each other, and through changes in land-level the direction of streams may be altered, and lead to considerable corresponding changes in the fauna. Lastly, the eggs of fishes may be, and no doubt often are, carried from one district to another by aquatic birds.

CONDITIONS LIMITING DISPERSAL.

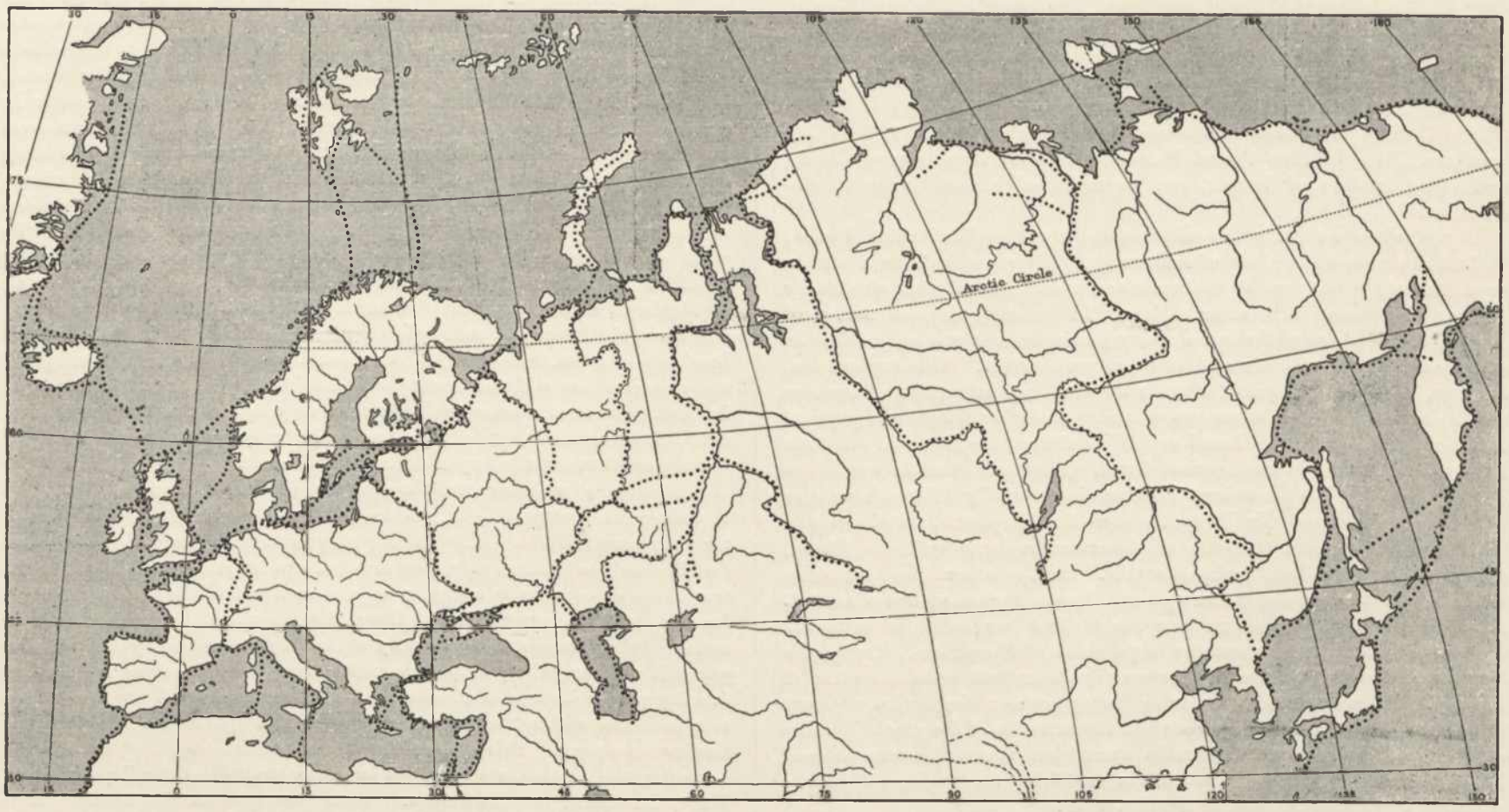
Against the various phenomena favouring dispersal which have been noticed above, must be reckoned certain factors which act in the way of limiting distribution. In many cases the range of a species is coincident with the area possessing the precise features suitable for its welfare. Thus, for example, strictly arboreal Mammals, such as Apes, Lemurs and Sloths, can only exist within the limits of the great forests to which they are adapted. Again, mountain-loving species do not thrive in the lowlands, and the result of this is that the colonies of such animals are sometimes widely separated and even altogether isolated. The Chamois, for example, is found in the Alps, the Pyrenees, and the Caucasus, but is entirely absent from the intervening districts, while the Mammals inhabiting the elevated regions of Tibet are singularly distinct and peculiar.

Another important factor which has an influence on geographical distribution is that of *temperature*. The opinions of authorities vary greatly as to the amount of limitation due to the effects of temperature alone. Examples can readily be found which prove that temperature very considerably affects distribution, while on the other hand others are as easily met with which apparently support the opinion that this factor is not of very great importance. The fauna of the Arctic Regions is of such a character that some zoögeographers would constitute a separate circumpolar region which is inhabited by animals markedly distinct from those of more southerly areas. Again, the South American Mammals, known as Vicunas and Guanacos, have a distribution which decidedly proves that they are influenced by temperature. In Peru and Ecuador they inhabit the high regions of the Cordillera, while in the more temperate country of the Argentine Republic and Patagonia they roam over the low-lying plains. These animals, therefore, being addicted to a cool climate, cannot exist elsewhere except at a considerable elevation. The Dotterel, too, in Great Britain nests on our highest mountains, and on the fringe of the Arctic Ocean at sea-level. On the other hand, an animal may be spread over an area presenting a considerable range in temperature. The Tiger, as we have already seen, is found not only in the hottest jungle districts of India, but also at considerable heights in the Caucasus and the Altai Mountains, and even in the cold Manchurian plains. Examples like the latter may of course be interpreted to prove the great adaptability of certain isolated species to a varying degree of heat and cold, and on the whole it may be said that temperature does indeed play a not unimportant part in determining or limiting the range of animals. It may be added, that the closest dependence in this respect upon temperature is to be found among marine organisms. Indeed, this is often the only condition acting as a limit. The temperature of the water undoubtedly checks the distribution of sea-fishes, and in the case of shallow-water species a great depth acts as a perfect barrier.

It has been mentioned above, that in the case of non-flying terrestrial animals, such as Mammals, it may be taken that an arm of sea exceeding 20 miles in width acts most effectively as a barrier to dispersal. The few cases in which animals swim across even this distance can only be regarded as *possible* methods of dispersal and not by any means the rule. When, therefore, we find a great similarity in the faunas of two regions separated by a wide tract of water, we must conclude that there has been in past ages a land connection between them. As will be seen later on, truly oceanic islands, *i.e.*, islands not having been connected with a continental area within comparatively recent geological times, are practically without any Mammals, Reptiles or Amphibians, while on the other hand they possess both Birds and Insects. A wide river may also act in the same way as an arm of the sea, though to a less extent. Thus, in the plains of the Amazon, the river separates entirely distinct sets of species of Monkeys, Birds and even Insects. In the case of species inhabiting high altitudes, *valleys* may act in precisely the same way.

SKETCH-MAP OF THE TRUNK LINES FOLLOWED BY BIRDS IN THEIR MIGRATIONS.

After Prof. J. A. Palmen.



That high *mountain ranges* act effectively as barriers to dispersal is shown by the fact that the species inhabiting one slope of such a range are often entirely distinct from those on the other; moreover, the fishes living in the rivers rising on different sides of the same range are likewise of different species. The influence of mountains is further borne out by the curious difference we find between the Old and New Worlds in this respect. In North and South America the chief ranges run from North to South, and consequently the animals are only limited in their range by conditions of temperature. In Europe and Asia, on the other hand, the principal ranges extend in a direction more or less parallel to the Equator, and hence we find in these continents a larger proportion of species with restricted distribution.

Lastly, *deserts* play a not unimportant part in limiting the range of certain animals, especially those possessing weak powers of locomotion. Thus, animals like the Amphibia, which require moisture for the younger stages of development and which cannot wander much, find even a small tract of arid ground an insurmountable obstacle. The Sahara has for a very long period separated Northern Africa from the rest of the continent, and so distinct are these areas in regard to their faunas that they are by general agreement allocated to different zoological regions.

Many other influences not yet mentioned may control the distribution of animals in various ways. Some groups are dependent for their welfare, or even their very existence, upon the presence or absence of other groups, and this is notably the case with carnivorous animals and their victims. Again, parasitic animals and their hosts have necessarily the same distribution, either wholly or in part, while insectivorous birds can of course only exist where there is an abundance of the particular group or groups upon which they feed. Vegetation is also an important factor in determining the limits of certain species. A butterfly, for example, would soon become extinct were the food-plant of its Caterpillar to fail, and the same applies to frugivorous birds and other groups indulging in a vegetarian diet. Thus the whole fauna and flora of a district is bound together by a complicated network of particular conditions, and the slightest altera-

tion in any detail may upset the balance of the whole and lead to far-reaching and unforeseen results. Interference by man himself has entirely changed the faunal aspect of certain countries. Examples may be found in the disappearance of animals like the American Bison, Quagga, Dodo, Great Auk and many others, which have succumbed to the sporting or destructive propensities of the human species or the so-called march of civilisation, while the opposite result has been reached in the case of certain species introduced purposely or by accident into regions far removed from their native home. Such a case is that of the Rabbit in Australia, which, introduced a comparatively short time ago, has increased and spread with amazing rapidity.

OTHER CONDITIONS AFFECTING DISTRIBUTION.

There is strong evidence in support of the theory that all the great continental areas and all the chief ocean basins have been for a vast period in the same general position. At the same time the presence of sedimentary rocks over all the great land masses proves that practically every portion has been at one time or another under water. This general permanence of situation, coupled with a constant change of form, must have exercised a paramount influence on the distribution of animal life. Attention has been drawn by more than one authority to the fact that at the present day all the greatest masses of land appear to radiate from the Arctic Regions. Behring Strait is the only break, and this is not only shallow, but interrupted by islands. Hence it is possible for a traveller to start at Cape Horn and finish at the Cape of Good Hope without ever being out of sight of land.

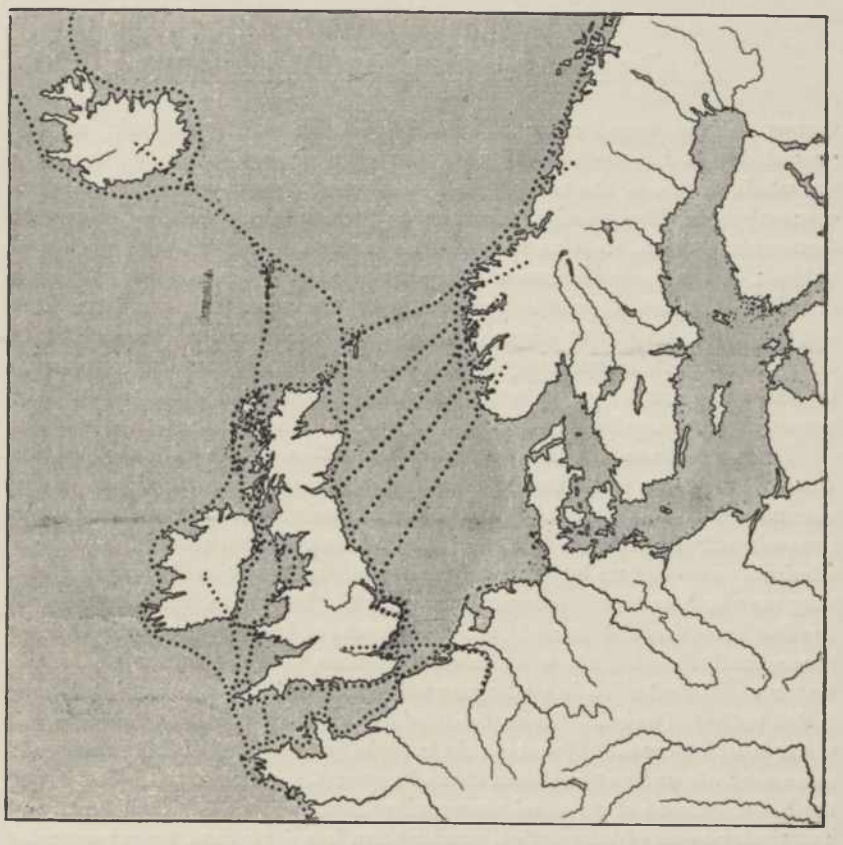
Let us now consider the effect of past changes. As one portion of a continent gradually became submerged its inhabitants would be forced to migrate to a fresh area, there to experience a new set of conditions, including competition with other groups of animals, which they might succeed in exterminating or to which, on the other hand, they themselves might succumb. Again, the isolation of a portion of land by the submergence of the surrounding areas might lead to the development of special forms of life, and these might, by the subsequent raising of a submerged area, be enabled to reach another portion and mingle with its fauna. Thus the ever-changing relationships and proportions of land and water must have resulted in a great complexity of conditions, sufficient, indeed, to account for many of the peculiarities of distribution known to us.

The slow and gradual changes of climate which certain regions have from time to time undergone must also be reckoned as a most important factor in regulating the distribution, evolution and extinction of the various forms of life. There is abundant geological evidence that the Arctic and Antarctic Regions were favoured during the Secondary and Tertiary Periods with a much warmer climate than they possess at present, while, on the other hand, the remarkable cold spell in the northern temperate regions, which is generally spoken of as the "glacial epoch," must also be held responsible for most important changes in the character of the fauna of these regions. For example, in Pliocene times Tigers, Camels, Elephants, Rhinoceroses and Hyænas inhabited the British Islands, as well as other parts of Europe. But as the glacial epoch gradually crept on, most of the temperate-loving forms of life would be compelled to retreat further and further south, while some would become either extinct altogether or modified to suit the changed conditions. The presence of certain Arctic forms, such as the Musk Ox, in Britain, and their eventual disappearance, may thus be accounted for.

The evolution of new species and genera, and the extinction of old forms, implied by the foregoing considerations, may be effected in something like the following manner. The natural tendency of any species which is successful in the ever-waging struggle for supremacy is to gradually spread over a wider and wider area. The increase in the number of individuals which is implied in such a case indeed necessitates an extension of the space occupied, otherwise the supply of food would be insufficient. As a species extends its range and comes to occupy ground more and more remote from its original home, the outlying members may be confronted with a new set of conditions, climatic, physical, or otherwise. Such a contingency will, by a process of natural selection, lead to a modification of the original species, and this process being repeated as the successful animals spread more and more, a

SKETCH-MAP OF THE TRUNK LINES FOLLOWED BY BRITISH BIRDS IN THEIR MIGRATIONS.

After W. Eagle Clarke.



group of closely allied species will in time be evolved, which may be regarded as a distinct genus. Hence, in considering the geographical distribution of existing genera, which are nothing but groups of allied forms, due regard must be given to their origin and development by natural selection.

On the contrary, if several species, possessing similar habits, occupy the same area, the competition becomes much more intense, and the weaker or less fitted may in course of time be exterminated. In such a case, an extension of range or the removal by some means, casual or otherwise, of a portion of the individuals to a remote or isolated district, may save the species from extinction. It may continue to exist in its new home without the slightest modification, while in the more crowded original area new varieties are being evolved.

The principles involved in the two preceding cases have probably been in force for an immense period of time, and hence the present anomalies of distribution may be partly explained by an examination of the remains of extinct forms. Fossil species may be discovered in regions which lie between areas which are now isolated and inhabited by their descendants. The work of the palæontologist must, therefore, be of immense aid to the student of zoögeography, and, as Wallace justly remarks, "even with our present scanty information, we are able to throw much light upon the past history of our globe and its inhabitants, and can sketch out with confidence many of the changes they must have undergone."

PART II.
HISTORICAL AND GEOGRAPHICAL.

ZOÖGEOGRAPHICAL REGIONS.

Owing to the peculiarities of distribution shown by animals at the present day, it has been found practicable, and indeed advisable, to divide the whole surface of the earth into a number of regions, quite independent of mere geographical considerations, each of which is characterised by certain features of its own, such as the presence or absence of particular groups of animals, or the predominance or otherwise of certain others. But all classes of animals are not distributed according to the same plan, and hence it is not possible to adopt any single scheme which shall be equally applicable to all. Every specialist naturally follows the divisions and boundaries indicated by his own particular group, and hence a large number of schemes have been proposed, each one of which is specially adapted to a certain class of animals.

The general student is therefore brought face to face with the question as to what scheme is the best to adopt for ordinary purposes. By a general consensus of opinion, the highest class of animals, the Mammals, are judged pre-eminently suitable for this end. The reasons for this selection have been admirably summed up by Wallace, our leading authority on the subject; and they may be here briefly recapitulated. In the first place, the abundance of the fossil remains of Mammals, and the amount of knowledge of them that we consequently possess, show us more fully than does any other group the features of distribution in past ages; while the careful study of such remains, added to that of existing forms, has rendered their classification, which is one of the most important adjuncts to the study of geographical distribution, much more accurate and natural than that of any of the other classes. Moreover, the limited means of dispersal possessed by Mammals, their high organisation and their powers of adaptation, render them less dependent upon particular kinds of food or upon particular conditions of existence, and place such animals before all others in their suitability for the purpose we have indicated.

Before treating of the zoological regions in detail, it may be well to place before the reader a concise history of the subject, and this, coupled with a reference to the bibliography given in Part IV., will enable him to pursue the study more closely and logically hereafter, should he elect to do so.

The first attempt to map out a number of zoögeographical regions, based upon the actual distribution of species, and apart altogether from purely geographical considerations, was made by Dr P. L. Sclater. This eminent zoologist, who is fortunately still living, read a paper before the Linnean Society of London, in June 1857, entitled "On the General Geographical Distribution of the Members of the Class Aves." Taking as his basis the Passerine, or "Perching" Birds, he proposed the division of the earth into six great regions, which he defined geographically, and whose area in square miles he roughly estimated. At the same time, he furnished a tabulated statement of the number of species found in each region, and an indication of the peculiar and characteristic genera. As this paper was an epoch-making one, and as its divisions correspond very closely with the main regions adopted in most of the schemes since proposed, it is perhaps desirable to quote the main features before proceeding further.

The regions proposed by Dr Sclater were as follows:—

I. **Palæarctic.**—Extent: Africa north of the Atlas, Europe, Asia Minor, Persia and Asia generally north of the Himalaya range, upper part of the Himalaya range (?), Northern China, Japan and the Aleutian Islands.
Approximate area: 14,000,000 square miles.
Number of species: 650.

II. **Æthiopian or Western Palæotropical.**—Extent: Africa south of the Atlas range, Madagascar, Bourbon, Mauritius, Socotra, and probably Arabia up to the Persian Gulf, south of 30° N. lat.
Approximate area: 12,000,000 square miles.
Number of species: 1250.

III. **Indian or Middle Palæotropical.**—Extent: India and Asia generally south of Himalayas, Ceylon, Burmah, Malacca and Southern China, Philippines, Borneo, Java, Sumatra and adjacent islands.
Approximate area: 4,000,000 square miles.
Number of species: 1500.

IV. **Australian or Eastern Palæotropical.**—Extent: Papua and adjacent islands, Australia, Tasmania and Pacific Islands.
Approximate area: 3,000,000 square miles.
Number of species: 1000.

V. **Nearctic or North-American.**—Extent: Greenland and North America down to centre of Mexico.
Approximate area: 6,500,000 square miles.
Number of species: 660.

VI. **Neotropical or South-American.**—Extent: West India Islands, Southern Mexico, Central America and whole of South America, Galapagos Islands, Falkland Islands.
Approximate area: 5,500,000 square miles.
Number of species: 2250.

The first four of these regions Dr Sclater grouped together to form the great division **Palæogæa**, while the remaining two formed the division **Neogæa.**

The publication of this important paper gave a great impetus to the study of the subject, and it was followed immediately by a paper on Reptiles by Dr Günther. Here it was shown that the division of the earth, as proposed by Dr Sclater, answered admirably for Reptiles. A few years later (1866), Andrew Murray gave to the world a large volume on *The Geographical Distribution of Mammals.* This author contended that only four primary regions could be established for Mammals, the Indian and Ethiopian being united, and likewise the Nearctic and Neotropical.

In 1868 Huxley contributed a paper on the classification and distribution of the Gallinaceous Birds (Alectoromorphæ and Heteromorphæ), in which he suggested the division of the earth into two primary divisions, a northern called Arctogæa and a southern called Notogæa. In the former he placed the Nearctic, Palæarctic, Ethiopian, and Indian regions of Sclater, adopting these as subdivisions, while the Notogæa were divided into three provinces: (1) Austro-Columbia (=Neotropical); (2) Australasia (equivalent to the Australian region of Sclater minus New Zealand); and (3) New Zealand. Besides forming a new province for New Zealand, Huxley advocated the separation of a circumpolar region. His scheme, however, has received little support, and the regions proposed are regarded as disproportionate and inconvenient.

During the next three years papers were published by W. T. Blanford, E. Blyth and J. A. Allen, and then in 1876 appeared Alfred Russel Wallace's classical work, *The Geographical Distribution of Animals*, an elaborate and exhaustive treatise in two volumes, which still remains the standard authority on the subject as a whole. In this important publication the various systems hitherto proposed are carefully discussed, and the original six regions of P. L. Sclater adopted as most suitable for general purposes (*see* **Plate 1**). The name "Oriental" is substituted for "Indian" in Region III., and each region is further divided into four sub-regions, which are shown on carefully prepared coloured maps. The work is arranged in four parts:—Part I. treats of the Principles and General Phenomena of Distribution; Part II. deals with the Distribution of Extinct Animals; Part III. is devoted to Zoological Geography, and gives an exhaustive review of the various regions and sub-regions; while Part IV. concludes the work with an account, in systematic order, of the distribution of all the families and most of the genera of the higher animals, together with certain Insects and Molluscs.

During the next four years (1877-1880) several important contributions to the subject appeared, including a volume by Wallace on *Island Life* and one by Dr Günther on *Fishes.* In the latter work various zoological regions and sub-regions were proposed for use in connection with the class of animals concerned. In 1887 Dr Angelo Heilprin published an important, though not a large volume on the general subject. Adopting a suggestion of Professor Alfred Newton's, Heilprin unites the Nearctic and Palæarctic regions into one huge "Holarctic" realm, separates off a "Polynesian" realm, and suggests the use of three "transition" tracts, viz.: (*a*) Tyrrhenian or Mediterranean, between the Palæarctic (Eastern Holarctic) and Ethiopian realms; (*b*) Sonoran or American, between the Nearctic (Western Holarctic) and Neotropical realms; and (*c*) Papuan or Austro-Malaysian, between the Oriental and Australian realms.

In 1890 Dr W. T. Blanford, in his Anniversary Address to the Geological Society of London, proposed the adoption of the following three regions: (1) Australian; (2) South American; and (3) Arctogean; dividing the last-named into Malagasy, Ethiopian, Oriental, Aquilonian (=Palæarctic and northern part of Nearctic), and Medio-Columbian (=Sonoran) sub-regions. Two years later the American zoologists, Dr J. A. Allen and Dr C. Hart Merriam, contributed important memoirs on the subject, with especial reference to the Mammals of North America, while the following year (1893) an anonymous writer in *Natural Science* proposed the use of the terms Notogæa, Neogæa and Arctogæa for Dr Blanford's three principal divisions. In the same volume appeared a paper by Dr R. Bowdler Sharpe, entitled "On the Zoo-Geographical Areas of the World, illustrating the Distribution of Birds." In this contribution the usual six regions are adopted, but they are divided into an unusual number of sub-regions. The author advocates the working out of statistics by specialists quite independently of each other, and the future correlation of results.

Professor Alfred Newton, in an important article on "Geographical Distribution" in the *Dictionary of Birds* (1893), urges the recognition of New Zealand as a primary region, and adopts Heilprin's "Holarctic" realm. He therefore uses the following six regions:—(1) New Zealand; (2) Australian; (3) Neotropical; (4) Holarctic; (5) Ethiopian; and (6) Indian.

In 1895 a useful little book by F. E. Beddard appeared under the title, *A Text-book of Zoögeography*, and the following year saw the publication of an important volume by R. Lydekker on *A Geographical History of Mammals.* In the latter work special prominence is given to the study of fossil forms, and the deductions which may be drawn from them. The information given in its pages presents the subject in a different light from

any of its predecessors. The regions adopted and shown in **Plate 2** of the present Atlas are as follows:—

I. Notogæic Realm.—1. Australian Region.
2. Polynesian Region.
3. Hawaiian Region.
4. Austro-Malayan Region.

II. Neogæic Realm.—Neotropical Region.

III. Arctogæic Realm.—1. Malagasy Region.
2. Ethiopian Region.
3. Oriental Region.
4. Holarctic Region.
5. Sonoran Region.

The last work it is necessary to mention specially in this place, is *The Geography of Mammals*, published by W. L. and P. L. Sclater in 1899. The regions adopted in this volume (*see* **Plate 2**), the first eight chapters of which had been previously published, are substantially the same as those first suggested by P. L. Sclater in 1857, and the sub-divisions correspond very closely with those of Wallace. In addition to the consideration of terrestrial forms, there is an important chapter on the distribution of Marine Mammals, which will be noticed later.

Wallace's great work, published in 1876, may be justly regarded as the standard text-book of Zoögeography, inasmuch as it treats the subject very exhaustively and, moreover, takes into consideration not only all the classes of Vertebrate animals, but, in addition, certain Invertebrates. In the account which follows, we shall therefore adopt this author's regions and their sub-divisions; but when any important departure from his scheme has been proposed by any author, owing to the more detailed study of certain groups, such modification will be briefly alluded to in its proper place.

The following enumeration of the various regions and sub-regions, as given in Wallace's two volumes (and as shown in Plate 1), may form a fitting conclusion to the foregoing brief history of the subject:—

I. Palæarctic Region.—1. European Sub-region.
2. Mediterranean Sub-region.
3. Siberian Sub-region.
4. Manchurian Sub-region.

II. Ethiopian Region.—1. East African Sub-region.
2. West African Sub-region.
3. South African Sub-region.
4. Malagasy Sub-region.

III. Oriental Region.—1. Indian Sub-region.
2. Ceylonese Sub-region.
3. Indo-Chinese Sub-region.
4. Indo-Malayan Sub-region.

IV. Australian Region.—1. Austro-Malayan Sub-region.
2. Australian Sub-region.
3. Polynesian Sub-region.
4. New Zealand Sub-region.

V. Neotropical Region.—1. Chilian Sub-region.
2. Brazilian Sub-region.
3. Mexican Sub-region.
4. Antillean Sub-region.

VI. Nearctic Region.—1. Californian Sub-region.
2. Rocky Mountain Sub-region.
3. Alleghany Sub-region.
4. Canadian Sub-region.

I. THE PALÆARCTIC REGION.

Extent.—This, the largest of the six regions, is estimated to cover an approximate area of 14,000,000 square miles. It includes the whole of Europe, Iceland, the Azores, Madeira, Canary Islands and Cape Verde Islands, all that portion of Africa and Arabia which lies to the north of the Tropic of Cancer, Asia Minor, Persia, Afghanistan and Baluchistan and the whole of Asia north of a line which runs up the valley of the Indus, along the great Himalayan range, thence eastwards to the Nan Ling Mountains, south of the Yang-tse-kiang and out to sea just south of the Japanese Islands.

Sub-regions.—The Palæarctic Region is divided into the following sub-regions:—(1) European; (2) Mediterranean; (3) Siberian; and (4) Manchurian.

The *European* Sub-region comprises Northern and Central Europe, its southern boundary running along the Pyrenees, Alps, Balkans, Black Sea and Caucasus. The *Mediterranean* Sub-region includes the rest of Europe, all the African and Arabian portions of the region, Asia Minor, Persia, Afghanistan and Baluchistan. The *Siberian* Sub-region embraces all Northern Asia, southwards to the Himalayas. Its eastern boundary runs up from the latter range along the western side of the Hoang-ho, thence to the north of the Amur River, and finally between the islands of Sakhalin and Yezo. The remaining part of Palæarctic China, Mongolia, Manchuria and Corea, together with the whole of Japan, form the fourth or *Manchurian* Sub-region.

Physical Features.—The Palæarctic Region, extending as it does from beyond the Arctic Circle to the Tropic of Cancer, and from the Atlantic eastwards to the Pacific, may be expected to show a wide range of temperature, great variations of rainfall, and great diversity in its surface features. Its western portion, consisting mainly of the Continent of Europe, is remarkable for the great length of coast-line in proportion to the area embraced. This feature is associated with the presence of great inland seas, and these have an equalising effect on the climate, which in high latitudes is more genial than anywhere else in the globe at a corresponding distance from the Equator. The Gulf Stream, moreover, materially helps to raise the temperature of Western Europe, while the southern portion of this continent is sheltered by mountain barriers which cut off the cold winds of the north. The eastern portion of this great region is, on the whole, much colder. Great extremes of cold are felt in the north, especially in North-eastern Siberia, while the great Tibetan plateau always has a low temperature. On the other hand, the highest summer temperature of the area is experienced in North-western India, Baluchistan and Arabia.

The northern portion of the Palæarctic Region is mostly low and flat, the only elevated land of any extent being the Scandinavian and the Ural Mountains. This band of low-lying country stretches across from the Bay of Biscay to Behring Strait, and the greater part of it is less than 600 feet above sea-level. Further south a series of mountain ranges runs across the region from west to east, including in Europe the Alps, Carpathians, Balkans, Pyrenees and Caucasus, and in Asia the Tian Shan, Altai, Kuen-lun and Himalayan ranges, while further east the main chains run in a more northerly and southerly direction. The great plateau of Tibet, consisting of elevated plains traversed by mountain ranges, has an elevation of 14,000 to 17,000 feet in the west and 9000 to 14,000 feet in the north east.

Steppes and deserts, with little or no rainfall, extend over the greater part of the African and Arabian portions of this region, and form also a prominent feature in South-eastern Europe and Central Asia. The fauna of these arid regions is very characteristic, and includes a number of interesting creatures, specially adapted to endure extremes of heat and drought.

The nature of the vegetation must be dismissed in a few words. In the extreme north runs a belt of "tundra," where the prevailing flora consists of lichens and mosses, with here and there a little grass or perhaps a stunted bush or two, trees being entirely absent. South of this barren area, extending from Scandinavia eastwards, is a broad belt of forest-land, consisting chiefly of coniferous trees. Then in Central and Western Europe and in the extreme east of the Manchurian Sub-region, the country is covered with a mixed flora, forest-trees and pasture-lands, with an abundance of flowering plants, prevailing. Lastly, the steppes and deserts, whose area is indicated above, have a peculiar flora of their own, consisting largely of plants adapted, like the animals, to withstand great dryness.

Zoological Characteristics.—The fauna of the Palæarctic Region as a whole is very similar to that of the Nearctic. So much, indeed, is this the case, that Heilprin proposed the union of the two into one great region, calling it the Holarctic Realm, and dividing it into two portions, an Old World or Eurasiatic Division, and a North-American or Nearctic Division. This has met with the approval of Newton, Huxley, Lydekker, and other authors. The Palæarctic Region possesses representatives of 135 families of terrestrial Vertebrates, namely, 33 of Mammals, 68 of Birds, 24 of Reptiles, and 10 of Amphibians. None of these, however, is peculiar to the region, but nine are common to and confined to the Palæarctic and Nearctic Regions, and, if to these are added five which are peculiar to the latter, we get a total of 14 families which are purely "Holarctic."

The nine families occurring in both divisions of the Holarctic Realm (to use for a moment Heilprin's name) are the *Talpidæ* (Moles), *Ochotonidæ* (Picas), and *Castoridæ* (Beavers) among Mammals; the *Regulidæ* (Gold-crests, &c.), *Colymbidæ* (Divers) and *Tetraonidæ* (Grouse) among Birds; and the *Proteidæ* (Proteus), *Salamandridæ* (Salamanders) and *Amphiumidæ* (Fish-like Salamanders) among Amphibians. The fresh-water fishes also support the union of these two regions, for five families are distinctively Holarctic, namely the *Percidæ* (Perches), *Gastrosteidæ* (Sticklebacks), *Esocidæ* (Pikes), *Acipenseridæ* (Sturgeons), and *Polyodontidæ* (Toothed Sturgeons). Among Mollusca we find one family, the *Aciculidæ*, confined to the Palæarctic Region, while among insects, the Butterflies of the genera *Thais*, *Parnassius*, *Pararge* and *Cœnonympha*, and the Beetles of the genera *Lucanus* and *Blaps* may be cited as characteristic.

Although there are no families of terrestrial Vertebrates peculiar to the Palæarctic Region, yet a large number of genera are confined to this area (amounting in the case of Mammals to about 24 per cent.). Among these may be mentioned *Talpa* (Mole), *Meles* (Badger), *Camelus* (Camel), *Capreolus* (Roe Deer), *Poëphagus* (Yak), *Rupicapra* (Chamois) and *Myoxus* (Dormouse), among Mammals; and *Accentor* (Accentors), *Erithacus* (Redbreasts, etc.), *Panurus* (Reedlings), *Garrulus* (Jays), *Nucifraga* (Nutcrackers), *Fringilla* (Finches) and *Perdix* (Partridges) among birds.

Among the animals more characteristic of this region, though not peculiar to it, are the family *Talpidæ*, and the genera *Ovis* (Sheep), *Capra* (Goats), *Rangifer* (Reindeer), *Alces* (Elk), *Bison* (Bison), *Castor* (Beaver), *Phasianus* (Pheasant) and *Chrysolophus* (Golden Pheasant).

European Sub-region.—In this sub-region only 85 families of terrestrial Vertebrates are represented, and of these the Reptiles and Amphibians number only six each. Only one genus of Mammals is peculiar, namely, *Myogale* (Desmans), but such animals as the Wolf, Hedgehog, Shrew, Mole and Dormouse are very characteristic, as are also the Wagtails, Pipits, Tits, Thrushes, and many other well-known birds. Among insects the Butterflies of the genera *Parnassius*, *Colias*, and *Argynnis*, and the Beetles of the families *Carabidæ* and *Staphylinidæ* are abundant and characteristic.

Mediterranean Sub-region.—This area is much the richest part of the Palæarctic Region, possessing representatives of 120 families of terrestrial Vertebrates. The Fallow Deer, Elephant Shrew, Civet, Ichneumon, Hyæna, Hyrax and Porcupine, are all characteristic Mammals, while

the presence in its eastern portion of the Lion, Leopard, and other large members of the *Felidæ*, show the transitional character of this Sub-region. Among Birds, the genera *Pastor*, *Upupa*, *Turnix*, *Gyps* and *Vultur* may be cited as characteristic, while among Reptiles and Amphibians are several peculiar and interesting forms. *Thais* and *Doritis*, two important genera of Butterflies, are peculiar to this Sub-region, which is also very rich in certain families of Beetles, such as *Carabidæ*, *Buprestidæ*, and *Tenebrionidæ*.

Siberian Sub-region.—This area, in spite of its extreme and unsettled climate, possesses representatives of 94 families of terrestrial Vertebrates, a number slightly in excess of that of the neighbouring European Sub-region. Four genera of Mammals are peculiar, of which *Poëphagus* (the Yak) is the most familiar, the others being a Mole and two Antelopes. *Moschus* (Musk Deer) is almost confined to this sub-region, but ranges also into the Oriental Region, while the genera *Mustela*, *Gulo* (Glutton), *Rangifer* (Reindeer), and *Myodes* (Lemming), are characteristic of the far north. One of the most interesting members of the Siberian fauna is the Seal (*Phoca sibirica*) which inhabits the great fresh-water lake Baikal. The avifauna of this sub-region is akin to that of Europe, and there are very few peculiar forms; while the insects in general have also a decidedly European facies. The genus *Parnassius*, among Butterflies, is very characteristic.

Manchurian Sub-region.—This sub-region has a rich and varied fauna, with representatives of 102 families of terrestrial Vertebrates. At least a dozen genera of Mammals are peculiar, including the interesting forms known as *Rhinopithecus* (Tibetan Langur), *Ailuropus* (Great Panda), *Nyctereutes* (family *Canidæ*), *Hydropotes* (Chinese Water-Deer), and *Elaphodus* (Tufted Deer). The avifauna is extremely rich, partly owing to the intermingling of Palæarctic and Oriental types in the south-western portion. But the most characteristic birds are the Pheasants, of which several remarkably fine genera attain their greatest development in this Sub-region. The Butterflies also partake largely of an Oriental character, several handsome species being peculiar, and many truly tropical genera (such as *Mycalesis* and *Terias*) occurring well within the limits of the area.

Number of Families of terrestrial Vertebrates in the Palæarctic Region and its Four Sub-regions.[1]

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Palæarctic Region in General	33	68	24	10	135
European Sub-region ...	20	53	6	6	85
Mediterranean ,, ...	30	62	20	8	120
Siberian ,, ...	22	55	11	6	94
Manchurian ,, ...	23	57	15	7	102
No	*peculiar*	*Families*			

II. THE ETHIOPIAN REGION.

Extent.—The Ethiopian Region is easily defined. It consists of the whole of Africa and Arabia south of the Tropic of Cancer, together with Madagascar and the small islands adjacent.

Sub-regions.—Four sub-regions are recognised, as follows:—(1) East African; (2) West African; (3) South African; and (4) Malagasy. Taken in reverse order, the *Malagasy* Sub-region includes Madagascar, Réunion, Mauritius, Rodriguez, the Seychelles, and the Comoro and neighbouring islands. The *South African* Sub-region comprises the southern portion of the continent, from the Cape northwards to Walfish Bay on the west and the Limpopo River on the east, together with a narrow strip of coast-land running up as far as Mozambique. The *West African* Sub-region consists of most of the great African forest region, from the River Gambia eastwards to beyond Lake Chad, and southwards to embrace the watershed of the Congo. All the rest of tropical Africa and tropical Arabia are included in the great *East African* Sub-region.

Physical Features.—Since nearly the whole of the Ethiopian Region lies between the Tropics, the conditions of life are much more uniform than is the case in the Palæarctic and other regions. The whole coast-line of Africa, too, is remarkably free from deep indentations, while there is an absence of extensive mountain ranges, such as are met with in other continents. The southern and eastern portions of the region are characterised by extensive plateaux, which run quite close up to the coast, and in the southern half have an average elevation of nearly 4000 feet. The most important mountain ranges in the Ethiopian Region run up the eastern half, and here also we find most of the great African lakes. In the north of the region is the great Sahara, the most extensive continuous desert in the world. This forms a most effective barrier between the regions (Palæarctic and Ethiopian) which it separates, and hence the faunas north and south of it are remarkably distinct. South of this we have a great region of luxuriant tropical forest, with an abundant and very distinct fauna, which serves as a basis for the separation of a "West African" Sub-region. South of this again are the Kalahari and Damara Land desert regions, while beyond the Southern Tropic is the "South African" Sub-region, with a fairly temperate climate and a wonderfully rich flora. The eastern portion of the continent is largely a region of savannas and grass-land, of a uniform character. Lastly, the island of Madagascar is sufficiently distinct, both geographically and zoologically, to require separate description. Cut off as it is from the mainland by a very deep channel, and characterised by a very peculiar fauna, this interesting island has been the subject of much investigation and speculation on the part of naturalists. Some authors maintain that it at one time formed part of a direct land-connection between South Africa and India, and that this area was submerged and the remains left as islands in early tertiary times. As seen in Plate 2, Lydekker regards Madagascar and the neighbouring islands as a distinct region, and there is indeed much justification for such a conclusion.

[1] For the purpose of comparison it may be stated that the total number of known families of terrestrial Vertebrates is as follows:—Mammals, 82; Birds, 148; Reptiles, 52; Amphibians, 24; making a total of 306.

Zoological Characteristics.—The fauna of the Ethiopian Region is rich, varied, and well-marked. No fewer than 161 families of terrestrial Vertebrates are represented, which number exceeds that of any other zoögeographical region. Of these, 30 are peculiar and may be here enumerated:—

Mammals (12.)

Chiromyidæ (Aye-Aye).
Chrysochloridæ (Golden Moles).
Centetidæ (Tenrecs).
Potamogalidæ (Potamogale).
Protelidæ (Earth Wolf).
Bathyergidæ (African Mole-Rats).
Lophiomyidæ (Crested Rats).
Pedetidæ (African Jumping Hares).
Anomaluridæ (African Flying Squirrels).
Giraffidæ (Giraffes and Okapi).
Hippopotamidæ (Hippopotamus).
Orycteropodidæ (Aard-Varks).

Birds (13.)

Promeropidæ (Promerops).
Aërocharidæ (Helmet-Bird).
Vangidæ.
Philepittidæ.
Musophagidæ (Plantain Eaters).
Leptosomatidæ (Kiroumbos).
Irrisoridæ (Wood-Hoopoes).
Coliidæ (Colies).
Serpentariidæ (Secretary-Birds).
Scopidæ (Hammer-Head).
Balænicipitidæ (Whale-Head).
Mesœnatidæ.
Numididæ (Guinea-Fowls).

Reptiles (4.)

Rhachiodontidæ (Egg-eating Snake).
Gerrhosauridæ.
Zonuridæ (Girdled Lizards).
Uroplatidæ.

Amphibians (1.)

Dactylethridæ (Clawed Toads).

The *Struthionidæ* (Ostriches), may also be regarded as practically peculiar, since elsewhere these birds only occur in Arabia and Syria (in the Palæarctic Region).

In addition to these families, a large number of important genera are confined to this region, among which may be mentioned *Anthropopithecus* (Chimpanzee), *Gorilla* (Gorilla), many Lemurs, the Monkeys of the genera *Colobus* and *Cercopithecus*, *Lycaon* (Cape Hunting Dog), *Potamochœrus* (River Hogs), and many others. The various species of Zebra and a large number of Antelopes are also peculiar and important. Of the families which range also beyond the limits of the Ethiopian Region, but which are quite characteristic of it, the following are the most important:—*Macroscelidæ* (Elephant-Shrews), *Hyænidæ* (Hyænas), *Elephantidæ* (Elephants), *Rhinocerotidæ* (Rhinoceroses), *Procaviidæ* (Hyraces), *Equidæ* (Horses, &c.), *Manidæ* (Pangolins); and among birds the *Ploceidæ* (Weaver-Birds), *Nectariniidæ* (Sun-Birds), *Zosteropidæ* (White-Eyes), *Indicatoridæ* (Honey-Guides), *Capitonidæ* (Barbets), *Bucerotidæ* (Hornbills), and *Struthionidæ* (Ostriches).

There are no peculiarly Ethiopian families of Butterflies, but one, namely, the *Acræidæ*, is highly characteristic, attaining in Africa its greatest development. The Nymphalid genera *Amauris* and *Euphædra* form good examples of typical Ethiopian genera, while *Charaxes* and many others are represented by a large number of handsome forms.

Lastly, the entire absence of certain important families which are, strangely enough, widely distributed in other regions of the Old World, must be alluded to. Such are, among others, the *Talpidæ* (Moles), *Ursidæ* (Bears), *Cervidæ* (Deer, Goats and Sheep), *Cinclidæ* (Dippers), and *Troglodytidæ* (Wrens). Since the climatic and other conditions are apparently favourable to the existence of such groups, their entire absence must be explained by the presence, throughout long periods, of barriers which have effectually prevented the migration of these animals into the great Ethiopian continent.

East African Sub-region.—Of the 145 families of terrestrial Vertebrates occurring in this area, only two are peculiar, namely, the *Lophiomyidæ* (Crested Rats) among Mammals, and the *Balænicipitidæ* (Whale-Head) among birds. Both these groups are small ones, containing only three and one species respectively. Certain large and familiar Mammals, though not absolutely confined to the sub-region, are nevertheless highly characteristic of it, and in this category may be placed the Giraffes, Zebras, and the African Rhinoceroses. Although covering an immense extent of country, this section of the Ethiopian Region has little of a special nature to characterise it, beyond the possession of the ordinary African types.

West African Sub-region.—This sub-region has no peculiar families of terrestrial Vertebrates, although representatives of 134 occur within its limits. The most characteristic Mammals are the Gorilla and the Chimpanzee; the Monkeys known as Mangabeys (*Cercocebus*); the Pottos (*Perodicticus*); the Insectivore known as *Potamogale*; the Water Chevrotain (*Hyomoschus*); the African Flying Squirrels (*Anomalurus*); and the interesting and recently-discovered Okapi (*Okapia johnstoni*). Among Birds, the most interesting species is *Pitta angolensis*, the sole Ethiopian member of the *Pittidæ*, a family which is essentially Oriental and Australian in distribution. Characteristic Butterflies are those of the genera *Euphædra* and *Elymnias*, but the latter is also Oriental.

South African Sub-region.—Representatives of 133 families of terrestrial Vertebrates occur in this area, one of which, the *Promeropidæ* (Birds allied to the Sun-Birds or *Nectariniidæ*), is peculiar. The *Chrysochloridæ* (Golden Moles), *Macroscelidæ* (Elephant Shrews), *Protelidæ* (Earth Wolf), *Bathyergidæ* (African Mole Rats), *Pedetidæ* (African Jumping Hares), and *Orycteropodidæ* (Aard-Varks), are all very characteristic groups of Mammals,

as are also the curious *Lycaon pictus* (Cape Hunting Dog), and *Otocyon megalotis* (Long-eared Dog). The *Indicatoridæ* (Honey-Guides) and *Coliidæ* (Colies) apparently have their metropolis in this sub-region, while the *Serpentariidæ* (Secretary Birds), *Struthionidæ* (Ostriches), and *Rhachiodontidæ* (Egg-eating Snake), are very characteristic groups, though they extend also to other parts of Africa.

Malagasy Sub-region.—The fauna of this sub-region is one of the most interesting in the whole world. Its zoological peculiarities and its claim to regional rank have been alluded to above. Of the 86 families of terrestrial Vertebrates found within this area, no fewer than eight are absolutely confined to it. These are the following:—

Mammals—
Chiromyidæ (Aye-Aye).
Centetidæ (Tenrecs).

Birds—
Aërocharidæ (Helmet-Bird).
Vangidæ.

Birds—*continued*—
Philepittidæ.
Leptosomatidæ (Kiroumbos).
Mesœnatidæ.

Reptiles—
Uroplatidæ.

The most characteristic family of Mammals is the *Lemuridæ*. Within this family the true Lemurs are grouped together to form a sub-family, known as *Lemurinæ*, and all the 35 known species are absolutely confined to Madagascar and the small neighbouring islands. This fact, indeed, is responsible for the use of the word "Lemuria," to designate the hypothetical continent or land-connection, which is supposed to have stretched across the present Indian Ocean (*vide supra*). Of Chiroptera, four families are represented, and of Insectivora three, of which one (*Centetidæ*) is peculiar, and another (*Potamogalidæ*) is found also in West Africa, but not elsewhere. The few (nine) Carnivora in this sub-region belong to the *Viverridæ*, and two of them are highly peculiar, viz., the Fossa (*Cryptoprocta ferox*) and Daubenton's Civet (*Fossa fossa*). A dozen Mice occur in Madagascar, all belonging to a special sub-family (*Nesomyinæ*), and these are the only representatives of the great order of Rodents found in the sub-region. Lastly, a species of River Hog (*Potamochœrus larvatus*) forms the only Ungulate, or hoofed animal, found in the island, and completes the very peculiar list of Mammals inhabiting this remarkable area.

Of Birds, some 55 families are represented, five of which are peculiar, as shown above. Fifteen families of Reptiles occur, of which one (*Uroplatidæ*) is confined to the sub-region, while the presence of two genera of *Iguanidæ* is of special interest, since this is an essentially New World group. Finally, the interesting *Chamæleontidæ* (Chamæleons) are very characteristic of Madagascar, for they are here more abundant than in any other part of the world.

Number of Families of terrestrial Vertebrates in the Ethiopian Region and its Four Sub-regions.

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Ethiopian Region in General	44 (12)[1]	84 (13)	26 (4)	7 (1)	161 (30)
East African Sub-region ...	39 (1)	76 (1)	24	6	145 (2)
West ,, ,, ...	33	73	22	6	134
South ,, ,, ...	35	73 (1)	21	4	133 (1)
Malagasy ,, ...	12 (2)	55 (5)	15 (1)	4	86 (8)

[1] The figures within parentheses indicate the number of *peculiar* families.

III. THE ORIENTAL REGION.

Extent.—This region includes those portions of continental Asia which are not comprised in the Palæarctic and Ethiopian Regions, together with the Malay Archipelago as far east as, and including, Bali, Borneo, the Philippine Islands, and Formosa.

Sub-regions.—The four sub-regions adopted by Wallace are:—(1) Indian; (2) Ceylonese; (3) Indo-Chinese; and (4) Indo-Malayan. The first of these consists of Central and Northern India, from the River Indus and the foot of the Himalayas southwards to Goa and the River Kistna, the line of demarcation taking a southward bend nearly as far as Mysore. The rest of the Indian Peninsula and the island of Ceylon form the *Ceylonese* Sub-region, while China, south of the Palæarctic boundary, Burma, Anam, and Siam, as far south as Tenasserim, together with the islands of Hainan and Formosa, constitute the *Indo-Chinese* Sub-region. The *Indo-Malayan* Sub-region includes the Malay Peninsula and all those islands of the Malay Archipelago which fall within the Oriental Region.

Physical Features.—In proportion to the extent of its land surface the Oriental Region presents a great variety of physical features. The Indian Sub-region is, in its northern portion, chiefly composed of plain and desert, more particularly in the watersheds of the great rivers Indus and Ganges. Its fauna, as a whole, shows a decided affinity to that of the Ethiopian Region, while the desert country in the north-west is debatable ground, and may be regarded as a transition tract between the Oriental and Palæarctic Regions. The southern portion of India is more luxuriant than the northern, and largely covered with tropical forest, with a series of elevated tracts culminating in the Western and Eastern Ghats. Ceylon, the Indo-Chinese Sub-region, and most of the Malayan islands are almost entirely covered with tropical forests of a most luxuriant character, and possess a varied and extremely rich fauna. Finally, in the extreme northern portion of the region, where the great mountain ranges occur, and especially between Bhutan and Yang-tse-kiang, we find more temperate conditions, with an interesting mingling of Palæarctic and Oriental types of animal life.

Zoological Characteristics.—In this region the terrestrial Vertebrates are represented by 153 families, of which 10 are peculiar. These comprise four of Mammals, one of Birds, and five of Reptiles, as shown in the following list:—

Mammals—
Hylobatidæ (Gibbons).
Tarsiidæ (Tarsiers).
Galeopithecidæ (Flying Lemurs).
Tupaiidæ (Tree-Shrews).

Birds—
Eurylæmidæ (Broad-Bills).

Reptiles—
Elachistodontidæ.
Uropeltidæ (Shield-Tails).
Lanthanotidæ.
Gavialidæ (Gavials).
Platysternidæ (Big-Headed Tortoise).

In addition to the above, several well-known species and genera are quite characteristic. Among Mammals the Orang-Utan (*Simia satyrus*), the Macaque Monkeys (*Macacus*), the Tiger (*Felis tigris*), the Indian Elephant (*Elephas maximus*), the Malayan Tapir (*Tapirus indicus*), and three out of the five known species of Rhinoceros are nearly or quite confined to the region, while the families *Tragulidæ* (Chevrotains) and *Manidæ* (Pangolins) are very characteristic. Although only one family of Birds is given above as peculiar, yet many others have their metropolis in the Oriental Region, such as the *Sturnidæ* (Starlings), *Dicruridæ* (Drongos), *Oriolidæ* (Orioles), *Dicæidæ* (Honey-Peckers), *Timeliidæ* (Babbling Thrushes), *Pycnonotidæ* (Bulbuls), *Pittidæ* (Pittas), and many others. Reptiles and Amphibians are very well represented in this region, for besides the five peculiar families above enumerated, the following are characteristic:—*Ilysiidæ* (Cylinder Snakes), *Xenopeltidæ*, *Acrochordidæ* (Wart Snakes), *Homalopsidæ* (Oriental Fresh-Water Snakes), *Crotalidæ* (Pit Vipers, &c.), *Agamidæ*, *Varanidæ* (Monitors), *Dibamidæ*, *Trionychidæ* (Soft Tortoises), and *Dyscophidæ.*

Among Butterflies the families *Elymniidæ* and *Morphidæ* are characteristic (though not peculiar), while *Ornithoptera*, *Delias*, *Euplœa*, *Kallima*, and *Euthalia* may be cited as examples of handsome and highly-characteristic genera. The same may be said of the Coleopterous genera *Odontolabis*, *Melolontha*, and *Chrysochroa.*

Indian Sub-region.—Of the 123 families of terrestrial Vertebrates inhabiting this area, only one is peculiar, namely, the *Elachistodontidæ*, which includes a single species of Colubrine Snake. Beyond this, there appears to be little to mark off this Sub-region as distinct. Indeed, by Sclater and other authors, the first two of Wallace's Sub-regions, which together include the whole of the peninsula of India and Ceylon, are regarded as one. Even if this plan be followed, only four genera of Mammals and a second family of Reptiles are found to be peculiar, as follows:—*Tetraceros* (Four-horned Antelope), *Antilope* (Black Buck), *Boselaphus* (Nylghaie), *Melursus* (Indian or Sloth Bear), and the *Uropeltidæ* (Shield-Tails).

Ceylonese Sub-region.—The main peculiarities of this area are the exclusive possession of the curious family of Snakes, known as Shield-Tails (*Uropeltidæ*), and the presence of the Loris, or Slender Lemur, which does not occur in Northern India, though recorded from Eastern Burma. The genus *Platacanthomys* (Spiny Rat) is also characteristic, only occurring elsewhere in Cochin China. The families of terrestrial Vertebrates inhabiting this doubtfully distinct area number 122, and are nearly identical with those of the previous sub-region.

Indo-Chinese Sub-region.—The fauna of this area is much richer and more varied than that of any other Oriental Sub-region. Out of the 153 families of terrestrial Vertebrates found in the Oriental Region, no fewer than 138 are represented, and one family of Tortoises, namely, the *Platysternidæ*, is peculiar. Among Mammals, three genera are almost or quite confined to this area, namely, *Budorcas* (Takin); *Hapalomys* (family *Muridæ*); and *Ailurus* (Panda), whose nearest relatives are the American Raccoons (*Procyonidæ*); while the peculiar genera of birds are far too numerous to mention. It is interesting to observe how many typically Palæarctic families extend their range into the present sub-region; among these may be mentioned the *Talpidæ* (Moles), *Troglodytidæ* (Wrens), *Iyngidæ* (Wrynecks), *Discoglossidæ* (Disc-tongued Frogs), and *Salamandridæ* (Salamanders). On the other hand a truly Malayan character is given to the fauna by the presence of the *Hylobatidæ* (Gibbons), *Galeopithecidæ* (Flying Lemurs), *Rhinoceros sondaicus* (the Javan Rhinoceros), *Tapirus indicus* (the Malayan Tapir), and among Birds the *Eurylæmidæ* (Broad-Bills).

Indo-Malayan Sub-region.—In this sub-region occur 132 families of terrestrial Vertebrates, of which one, the *Lanthanotidæ* (a family of lizards), is peculiar, and another, the *Tarsiidæ*, practically so, since it only slightly oversteps the boundary of the Australian Region (occurring in Celebes and the small islands immediately adjacent). In addition, several genera of Mammals are peculiar, giving this sub-region its strongly Oriental character. Among these may be mentioned *Simia* (the Orang-Utan), *Nasalis* (the Proboscis Monkey), *Hemigale* and *Cynogale* (family *Viverridæ*), *Mydaus* (Malayan Badger), and some small Rodents. The genus *Tupaia* (Tree-Shrews) is extremely well represented and characteristic, while the *Hylobatidæ* (Gibbons), the *Galeopithecidæ* (Flying Lemurs), two species of Rhinoceros, the Malayan Tapir and the *Eurylæmidæ* (Broad-Bills) are peculiarly Oriental forms which this sub-region shares with the Indo-Chinese. The typically Australian *Cacatuidæ* (Cockatoos) are represented by a single species in the Philippines, while the *Megapodidæ* (Megapodes), another essentially Australian group, occur in the Philippines, Borneo, and the Nicobar Islands.

Lastly, it is interesting to note that many families which have a wide range in the Old World, or in both Old and New Worlds, are sharply limited to the south-east by a theoretical line drawn between the adjacent islands of Bali and Lombok and continued northwards between Borneo and Celebes. This line, indeed, is identical with the boundary between the Oriental and the Australian Regions, as defined by Wallace. Since this author was the

first to draw attention to the remarkable distinctness of the faunas on either side of this imaginary line, the boundary in question is often spoken of as "Wallace's line." Among the widely-spread families whose distribution is thus sharply limited, may be mentioned the *Erinaceidæ* (Hedgehogs), *Mustelidæ* (Weasels, &c.), *Ursidæ* (Bears), *Canidæ* (Dogs, Foxes, &c.), *Leporidæ* (Hares and Rabbits), *Troglodytidæ* (Wrens), *Fringillidæ* (Finches), *Upupidæ* (Hoopoes), *Viperidæ* (Vipers), *Lacertidæ* (Typical Lizards), *Anguidæ* (Slow-Worms) and *Cœciliidæ*.

Number of Families of terrestrial Vertebrates in the Oriental Region and its Four Sub-regions.

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Oriental Region in General	37 (4)[1]	76 (1)	30 (5)	10	153 (10)
Indian Sub-region	27	69	23 (1)	4	123 (1)
Ceylonese ,, ...	27	67	23 (1)	5	122 (1)
Indo-Chinese ,, ...	33	70	25 (1)	10	138 (1)
Indo-Malayan ,, ...	32 (1)	69	25 (1)	6	132 (2)

[1] The figures within parentheses indicate the number of *peculiar* families.

IV. THE AUSTRALIAN REGION.

Extent.—This region includes the whole of Australia, New Zealand, New Guinea, the Moluccas and neighbouring islands, and practically the whole of the islands in the Pacific Ocean. Its boundary on the west is a line drawn between the islands of Bali and Lombok (Wallace's line), thence to the east of Celebes and the Philippine Islands, and just to the west of the Pelew and Ladrone Islands. The line then runs due eastwards along the Tropic of Cancer to include the Sandwich Islands, thence in a south-easterly direction as far as the Low Archipelago, and finally curves round to the south of New Zealand and the Auckland Islands, Tasmania and Australia.

The island of Celebes has always proved a difficulty, chiefly on account of the number of peculiar forms which it possesses. It bears a close relationship to both the Oriental and the Australian Regions, and although originally placed by Wallace in the latter, it is often considered at the present day as a separate sub-region of the Oriental.

Sub-regions. — The four Sub-regions are as follows:—(1) Austro-Malayan; (2) Australian; (3) Polynesian; and (4) New Zealand. The *Austro-Malayan* Sub-region comprises all the islands of the Malay Archipelago not included in the Oriental Region, together with New Guinea, the Moluccas, and the Solomon Islands. The *Australian* Sub-region consists of the whole of Australia and Tasmania; while New Zealand, Lord Howe Island, Norfolk Island, the Kermadec, Chatham, Auckland, Campbell and Macquarie Islands constitute the *New Zealand* Sub-region. Finally, all the remaining islands of Polynesia, as far north as the Tropic of Cancer, and including the Sandwich Islands, are embraced in the Polynesian Sub-region.

Physical Features.—This region is essentially one of islands, with only three land-masses of any considerable extent, viz.:—Australia, New Guinea and New Zealand. The first of these is characterised by a peculiar climate and, coupled with this, a very remarkable fauna. This may be accounted for by its great isolation, for it is surrounded on nearly all sides by thousands of miles of ocean, and only on the north-west is there any adjacent land suggesting a former connection with other continental areas. A great portion of the interior of this island-continent consists of arid plain and desert, the most fertile temperate region lying in the east and south-east. The northern portion is entirely tropical, with a heavy rainfall, but with this exception the climate of the whole area is peculiarly arid and the rainfall very irregular. As a contrast to this, most of the islands of the Austro-Malayan Sub-region are covered with luxuriant tropical forest, with a rich and varied fauna. In the south-western islands, however (*e.g.* Flores and Timor), the conditions approach those of Australia. The numerous scattered islands of the Polynesian Sub-region may be roughly grouped into two classes, volcanic islands and atolls. The former usually rise to a high elevation and are clothed with rich forests, while the latter are remarkably low, desolate and almost devoid of both fauna and flora. New Zealand, the last area to be considered, possesses a temperate and equable climate, with a backbone of high mountain ranges and numerous fine rivers, due to an abundant rainfall. The fauna is deficient, especially as regards the higher forms of life, but such creatures as there are, claim attention through their interesting and highly peculiar nature.

Zoological Characteristics.—This very distinct region possesses representatives of 134 families of terrestrial Vertebrates, no fewer than 30 of which are peculiar, including eight of Mammals, 17 of Birds, 3 of Reptiles, and 2 of Amphibians. The peculiar families of Mammals comprise the whole order Monotremata and most of the Marsupialia, the remaining families of the latter being the *Didelphidæ* (Opossums), confined to the Neotropical and the southern portion of the Nearctic Regions, and the small group known as *Cænolestidæ* (Opossum Rats), confined to a small area in the Neotropical Region. The complete list of peculiar families in the Australian Region is as follows:—

Mammals.

Macropodidæ (Kangaroos).
Phalangeridæ (Phalangers).
Phascolomyidæ (Wombats).
Peramelidæ (Bandicoots).
Notoryctidæ (Marsupial Mole).
Dasyuridæ (Dasyures).
Echidnidæ (Spiny Ant-eaters).
Ornithorhynchidæ (Duck-Bills).

Birds.

Paradiseidæ (Birds of Paradise).
Ptilonorhynchidæ (Bower-Birds).
Meliphagidæ (Honey-Eaters).
Drepanididæ (Drepanis).
Atrichornithidæ (Scrub-Birds).
Xenicidæ.
Menuridæ (Lyre-Birds).
Nestoridæ (Nestor-Parrots).
Loriidæ (Lories).
Cyclopsittacidæ.
Stringopidæ (Owl-Parrots).
Rhinochætidæ (Kagu).
Gouridæ (Crowned Pigeons).
Didunculidæ (Tooth-billed Pigeon).
Apterygidæ (Kiwis).
Dromæidæ (Emus).
Casuariidæ (Cassowaries).

Reptiles.

Pygopodidæ (Scale-footed Lizards).
Hatteriidæ (Tuatera).
Carettochelydidæ (Fly-River Turtle).

Amphibians.

Ceratobatrachidæ.
Genyophrynidæ.

Besides these, the following families are highly characteristic: the *Dicæidæ* (Honey-Peckers), *Campophagidæ* (Cuckoo-Shrikes), *Podargidæ* (Frog-Mouths), *Cacatuidæ* (Cockatoos), *Megapodidæ* (Megapodes), *Chelydidæ* (Side-necked Tortoises), and *Cystignathidæ*.

The region is also characterised almost as much by the absence of certain important groups as by those which are present and peculiar. Thus there are few Mammals except Marsupials and Monotremes, the other Orders being represented by some Bats and small Rodents, and one or two odd species which just enter the Region over the Oriental boundary. Apes and Monkeys, Insectivores, Carnivores, Ungulates, and Edentates may be regarded, therefore, as practically absent. Among Birds, the *Fringillidæ* (Finches), *Emberizidæ* (Buntings), and *Picidæ* (Woodpeckers) are absent, as are also the Reptilian families *Viperidæ* (Vipers), and *Lacertidæ* (Typical Lizards).

The fauna of this region, as a whole, is thus seen to be very peculiar and distinct, and there is no little justification for the raising of Wallace's Region and Sub-regions respectively to higher rank, as has been done by Heilprin, Lydekker, and others (*vide supra* and Plate 2).

Austro-Malayan Sub-region.—In this insular sub-region there are 113 families of terrestrial Vertebrates, of which four are peculiar. These are the *Gouridæ* (Crowned Pigeons) and the *Carettochelydidæ* (Fly-River Turtle), both confined to New Guinea, and two little-known Amphibian families, *Ceratobatrachidæ* and *Genyophrynidæ* from the Solomon Islands and Sudest Island respectively. Moreover, since most of this area consists of comparatively small islands, a large number of peculiar genera and species exist, especially when the exceptionally interesting island Celebes is included. In New Guinea three Marsupial genera are peculiar; as are also in Celebes the Black Ape (*Cynopithecus niger*), and the Anoa (*Anoa depressicornis*). The Babirussa (*Babirussa babirussa*) is another remarkable and peculiar member of the Austro-Malayan fauna, occurring in Celebes, Buru, and the Sulu Islands. Among Birds, the families *Paradiseidæ* (Birds of Paradise), *Ptilonorhynchidæ* (Bower-Birds), *Meliphagidæ* (Honey-Eaters), *Zosteropidæ* (White-eyes), *Podargidæ* (Frog-mouths), *Loriidæ* (Lories), *Cyclopsittacidæ*, *Megapodidæ* (Megapodes), and *Casuariidæ* (Cassowaries), attain their highest development in this area, while the families *Dicæidæ* (Honey-Peckers), *Campophagidæ* (Cuckoo-Shrikes), *Muscicapidæ* (Fly-Catchers), *Pittidæ* (Pittas) and *Treronidæ* (Fruit-Pigeons) are very numerously represented. Lastly, in New Guinea and the neighbouring islands, the Amphibian families *Engystomatidæ* (Narrow-mouthed Toads) and *Hylidæ* (Tree-Frogs) are characteristic.

Australian Sub-region.—In this Sub-region 98 families of terrestrial vertebrates are represented, namely 15 of Mammals, 67 of Birds, 13 of Reptiles, and three of Amphibians. Of these, some half-dozen are confined to this area, as follows:—*Phascolomyidæ* (Wombats), *Notoryctidæ* (Marsupial Mole), *Ornithorhynchidæ* (Duck-Bills), *Atrichornithidæ* (Scrub-Birds), *Menuridæ* (Lyre-Birds), and *Dromæidæ* (Emus). This area is notable as being the great home of the Marsupials, for out of 41 known genera 34 are represented and 24 absolutely confined to it. The avifauna too, is highly peculiar, for although only three families are confined to the Sub-region, yet the proportion of peculiar *species* is larger than in any other Sub-region in any part of the world.

The characteristic, but not peculiar, families are the *Macropodidæ* (Kangaroos), *Peramelidæ* (Bandicoots), *Dasyuridæ* (Thylacine, &c.), *Ptilonorhynchidæ* (Bower-Birds), *Meliphagidæ* (Honey-Eaters), *Certhiidæ* (Creepers), *Artamidæ* (Swallow-Shrikes), *Cacatuidæ* (Cockatoos), *Turnicidæ* (Bustard-Quails), *Elapidæ* (Cobras, &c.), *Pygopodidæ* (Scale-footed Lizards), *Varanidæ* (Monitors), *Chelydidæ* (Side-necked Tortoises), and *Cystignathidæ*. The *Elapidæ* form about two-thirds of all the Snakes found in Australia, and all of them are poisonous, so that the absence of Vipers (*Viperidæ*) and Rattlesnakes (*Crotalidæ*) is, unfortunately for the country, more than compensated for. Lastly, the entire absence of all tailed Amphibians (Newts, &c.) is noteworthy.

Polynesian Sub-region.—In this Sub-region, made up as it is entirely of small islands, the absence of certain forms is probably to be regarded as more characteristic than is the presence of the few peculiar ones which are mentioned below. The families of terrestrial Vertebrates represented in this great oceanic area only number 53. Of these, 3 are of Bats and 37 of Birds, whose occurrence in these remote islands is probably due to their superior powers of dispersal. Of Reptiles 9 families occur, and of Amphibians only 2, both of which are confined to a single group of islands. The other two families are the *Muridæ* (Mice), and the *Cervidæ* (Deer). Of the latter a single species occurs in the Ladrone Islands.

The families peculiar to the Polynesian Sub-region are the following:—the *Drepanididæ*, confined to the Sandwich Islands; the *Rhinochætidæ* (Kagu), only found in New Caledonia; and the *Didunculidæ* (Tooth-billed Pigeon), confined to Samoa.

For further details regarding the fauna of the Sandwich Islands, the reader is referred to the Section on *Insular Faunas*, which follows (*vide* p. 10).

New Zealand Sub-region.—The fauna of New Zealand is very remarkable, rendering it worthy of the regional rank which is by some authorities accorded it. Only 34 families of terrestrial Vertebrates are represented, of which there are 3 of Mammals, 27 of Birds, 3 of Reptiles, and 1 of Amphibians. Five families are altogether confined to the Sub-region, namely, the *Xenicidæ*, *Nestoridæ* (Nestor-Parrots), *Stringopidæ* (Owl-Parrots), *Apterygidæ* (Kiwis), and *Hatteriidæ* (Tuatera). The three Mammalian families represented are the *Noctilionidæ* (Free-tailed Bats), *Vespertilionidæ* (Typical Bats), and the *Muridæ* (Rats, Mice, &c.). Since the New Zealand Rat is probably an introduction, it is fair to say that this country possesses no indigenous Mammals (excluding the purely aerial Bats), while there are only about 16 species of Lizards, no land Snakes, and only one Frog. The peculiar animal known as the Tuatera (*Hatteria*) is so remarkable, however, that its presence amply compensates in interest for the paucity of Reptiles and Amphibians. The insects are also deficient, for only about 260 species of Macrolepidoptera have been recorded, of which some 16 are Butterflies. There are no Scorpions, while Wasps (*Vespidæ*) likewise appear to be absent.

The Lizards found in this Sub-region belong entirely to the families *Geckonidæ* (Geckos) and *Scincidæ* (Skinks), while the frog is *Liopelma hochstetteri*, a member of the *Discoglossidæ*, which family, it is interesting to note, is otherwise confined to the Palæarctic Region.

Number of Families of terrestrial Vertebrates in the Australian Region and its Four Sub-regions.

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Australian Region in General	22 (8)	78 (17)	25 (3)	9 (2)	13 30)
Austro-Malayan Sub-region	18	65 (1)	23 (1)	7 (2)	113 (4)
Australian ,,	15 (3)	67 (3)	13	3	98 (6)
Polynesian ,,	5	37 (3)	9	2	53 (3)
New Zealand ,,	3	27 (4)	3 (1)	1	34 (5)

[1] The figures in parentheses indicate the number of *peculiar* families.

V. NEOTROPICAL REGION.

Extent.—This luxuriant region comprises the whole of South and Central America, the West Indies, and the southern part of Mexico, with the exception of a narrow tract belonging to the Nearctic Region, which runs southwards over the central plateau almost to Guatemala.

Sub-regions.—The four Sub-regions recognised by Wallace are the following:—(1) Chilian; (2) Brazilian; (3) Mexican; and (4) Antillean. The *Chilian* Sub-region is defined by a line commencing on the western coast of South America about 4° south of the Equator, running down the summits of the Andes of Peru and Bolivia, thence eastwards about the Southern Tropic, and finally reaching the Atlantic coast at 30° south latitude. The *Brazilian* Sub-region includes all the rest of South America, terminating northwards at the Isthmus of Panama; while all the Neotropical country north of this on the mainland constitutes the *Mexican* Sub-region. The *Antillean* Sub-region comprises all the West Indies, except Tobago and Trinidad, which must be regarded as belonging to the adjacent continent.

Physical Features.—The Neotropical is essentially a tropical region, although a considerable portion of it is well within the south temperate zone. It is remarkable for the great extent and luxuriance of the forests which almost entirely cover the tropical portion, and for the almost total absence of desert. This may be accounted for by the fact that its high ground is almost entirely restricted to a comparatively narrow band running down close to and parallel with the western coast. Hence the greater part of the region is open to the influence of moist trade-winds from the Atlantic. The condensation on the high mountain slopes of the moisture carried by these winds gives rise to a great number of vast streams, which flow eastwards, and hence we have an extensive, low-lying and exceptionally well-watered region, harbouring an unusually rich flora and fauna. The narrow strip to the west of the Andes has a singularly dry climate, and the fauna consequently approaches that of the temperate portion of the region. The great mountain ranges of this and the Nearctic Region may be contrasted with those of the Palæarctic, inasmuch as they run in a north to south direction, while those of the latter are mainly west to east. The Andes, again, are remarkable for their great height in proportion to the amount of land surface they cover. The temperate portion of the region consists chiefly of low-lying pampas, with a dry climate, but the southern extremity is covered with cold, damp forest. With all these varied conditions it is hardly surprising that this great region possesses a marvellously rich and peculiar fauna, with a larger number of special types, both family and generic, than any other.

Zoological Characteristics.—In support of the remarks in the preceding paragraph relative to the rich and varied nature of the Neotropical fauna, it may be stated that representatives of 155 families of terrestrial Vertebrates are found within the limits of the region, and of these no fewer than 39 are absolutely confined to it. The complete list of peculiar families is as follows:—

Mammals.

Cebidæ (American Monkeys).
Callitrichidæ (Marmosets).
Solenodontidæ (Solenodons).
Dasyproctidæ (Agouties).
Chinchillidæ (Chinchillas).
Caviidæ (Cavies).
Dinomyidæ (Dinomys).
Bradypodidæ (Sloths).
Myrmecophagidæ (Ant-eaters).
Cænolestidæ (Selvas).

Birds.

Cœrebidæ (Honey-Creepers).
Phytotomidæ (Plant-Cutters).
Pipridæ (Manakins).
Oxyrhamphidæ.
Dendrocolaptidæ (American Creepers).
Conopophagidæ.
Formicariidæ (Ant-Thrushes).
Pteroptochidæ.
Galbulidæ (Jacamars).
Bucconidæ (Puff-Birds).
Rhamphastidæ (Toucans).
Steatornithidæ (Oil-Bird).
Momotidæ (Motmots).
Todidæ (Todies).
Palamedeidæ (Screamers).
Psophiidæ (Trumpeters).
Cariamidæ (Cariamas).
Aramidæ (Courlans).
Eurypygidæ (Sun-Bitterns).
Thinocorythidæ (Seed-Snipes).
Opisthocomidæ (Hoatzin).
Tinamidæ (Tinamous).
Rheidæ (Rheas).

Reptiles.

Xenosauridæ.
Dermatemydidæ (Mud-Terrapins, &c.).

Amphibians.

Dendrobatidæ (Solid-chested Tree-Frogs).
Hemiphractidæ.
Amphignathodontidæ.
Dendrophryniscidæ.

From the above list it will be seen that ten families of Mammals, out of 32 which occur in the region, and 23 families of Birds, out of 80, are purely Neotropical, these numbers in both cases showing a remarkably high percentage of peculiarity.

The following 16 families are common to this region and the Nearctic, but are not found elsewhere:—

Mammals.

Phyllostomatidæ (Vampire-Bats).
Geomyidæ (Pocket-Gophers).
Heteromyidæ (Pocket-Mice, &c.).
Dicotylidæ (Peccaries).
Dasypodidæ (Armadillos).
Didelphidæ (Opossums).

Birds.

Icteridæ (Cassiques and Hang-nests).
Tanagridæ (Tanagers).
Mniotiltidæ (Wood-Warblers).
Vireonidæ (Vireos).
Mimidæ (Mocking-Birds).
Cotingidæ (Chatterers).
Tyrannidæ (Tyrant Fly-Catchers).
Trochilidæ (Humming-Birds).
Cracidæ (Curassows, &c.).
Odontophoridæ (American Partridges, &c.).

If this list be added to the first one, a total is obtained of 55 families (or half the number present) of Mammals and Birds, which are either peculiar to or highly characteristic of this interesting region.

The insects of the Neotropical Region are remarkably abundant and varied. Of the 17 known families of Butterflies, 15 are represented, and one (the *Brassolidæ*) is peculiar Moreover, the *Neotropidæ*, *Heliconidæ*, *Euselasiidæ*, and *Lemoniidæ* extend into the southern portion of the Nearctic Region, but are otherwise peculiarly Neotropical. The brilliantly coloured members of the genus *Morpho* are confined to this region, while among Moths the *Castniidæ* and *Uraniidæ* are specially characteristic. Lastly, of land and fresh-water Mollusca the families *Orthalicidæ* and *Proserpinidæ* are peculiar and the *Urocoptidæ* almost so.

Chilian Sub-region.—In this area 100 families of terrestrial Vertebrates are represented, namely, 23 of Mammals, 53 of Birds, 17 of Reptiles, and 7 of Amphibians. The only peculiar families are the *Dinomyidæ*, containing a single species found in Peru, and the *Thinocorythidæ* (Seed-Snipes), numbering only five species. In spite, however, of the paucity of absolutely peculiar families, certain groups are quite characteristic. Thus, among others may be mentioned the *Chinchillidæ* (Chinchillas), the genus *Lama* (family *Camelidæ*), the *Phytotomidæ* (Plant-Cutters), *Pteroptochidæ*, *Steatornithidæ* (Oil-Bird), and the *Rheidæ* (Rheas), while the Spectacled Bear (*Tremarctos ornatus*), the only member of the *Ursidæ* found in South America, is restricted to this Sub-region, occurring only in the Andes.

Brazilian Sub-region.—This is much the richest of the Neotropical sub-regions, containing representatives of 133 families of terrestrial Vertebrates, or 86 per cent. of those occurring in the entire region. Of these, 27 are Mammals, 71 Birds, 23 Reptiles, and 12 Amphibians. Eight families are peculiar, as follows:—

Mammals.

Callitrichidæ (Marmosets).
Cænolestidæ (Selvas).

Birds.

Conopophagidæ.
Psophiidæ (Trumpeters).
Cariamidæ (Cariamas).
Opisthocomidæ (Hoatzin).

Amphibians.

Hemiphractidæ.
Amphignathodontidæ.

The Brazilian Sub-region is the great home of nearly all the arboreal Vertebrates of South America, and hence we find that the following families of tree-haunting Mammals are more numerously represented here than in any other sub-region:—*Cebidæ* (American Monkeys), *Phyllostomatidæ* (Vampire-Bats), *Hystricidæ* (section *Erethizontidæ* or American Porcupines), *Bradypodidæ* (Sloths), and *Didelphidæ* (Opossums).

There are, in addition, many characteristic families in this great forest area, and among these may be mentioned the *Octodontidæ* (Spiny Mice), *Dasyproctidæ* (Agouties), *Caviidæ* (Cavies), and the American Tapirs of the genus *Tapirus;* several families of Birds too numerous to mention in detail, but including many of those which are peculiar to the Neotropical Region

as a whole; and among the Reptiles and Amphibians the *Dipsadomorphidæ* (Tree Snakes), *Elapidæ* (Coral Snakes), *Iguanidæ* (Iguanas, &c.), *Tejidæ* (Greaved Lizards), *Alligatoridæ* (Alligators and Caimans), *Dendrobatidæ* (Solid-chested Tree-Frogs), *Hylidæ* (Typical Tree-Frogs), *Pipidæ* (Surinam Toad, &c.), and others.

Mexican Sub-Region.—In the richness of its fauna this Sub-region falls little short of the Brazilian, for it possesses representatives of 127 families of terrestrial Vertebrates. This number is made up as follows: Mammals, 24; Birds, 67; Reptiles, 26; and Amphibians, 10. There is little peculiarity, only two families—both Reptilian—being confined to the sub-region, namely, *Xenosauridæ* and *Dermatemydidæ* (Mud-Terrapins), which contain only one and four species respectively. Characteristic of this area are two species of Tapir (*Tapirus bairdi* and *dowi*), which are the most northerly representatives of the family in the New World. The following families appear to have their metropolis in this Sub-region:—*Procyonidæ* (Raccoons), *Momotidæ* (Motmots), *Odontophoridæ* (American Partridges), *Anguidæ* (Slow-Worms), and *Plethodontidæ*.

Antillean Sub-region.—Since this area is wholly made up of islands, most of which are small, it is hardly surprising to find that the number of families of terrestrial Vertebrates is much inferior to that in the other portions of the Neotropical Region. Some 76 families in all occur in the Sub-region. They are apportioned as follows:—Mammals, 7; Birds, 47; Reptiles, 16; and Amphibians, 6. Only two are peculiar, namely, one of Mammals, and one of Birds. These are the *Solenodontidæ* (Solenodons), of which only a couple of species are known, and the *Todidæ* (Todies), of which there are five.

There is a remarkable absence of Mammals in this, as in other insular Sub-regions, for there are no Primates, Carnivora, Ungulata, or Edentata. The only Rodents are the *Octodontidæ* (Spiny Mice), represented by about half a dozen species of *Capromys*, a genus practically peculiar to the West Indies; and a few *Muridæ* belonging to the sub-family *Sigmodontinæ*. The Birds are mainly of a Neotropical character, but the following important families are quite absent: *Phytotomidæ* (Plant-Cutters), *Pipridæ* (Manakins), *Dendrocolaptidæ* (American Creepers), *Formicariidæ* (Ant-Thrushes), *Rhamphastidæ* (Toucans), *Momotidæ* (Motmots), *Cracidæ* (Curassows, &c.), *Tinamidæ* (Tinamous), and *Rheidæ* (Rheas). Lastly, among Butterflies, the typically Neotropical *Brassolidæ*, *Euselasiidæ*, *Lemoniidæ*, and the genus *Morpho*, are totally unrepresented.

Number of Families of terrestrial Vertebrates in the Neotropical Region and its Four Sub-regions.

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Neotropical Region in General	32 (10)[1]	80 (23)	29 (2)	14 (4)	155 (39)
Chilian Sub-region	23 (1)	53 (1)	17	7	100 (2)
Brazilian ,, ...	27 (2)	71 (4)	23	12 (2)	133 (8)
Mexican ,, ...	24	67	26 (2)	10	127 (2)
Antillean ,, ...	7 (1)	47 (1)	16	6	76 (2)

[1] The figures in parentheses indicate the number of *peculiar* families.

VI. NEARCTIC REGION.

Extent.—The Nearctic Region embraces the whole of North America as far south as the Neotropical boundary, and the whole of Greenland.

Sub-regions.—Like all the other regions, the Nearctic is divided into four sub-regions, which are as follows:—(1) Californian; (2) Rocky Mountain; (3) Alleghany; and (4) Canadian. The *Californian* Sub-region consists of a narrow strip of country, west of the Sierra Nevada and the Cascade range, and extending from Vancouver Island and part of British Columbia in the north almost to latitude 30° in the south. The *Rocky Mountain* Sub-region lies immediately to the east of the Californian, and includes the whole of the dry and elevated area covered by the mountains from which it takes its name. To the south it embraces Lower California and the Central Mexican plateau, while its eastern boundary begins on the coast a little to the north of the Rio Grande, runs up nearly due north to about the 50th parallel, then sweeps round to the north-west almost to the Little Slave Lake, thence southwards to near the source of the Missouri River, and finally westwards till it meets the boundary of the Californian Sub-region. The *Alleghany* Sub-region comprises the United States east of the last sub-region and south of the Great Lakes, and includes Nova Scotia. All the remaining portion of North America and Greenland constitute the great *Canadian* Sub-region.

Physical Features.—The Nearctic Region presents a great variety of physical features. Like the Palæarctic Region, it extends from beyond the Arctic Circle to the Northern Tropic, and hence has a great range of temperature. In the northern portion the winter temperature is much lower than is found at a corresponding latitude in Europe, and this is largely due to the great widening out of the land mass towards the Polar Regions. Add to this the extreme contraction of the area in its sub-tropical portion, and we have two principal reasons for the somewhat smaller variety in the forms of animal life as compared with the Palæarctic Region. The chief physical features of the region are the large lakes and inland seas in the north-eastern portion and the important ranges of mountains in the west. The latter run from north to south, and are practically a continuation of the great chain which runs through Central America and the west of South America. In the east are smaller ranges, constituting the so-called Appalachian Highland, while in the centre of this great continent is a vast extent of plain, which in the north is frozen and barren, between latitudes 50° and 60° covered with forest, and in the south dry, treeless desert. Greenland, the outlying portion of the Nearctic Region, is entirely arctic, and buried beneath a mass of ice of unknown thickness.

Zoological Characteristics.—The close affinity of the Nearctic fauna with that of the Palæarctic Region has already been pointed out (*see* p. 5). The number of families of terrestrial Vertebrates represented in the Nearctic Region is 120, namely, 26 of Mammals, 59 of Birds, 21 of Reptiles, and 14 of Amphibians. This number is considerably below the corresponding one for the Palæarctic Region, but, on the other hand, while there are no peculiar families in the latter, the Nearctic Region possesses five, namely, the *Haplodontidæ* (Sewellels) and *Antilocapridæ* (Prongbuck) among Mammals; the *Chamæidæ* (Wren-Tits) among Birds; the *Aniellidæ* among Reptiles, and the *Sirenidæ* (Mud-Eels) among Amphibians.

There are, besides, several peculiar genera of importance, of which *Scalops* (Web-footed Moles), *Taxidea* (American Badger), *Haplocerus* (Rocky Mountain Goat), and *Ovibos* (Musk Ox) may be taken as examples. The latter, however, was once a Palæarctic species, and occurred even in Britain. The American Bison (*Bison bison*), Grizzly Bear (*Ursus horribilis*), American Beaver (*Castor canadensis*), Wapiti Deer (*Cervus canadensis*), Moose (*Alces americana*), and the Caribou (*Rangifer caribou*) are also characteristic animals, while the families *Geomyidæ* (Pocket Gophers) and *Heteromyidæ* (Pocket Mice) &c. among Mammals; the *Tetraonidæ* (Grouse) and *Meleagridæ* (Turkeys) among Birds; the *Xantusiidæ* among Reptiles; and the *Desmognathidæ* among Amphibians, are more numerously represented in this region than elsewhere.

Californian Sub-region.—In this small area are found representatives of 86 families of terrestrial Vertebrates, as follows: Mammals, 21; Birds, 49; Reptiles, 8, and Amphibians, 8. The Californian is the only one of the Nearctic Sub-regions which possesses any families peculiar to itself. These are three in number, namely, the *Haplodontidæ* (Sewellels), *Chamæidæ* (Wren-Tits), and *Aniellidæ* (a family of Lizards). Of characteristic families, though not peculiar, the *Phyllostomatidæ* (Vampire Bats) and *Noctilionidæ* (Free-tailed Bats) should be mentioned, while the genera *Neurotrichus* (Mole-Shrews) and *Bassariscus* (Cacomistles) are also to be placed in this category.

Rocky Mountain Sub-region.—This sub-region is the richest portion of the Nearctic Region, for it possesses representatives of 107 (out of 120) families of terrestrial Vertebrates. This number is made up as follows: Mammals, 25; Birds, 55; Reptiles, 18; and Amphibians, 9. Although there are no peculiar families in this area, yet there are several very characteristic genera, among which may be mentioned *Antilocapra* (the Prongbuck), *Haplocerus* (the Rocky Mountain Goat), *Bison* (the American Bison), and *Cynomys* (Prairie Dogs). The families *Dicotylidæ* (Peccaries), *Dasypodidæ* (Armadilloes), *Cotingidæ* (Chatterers), *Trogonidæ* (Trogons), and *Cracidæ* (Curassows) are examples of essentially Neotropical families which just enter this sub-region from the south, while, lastly, the *Helodermatidæ* (Poisonous Lizards) are common to this area and the Mexican Sub-region.

Alleghany Sub-region.—The Eastern United States, forming this Sub-region, are to be regarded as the most characteristic portion of the Nearctic Region. Some 99 families of terrestrial Vertebrates are represented, as follows: Mammals, 18; Birds, 53; Reptiles, 16; and Amphibians, 12. No family is peculiar, and among Mammals there is only one genus that is confined to the Sub-region, namely, *Condylura* (Star-nosed Mole). The *Didelphidæ* (Opossums) are common to this and the Rocky Mountain Sub-regions, while the extreme south of Florida is the home of many typically Neotropical groups of animals. Examples of such may be found in the *Phyllostomatidæ* (Vampire Bats); *Cœrebidæ* (Honey-Creepers); *Aramidæ* (Courlans); the Frogs of the family *Cystignathidæ*; the Land-Shells of the family *Urocoptidæ*; and the Butterflies of the family *Heliconidæ*. The most interesting of the peculiar Birds are the celebrated Passenger Pigeon (*Ectopistes migratorius*) and the Carolina Parrot (*Conuropsis carolinensis*)—both on the verge of extinction—while other characteristic groups are the *Meleagridæ* (Turkeys), and *Sirenidæ* (Mud-Eels).

Canadian Sub-region.—In this sub-region only 75 families of terrestrial Vertebrates are represented, namely, 20 of Mammals, 44 of Birds, 3 of Reptiles, and 8 of Amphibians. It is thus the poorest section of the Nearctic Region, but at the same time an interesting feature of the fauna is presented by the number of genera and species which are common to it and the Palæarctic Region. Among these may be mentioned *Cervus* (Deer), *Rangifer* (Reindeer), *Alces* (Elk), *Bison* (Bison), *Ovis* (Sheep), *Gulo* (Gluttons), *Mustela* (Martens), *Lemmus* (Lemmings), *Ursus maritimus* (the Polar Bear), *Vulpes lagopus* (the Arctic Fox), and many birds. The genus *Ovibos* (Musk Ox) is now peculiar to the sub-region. The Reptiles and Amphibians are few, and of little importance. Lastly, certain genera of Butterflies, such as *Parnassius*, *Colias*, *Cœnonympha*, *Œneis*, and others, are well represented and characteristic.

Number of Families of terrestrial Vertebrates in the Nearctic Region and its Four Sub-regions.

	Mammals.	Birds.	Reptiles.	Amphibians.	Total.
Nearctic Region in General ...	26 (2)[1]	59 (1)	21 (1)	14 (1)	120 (5)
Californian Sub-region ...	21 (1)	49 (1)	8 (1)	8	86 (3)
Rocky Mountain ,, ...	25	55	18	9	107
Alleghany ,, ...	18	53	16	12	99
Canadian ,, ...	20	44	3	8	75

[1] The figures in parentheses indicate the number of *peculiar* families.

INSULAR FAUNAS.

The animal life on islands is of special interest to the student of zoögeography. As a rule the genera and species are much fewer in number than is the case in continental areas, but at the same time these are often remarkably peculiar and well defined. Before a detailed study of any

particular insular fauna is made, careful consideration must be given to the nature, both geological and physical, of the island itself. Following Wallace, we may arrange all islands in two categories, viz., *continental* and *oceanic*. By a continental island is meant one lying comparatively near one of the great continental masses, and as a rule containing in its geological formation stratified rocks of various ages. Such an island has at one time or other been connected with the adjacent continent, having been separated by the submergence of the intervening area. Hence its fauna is more or less similar to that of the neighbouring mainland, and always includes a certain proportion of Mammals and Amphibians. Moreover, the number and nature of its special forms depend to a great extent upon the length of time which has elapsed since the separation took place. As examples of such islands we may take Great Britain, Borneo, Java, the Philippine Islands, Japan and Formosa. A certain number of continental islands are separated by water of considerable depth, amounting even to more than a thousand fathoms. Such are regarded as of more ancient origin than the rest, and the deficient yet highly peculiar nature of their fauna corroborates this view. They may even be the remains of some large continent which has disappeared beneath the waves, leaving only isolated and elevated portions which now figure as islands, with a fauna related, it may be, to quite remote parts of the earth's surface. Madagascar and its neighbouring groups of islands form, perhaps, the best example of this class.

An oceanic island, on the other hand, is one which has never been attached to any continent, but has been formed independently in mid-ocean, either by volcanic agency or through the building up of coral reefs, or again by a combination of both methods. The fauna of such islands is usually characterised by an entire absence of terrestrial Mammals and Amphibians, but includes a fair proportion of very peculiar birds and insects, and often a few reptiles. Many well-known islands may be included here, such as the Sandwich and Galapagos Islands, St Helena, the Azores, Bermuda and Kerguelen.

For a masterly and exhaustive account of insular faunas, the reader should consult the classical work of Alfred Russel Wallace, bearing the title *Island Life* (*vide* Bibliography). From this volume, the following short summary has been compiled.

OCEANIC ISLANDS.

The Azores.—In this group of islands there are no indigenous terrestrial Mammals, and Amphibians are also absent. Birds are represented by 53 species, 31 of which are either aquatic or waders, and chiefly occur as migrants. Of the remaining 22 species, which are land Birds, four are merely stragglers. There are thus 18 permanent residents, 15 of which are natives of Europe and North Africa. A single species, the Azorean Bullfinch (*Pyrrhula murina*) is peculiar. In the great class of insects, the Lepidoptera (Butterflies and Moths) and Hymenoptera (Ants, Bees, Wasps, &c.) are sparsely represented, the species being almost all European ones. Of Coleoptera (Beetles) there are 212 species, of which 175 are European. Of these 101 are probably introduced and 74 indigenous. The peculiar species number 14. There are 69 species of terrestrial Mollusca, of which 37 are European and 32 peculiar.

Bermuda.—No terrestrial Mammals occur in these islands, but four species of Bat occur rarely. Frogs and Snakes are absent, but there is one Lizard, which is a peculiar species. Of Birds 180 species are recorded, 85 of which are Land Birds. Of these, about a quarter are regular visitors, while only 11 are permanent residents. Eight of the latter are land, and the other three aquatic Birds, and all are common on the North American mainland. Insects are comparatively scarce. Of Coleoptera (Beetles) 19 species are recorded; of Hymenoptera, 11; of Lepidoptera, 26; Diptera, 9; Hemiptera, Orthoptera and Neuroptera, 9 each. All are common North American or West Indian species. The Land Mollusca comprise 28 species, six of which are peculiar.

The Galapagos Islands.—As in the preceding group of islands, there are no indigenous Mammals and no Amphibians. Reptiles, however, are abundant and the gigantic Land Tortoises, found in these islands, are both peculiar and of remarkable interest. Five species of Lizards occur, one of the family *Geckonidæ* and four of *Iguanidæ;* while there are also two species of Snakes.

The Birds are singularly interesting, inasmuch as 72 species, out of a total of 100 occurring in the islands, are peculiar. Sixty-six out of this number are land Birds, and of these only three are found elsewhere.

Of Beetles about 40 species are recorded, mostly peculiar; and of Land-Shells about 46, two-thirds of which are *Bulimuli*, and most of which are confined to these islands.

St Helena.—In this island there are no indigenous Mammals, Land-Birds, Reptiles or Fresh-water Fishes. One wader is present, namely, a peculiar species of Plover (*Ægialitis sanctæ-helenæ*). The Beetles number 203 species, of which 74 have probably been introduced. Strangely enough, about two-thirds of the remainder are Rhynchophora (Weevils)—a proportion approached in no other part of the globe. Of Land-Shells 29 species are recorded, 20 of which are indigenous. Of the latter, 13 appear to be extinct, being only represented by empty shells on or below the surface of the ground.

The Sandwich Islands.—These islands are so extensive and possess a fauna so peculiar, that Lydekker regards them as forming a distinct Zoögeographical Region, and W. L. Sclater as a sub-region of the Australian Region. While indigenous Mammals are entirely absent, the Birds are numerous and present many peculiarities. Fifty-eight species of aquatic and wading birds are recorded, of which six are peculiar, while four birds of prey have occurred in these islands. The *Passeriformes*, or Perching Birds, are represented by 55 species, 41 of which belong to a peculiar family, the *Drepanididæ*, while Parrots, Pigeons and Kingfishers, all of which are represented in the larger Pacific Islands, are entirely wanting. Two Lizards complete the list of Vertebrates.

Of Land and Fresh-water Mollusca, 477 species are recorded, 332 of which belong to the peculiar family *Achatinellidæ*. It is interesting to note, also, that the great majority of the species are confined to a single island. About a thousand species of Coleoptera (Beetles) are known, nine-tenths of which are peculiar.

CONTINENTAL ISLANDS.

The British Isles.—As compared with adjacent portions of the continent, the British Isles exhibit a curious paucity of species among Mammals, Reptiles and Amphibians—a fact accounted for by the glaciation of our country at a comparatively recent period. This, together with submergence, exterminated a large portion of the fauna, and the subsequent connection of these islands with the continent was not of sufficient duration to allow of the migration of many forms for which our climate and physical conditions are suitable.

Of terrestrial Mammals, Britain only possesses some 40 species, while there are about 90 in Germany. Only one is peculiar, namely, the Orkney Vole (*Microtus orcadensis*), but there are, in addition, several racial forms confined to these islands. Again, Belgium has 22 species of Reptiles and Amphibians, Britain only 13 and Ireland only four. Only a single *species* of Bird is peculiar to the British Isles, namely, the Red Grouse (*Lagopus scoticus*), but here again a number of species exhibit racial peculiarities. Among these are *Parus ater*, sub.-sp. *britannicus* (Cole Tit), *Acredula caudata*, sub.-sp. *rosea* (Long-tailed Tit), and *Troglodytes parvulus*, var. *hirtensis* (St Kilda Wren). Of fresh-water Fishes several forms of the genus *Salmo* (Trout and Charr) are peculiar to British and Irish lakes, while the Lepidoptera (Butterflies and Moths) include 179, and the Coleoptera (Beetles), 71 species and varieties, which are supposed to be confined to the British Islands. Finally, the list of land and fresh-water Mollusca shows 122 peculiar species and varieties.

Borneo and Java.—Out of 175 species of terrestrial Mammals occurring in Borneo, 55 are peculiar, and 10 others present varieties confined to the island. Of these, 7 are Monkeys, 10 Bats, 15 Insectivores, 4 Carnivores, 28 Rodents and 1 Ungulate (a Pig). Of Birds, the same island possesses 490 species, and of these no fewer than 126 are peculiar. In Java, on the other hand, only 90 species of Mammals are found, only some half dozen being peculiar; while of birds there are only 300 species of which 45 are peculiar. A number of typically Malayan animals are found in Borneo, but not in Java, and among these may be mentioned the Elephant, Malayan Bear and Tapir. There is a similar deficiency as regards the Javan Birds, certain genera of forms so conspicuous as Jays, Woodpeckers, Hornbills, Cuckoos, Parrots and Pheasants, being quite unknown, although these are of a Malayan type and present in other East Indian islands. As Wallace says: "From these facts, it is impossible to doubt that Java has had a history of its own, quite distinct from that of the other portions of the Malayan area."

The Philippine Islands.—In these very interesting islands there are 44 species of Mammals (excluding Bats), and of these no fewer than 33 are peculiar. Of the 22 Rodents found in the islands and peculiar to them, 10 belong to quite peculiar genera. The other Mammals confined to the Philippines are a *Galeopithecus* (Flying Lemur), a *Tupaia* (Tree Shrew), and three other Insectivores; a *Tragulus* (Chevrotain), and four species of *Cervus* (Deer); and lastly, *Buffelus mindorensis*, a small Buffalo. Of land Birds there are 442 species, with no less than 312 peculiar.

Japan.—Although occupying a very similar position with regard to the adjacent continent of Asia to that occupied by the British Isles in relation to Europe, the Japanese islands possess a far larger number of peculiar forms. Thus, of the 42 species of Mammals, no fewer than 27 are peculiar, including a Monkey, two Bats, six Insectivores, six Carnivores, nine Rodents, two Deer and a Pig. The *Erinaceidæ* (Hedgehogs), represented by a single species in Britain, are absent, but the *Ursidæ* (Bears), *Bovidæ* (Oxen), and *Suidæ* (Pigs), are all found in Japan. About 200 species of Birds occur, 17 of which are peculiar. These are principally allied to North Chinese and Siberian forms, but three are of a tropical character, and include a *Treron*, or Fruit-Pigeon.

Formosa.—In this island, whose southern portion enters the Tropics, 36 species of Mammals and 128 species of land Birds are recorded, and of these 10 and 35 respectively are peculiar. The proportion of over a quarter of peculiar land Birds is a very high one, considering the proximity of the island to the mainland. Nearly half the peculiar species of Birds are most closely allied to forms occurring in the Himalayas, Southern India, the Malay Islands and Japan, but absent from the nearest portion of the mainland; while there are eight species common to Formosa and India or the Malay Islands, not found in China. All these facts appear to indicate that a great change must have taken place in the distribution of the Asiatic fauna since the island now under consideration was separated from the adjacent continent.

Celebes.—A good deal of difference of opinion has prevailed, and still prevails, regarding the position which this island should occupy in the schemes of Regions and Sub-regions mapped out for distributional purposes. Originally it formed part of the Australian Region of P. L. Sclater and Wallace, and by the latter author it was placed in his Austro-Malayan Sub-region. Subsequently, however, it was transferred by W. L. and P. L. Sclater to the Oriental Region, where it formed a separate Sub-region. Heilprin regarded it as one of his "Transition Tracts," while Lydekker mapped it as a separate region, with both Oriental and Australian features.

The detailed lists of animals occurring in this puzzling island are of much interest. Of 40 species of terrestrial Mammals, 23 are peculiar, including 3 Primates, 1 Carnivore, 15 Rodents, 2 Ungulates and 2 Marsupials. *Cynopithecus niger* (the Black Ape), *Anoa depressicornis* (the Anoa), and *Babirussa babirussa* (the Babirussa), each belong to a peculiar genus, and are perhaps the most interesting of all the Mammals found in this island, since they have no close allies elsewhere. The Birds of Celebes (excluding the small neighbouring islands) number 207 species, 114 of which are peculiar, and many of which belong to peculiar genera.

Lastly, of about 200 species of Butterflies occurring in the island, something like three-fourths are confined to it, while these insects as a whole present certain peculiarities of shape, size, and colour, which readily distinguish them from their allies in other parts of the Malay Archipelago.

MARINE FAUNAS.

The sea, like the land, is tenanted by forms of life in every part, and these are specially adapted for existence under the peculiar conditions imposed by their surroundings. Not only shallow water, but also the greatest depths ever reached by the dredge and trawl have yielded a rich harvest of interesting creatures representing almost all classes of animals from fishes downwards. But the distribution of marine animals is not governed by the same principles as that of terrestrial forms, and hence the division of the various seas and oceans into regions and sub-regions cannot be so definite.

The most satisfactory, and therefore the usual method of grouping marine organisms is that founded on the depth of the water they inhabit. Three areas may be distinguished, namely, (1) the *Littoral*, embracing all the region from high-water mark down to about 40 fathoms; (2) the *Pelagic*, including the surface of the open ocean; and (3) the *Abyssal*, or deep-sea area. The first of these is characterised by a rich and varied fauna, and may be further divided into (*a*) the shore; (*b*) the true littoral zone, exposed only at low tide; (*c*) the Laminarian zone, extending to a depth of 15 fathoms; and (*d*) the Coralline zone, extending from 15 to 40 fathoms. The Pelagic area likewise possesses a great variety of animal forms, and these are of two kinds, namely, those which drift (known collectively as *Plankton*), and those which swim actively (called *Nekton*). The physical conditions of the ocean abyss are (1) complete absence of sunlight, direct or diffused, with a compensating production of phosphorescence by the inhabitants themselves; (2) a low and uniform temperature; (3) enormous pressure, amounting at some depths to $2\frac{1}{2}$ tons per square inch; (4) absence of plant life, necessitating purely carnivorous habits on the part of the fauna; and (5) perfect stillness of the water. These very peculiar conditions have led to the development of the most extraordinary forms, especially in fishes, which are known to exist at a depth of 2900 fathoms.

Numerous attempts have been made to construct zoological regions for marine forms. Thus the conchologist, Woodward, in 1856, proposed no fewer than 18 marine provinces for Mollusca; Fischer, in his *Manuel de Conchyliologie* (1887), adopts Woodward's scheme and reproduces his map. Again, Günther, in his well-known *Introduction to the Study of Fishes* (1880), proposes the following areas for showing the distribution of Shore Fishes:—

I. The Arctic Ocean.

II. The Northern Temperate Zone.

A. The Temperate North Atlantic.
1. The British district.
2. The Mediterranean district.
3. The North American district.

B. The Temperate North Pacific.
1. The Kamschatkan district.
2. The Japanese district.
3. The Californian district.

III. The Equatorial Zone.

A. The Tropical Atlantic.
B. The Tropical Indo-Pacific.
C. The Pacific Coast of Tropical America.
1. The Central American district.
2. The Galapagos district.
3. The Peruvian district.

IV. The Southern Temperate Zone.

1. The Cape of Good Hope district.
2. The South Australian district.
3. The Chilian district.
4. The Patagonian district.

In 1896 Dr A. E. Ortmann published a useful little treatise under the title, *Grundzüge der marinen Tiergeographie.* In this work, which is based on the study of Decapod Crustaceans, he divides the oceans into the several areas shown on **Plate 2**, where the reader will find an adaptation of the Map given by Ortmann.

Lastly, on the same Plate is shown the scheme of marine areas proposed by P. L. Sclater for Mammals in 1897, and afterwards published in the volume on *The Geography of Mammals* (1899).

PART III.—ZOOLOGICAL

CLASS MAMMALIA (Mammals).

ORDER **PRIMATES**[1] **(Apes, Monkeys, &c.; 370 Species).**

This Order, placed at the head of the animal kingdom, contains, besides Man, five families of Monkeys, forming the Sub-Order **Anthropoidea**, and three families of Lemurs and their allies, constituting the Sub-Order **Lemuroidea**. All the members of the Order are confined at the present day to the warmer regions of the globe, only ranging about 40 degrees north and south of the Equator. They are entirely absent from Australia and the various islands of the Pacific Ocean.

The first three families of the Anthropoidea (*Simiidæ*, *Hylobatidæ* and *Cercopithecidæ*) are exclusively Old World inhabitants, and are much more akin to one another than the other two families (*Cebidæ* and *Callitrichidæ*), which are confined to the New World. The former are known as Catarrhine and the latter as Platyrrhine Monkeys, these terms having reference to the narrowness and the breadth respectively of the septum which separates the nostrils in these two groups. The fossil forms belonging to this Sub-Order extend its range in the New World southwards to the Straits of Magellan, and in the Old World from the Black Sea through Southern and Central Europe to Britain.

The remains of the fossil Anthropoid known as *Pithecanthropus erectus*, probably represent the highest form of animal life known, man alone excepted. By some authors this remarkable fossil, which was discovered in 1894 in the Pleistocene deposits of Java, is assigned to the same family as man himself (*Hominidæ*).

The Sub-Order Lemuroidea is restricted to tropical Africa, the Mascarene Islands and the Oriental region from the Himalayas eastwards to the Philippines and Celebes and southwards to Sumatra, Java and adjoining islands. In past ages Lemuroids also occurred in France and Central Europe and the western half of North America.

SIMIIDÆ (Gorilla, Chimpanzee and Orang-Utan; 3 Species). Plate 3, Map i.

The members of this family, together with the Gibbons or *Hylobatidæ*, closely resemble man in bodily structure, and are hence known as Anthropoid or Man-like Apes. They are all inhabitants of tropical forest regions in the Old World, and lead an almost exclusively arboreal existence. The distribution of the three species is shown separately on the map.

The **Gorilla** (*Gorilla gorilla*) is the most formidable species, and is restricted to tropical Africa, ranging from the Cameroons in the west over the Congo basin to the frontiers of Uganda and German East Africa.

The **Chimpanzee** (*Anthropopithecus troglodytes*) and its races occupy a somewhat more extensive range in the same region, extending westwards as far as Senegambia. It is a smaller animal than the Gorilla, with smaller canine teeth. The remains of another species have been found in the Miocene and Pliocene deposits of India.

In the Oriental region the family is represented by the **Orang-Utan** (*Simia satyrus*). This animal is characterised, like the Gorilla, by its very large canine teeth, and its brain approaches that of man more closely than does that of any other ape. At the present day the Orang is restricted to the dense primeval forests of Borneo and Sumatra, but in the Pliocene period it appears to have inhabited northern India.

HYLOBATIDÆ (Gibbons; 16 Species). Plate 3, Map i.

The Gibbons should, perhaps, be united with the *Simiidæ*, from all of which, however, they may be distinguished by the great length of their arms and by their habit of walking upright. They are purely Oriental in their distribution, being confined to the wooded regions of south-eastern Asia. Their range extends from Assam and the island of Hainan in the north, through Siam and the Malay Peninsula to the islands of Sumatra, Borneo, and Java.

CERCOPITHECIDÆ (Old World Monkeys; 174 Species). Plate 3, Map ii.

This family includes all the Old World true Monkeys, as distinguished from Apes, and is characteristic of the Ethiopian and Oriental regions, but it has no representatives in the large island of Madagascar. In Asia these monkeys extend in an eastward direction as far as Japan, the Philippine Islands and Celebes. The family includes, among others, the Langurs, the Proboscis Monkey, a number of African species of the typical genus *Cercopithecus*, the Mangabeys and Macaques, and the Baboons. Although most of the species are confined to warm regions, yet some of the Asiatic forms can endure a considerable degree of cold, being sometimes found above the snow-line.

The Langurs (*Semnopithecus*) are found in southern Asia and the Malay Archipelago. Over 30 species are known, one of which ascends to a height of 10,000 feet in the Himalayas. The Macaques (*Macacus*) are, with one exception, entirely confined to Asia. The exception referred to is the Barbary Ape, which frequents the mountains of Marocco and Algeria and also occurs on the Rock of Gibraltar, being thus the only species of monkey found in Europe. In the latter locality it is protected by law. The curious Proboscis Monkey (*Nasalis larvatus*) is confined to north-west Borneo, and is the only representative of its genus. The Mangabeys (*Cercocebus*) and the species of the genera *Colobus* and *Cercopithecus* are exclusively African, as are also the Baboons (*Theropithecus* and *Papio*). The skins of two species of *Colobus* and one of *Cercopithecus* are used by furriers, one species of the former genus, found on the west coast of Africa, being in serious danger of extermination, owing to an average annual slaughter of 200,000 animals. The island of Celebes possesses a remarkable and peculiar form, known as the Black Ape (*Cynopithecus niger*). This animal forms a connecting link between the Macaques and the Baboons.

The range of the known fossil species indicates that southern Europe and even Britain once possessed monkeys of this family. The oldest representatives occur in the deposits of Middle Miocene age. At the present day fully two-thirds of the species are African.

CEBIDÆ (Spider-Monkeys, Howlers, Squirrel-Monkeys, &c.; 75 Species). Plate 3, Map ii.

Included in the present family are the American monkeys variously called Spider-Monkeys, Howling Monkeys, Sapajous or Capuchin Monkeys, Squirrel-Monkeys, Titis and Sakis. These creatures pass their whole lives amongst the dense foliage of the great forests which serve as their home, seldom descending to the ground. They are entirely confined to Central and Tropical South America (east of the Andes), having their metropolis in the forests of Brazil. Their northern limit is about the latitude of 23° N. in Mexico, while to the south they extend to Paraguay and the northern Argentine provinces.

The tail in many species is long and prehensile, and is as useful as an additional hand. This appendage reaches its maximum of development in the Spider-Monkeys (*Ateles*).

The Howlers (*Alouata*), which include about six species and form a distinct sub-family, receive their name from the fact that they make the night hideous by their loud discordant cries. The fur of members of this genus is sometimes made up into muffs.

Several fossil species of *Cebidæ* are known, most of which are from the Santa Cruz Formation (supposed Miocene) of Patagonia.

CALLITRICHIDÆ (Marmosets; 35 Species). Plate 3, Map ii.

These pretty creatures are the smallest of all the true Primates, and are restricted in their range to the tropical forests of Central and South America. Only one species has been recorded north of the Isthmus of Panama, occurring as far as Chiriqui, all the rest being confined to the great forests of the Neotropical Region, where they subsist chiefly on fruit and insects.

LEMURIDÆ (Lemurs, Galagos, Lorises and Pottos; 62 Species). Plate 3, Map iii.

In this family are included the true Lemurs (*Lemurinæ*), the Lorises and Pottos (*Lorisinæ*), and the Galagos (*Galaginæ*). The first-named, consisting of 35 species, are entirely confined to Madagascar and the adjacent islands, where they constitute quite half the Mammalian fauna. Some of them are remarkable for their great beauty of coloration. On the other hand, the Lorises or Slow Lemurs (six species) are Oriental, and range from India and Ceylon to Java, Borneo and the Philippines, while the Pottos (three species) are only found in West Africa from Sierra Leone to the Congo. The 18 known species of Galago range over all that portion of Africa which is coloured green in our Map.

The majority of the creatures in this family are nocturnal in their habits, and live nearly all their time among the branches of the trees. Their food consists largely of fruit and various vegetable substances.

Several fossil species have been discovered, all from the Pliocene and Pleistocene of Madagascar.

TARSIIDÆ (Tarsiers; 4 Species). Plate 3, Map iii.

This is a group of singular little animals, the best known of which is found in Sumatra, Borneo, Java, and a few other islands. Two species occur in Celebes and the adjacent isles, while the fourth is a native of the Philippines. The Tarsiers are, like the Lemurs, nocturnal and arboreal creatures. They are only rarely met with and are usually seen going about singly or in pairs.

CHIROMYIDÆ (The Aye-Aye; 1 Species). Plate 3, Map iii.

The single species (*Chiromys madagascariensis*) constituting this family is a strange-looking creature about the size of a cat, and inhabits the island of Madagascar. It is nocturnal and arboreal in its habits, being partial to the sugar-cane forests which abound in the island. It not only

[1] The classification adopted for the Mammalia is, with slight modifications, that of Messrs Flower and Lydekker in *Mammals Living and Extinct*, 1891.

feeds upon the cane, but also upon the wood-boring larvæ affecting it. These it draws from their holes by the aid of its extremely slender third finger, which is specially adapted for the purpose.

ORDER CHIROPTERA (Bats; 858 Species).

The animals comprised in this Order are the only Mammals which are capable of true flight, and, as might be expected from the possession of such an effective method of locomotion, they are extremely widely distributed, being found in all parts of the world—many oceanic islands included—from the Arctic circle southwards. Moreover, in some islands (including New Zealand), they are the only indigenous Mammals. Six families of Bats are here recognised, one of which (*Pteropodidæ*) contains purely fruit-eating species and is sometimes regarded as forming a Sub-Order in itself, under the name of MEGACHIROPTERA, the remaining five being mainly insectivorous and constituting the Sub-Order MICROCHIROPTERA.

PHYLLOSTOMATIDÆ (Vampire-Bats; 144 Species). Plate 3, Map iv.

The members of this family are confined to the tropical and subtropical regions of the New World. Only three species are found in North America, and these only in Texas, California and Florida. On the other hand, they are well represented in the West Indies and Central America. Southwards very few (about three) species extend beyond the tropic; hence the metropolis of this important group appears to be the great Amazonian forest region. A single fossil Vampire-Bat has been described, from the Eocene of Southern France, and if such a species is correctly placed, this fact indicates a much wider distribution of the family in past ages.

The *Phyllostomatidæ* are restricted to forests, and their food is remarkably varied in its nature, some species subsisting entirely on fruit, others both on fruit and insects. Two species are purely blood-suckers, and these have an enormous geographical range, occurring from Central America to southern Brazil and Chili.

RHINOLOPHIDÆ (Horseshoe and Leaf-nosed Bats; 124 Species). Plate 3, Map iv.

In contradistinction to the last family, the *Rhinolophidæ* are exclusively Old World inhabitants, but some of them have a remarkably wide distribution. The Greater Horseshoe Bat (*Rhinolophus ferrum-equinum*), for example, is found throughout southern and central Europe, including the southern half of England, and in most of Africa, while in Asia it ranges from the Himalayas to Japan. The family is represented in all the temperate and tropical parts of the Eastern Hemisphere, with the exception of New Zealand and the greater part of Polynesia. The principal genera are *Rhinolophus*, the Horseshoe Bats, with 75 species, and *Hipposiderus*, the Leaf-nosed Bats, with 40.

The Eocene and Miocene beds of Europe have yielded the remains of about 20 extinct species.

NOCTILIONIDÆ (Free-tailed Bats; 139 Species). Plate 3, Map v.

The members of this family are widely distributed over the warmer regions of the whole world, but are most abundant in the equatorial zone. Only a single species occurs in Europe (*Nyctinomus tæniotis*), and this ranges from Portugal to Switzerland, Italy and Greece. The principal genera are *Taphozous*, with 14 species known as Tomb-Bats, widely diffused over the Ethiopian, Oriental and Australian regions; *Molossus* (Mastiff-Bats), with 25 species, all American, and ranging from Southern California to the Argentine Republic; and *Nyctinomus*, with 51 species, which are scattered over the whole area covered by the family. The New Zealand representative known as *Mystacops tuberculata* is one of the two species of Bat inhabiting that country.

NYCTERIDÆ (False Vampire-Bats; 16 Species). Plate 3, Map v.

The *Nycteridæ* are met with only in the warmer regions of the Eastern Hemisphere and are especially characteristic of the Ethiopian region. Ten species occur in Africa, three of which are wide-ranging, but only one crossing the Tropic of Cancer to occur in Egypt. One is Indian, another Australian, while the remaining four range from Siam through the Malay Archipelago as far as Timor.

The False Vampires, like a few of the true ones, are sometimes addicted to blood-sucking. No fossil forms are known.

VESPERTILIONIDÆ (Typical Bats; 299 Species). Plate 3, Map vi.

In this, the largest family of Bats, are found such well-known British forms as the Long-eared and Daubenton's Bats, the Pipistrelle, Noctule, and Serotine. The species are in general so wide-ranging that it would not serve any useful purpose to give statistics. The family is truly cosmopolitan, no sub-region of the whole world being entirely without representatives. Their range seems only to be regulated by the exigencies of food-supply, for in the New World they occur from Hudson's Bay to the extreme point of South America, and in the Old World from the Arctic circle to Cape Colony and New Zealand.

Several fossil species of this family are known, most of which are from the Eocene and Miocene of France, and others from the Miocene of Germany and the Eocene and Miocene of North America.

PTEROPODIDÆ (Flying Foxes or Fruit-Bats; 136 Species). Plate 3, Map vi.

The Fruit-Bats are limited in their distribution to the tropical and subtropical regions of the Old World, only five species being found in the Palæarctic region (in Egypt, Syria and Arabia). In Australia 36 species are met with, in the Oriental region 41, and in the Ethiopian 35. The distribution of the typical genus *Pteropus* is particularly interesting. Of the 61 known species five occur in Madagascar and the adjacent islands, the rest being essentially Oriental and Australian forms. Moreover, one or two of these Mascarene representatives are only distinguished by very critical characters from the common Indian species. This genus is totally absent from the African continent, although representatives are found in the Comoro Islands, only a couple of hundred miles distant, and even in the island of Pemba, only 37½ miles from the mainland. The evidence provided by this peculiar distribution is used, along with that of other groups of animals, as a basis for the theory that there was formerly a land-connection between India and the islands of the Malagasy sub-region.

To this family belong the three very remarkable species of Tube-nosed Bats (*Gelasinus*) found in North Australia, Celebes, New Guinea and the neighbouring islands.

The Fruit-Bats are so distinct in structure and habits from all other *Chiroptera* that they have been placed in a separate Sub-Order bearing the name of *Megachiroptera*, or Large Bats. They are purely fruit-eating creatures and are much the largest of the Bat tribe, hence the name "Flying Foxes."

ORDER INSECTIVORA (Insectivores; 406 Species).

The members of this Order are comparatively small animals—the largest not exceeding our common Rabbit in size—and in a general sense widely distributed. Representatives are found in all the temperate and tropical parts of the world, with the exception of Australia, New Zealand and the Papuan region. In South America, however, only three species occur, which belong to a typically North American genus of Shrews (*Blarina*), and these only inhabit that portion of South America which lies north of the Equator. In the West Indies, in Cuba and Hayti, only two species of Insectivores are found, which belong to the peculiar family *Solenodontidæ*, whose nearest living allies are to be found far away in Madagascar as another peculiar family, the Tenrecs or *Centetidæ*.

TALPIDÆ (Moles, Mole-Shrews and Desmans; 31 Species). Plate 4, Map i.

The members of this family are entirely confined to the Northern Hemisphere, where they are specially characteristic of the temperate regions, 12 being New World species and 19 being widely distributed over Europe and Asia. Only five species inhabit the Oriental region, all the other Old World representatives being essentially Palæarctic in their distribution. Of the European members of this family the Desmans (*Myogale*) are most interesting from a distributional point of view. Only two species now exist, one of which is confined to the streams of the Pyrenean region and Portugal, while the other is peculiar to the rivers and lakes of south-east Russia and Turkestan. They are both aquatic, and are characterised by not having their fore-limbs modified for digging purposes, as in the true Moles. In former times they were more widely distributed in Europe, where their fossil forms are found in the Middle and Lower Miocene. The Russian species is represented by remains found in the forest-bed on the east coast of England.

While the true Moles (*Talpa*) and the Mole-Shrews (*Urotrichus*) are remarkable for their fossorial habits, the single species forming the genus *Uropsilus*, a creature confined to Tibet and Western China, is cursorial. The Web-footed Moles (*Scalops*), the Hairy-tailed Moles (*Scapanus*) and the Star-nosed Mole (*Condylura*) are confined to North America. The Web-footed Moles are strictly fossorial in their habits and are not swimming animals, as the peculiar structure of their hind feet was formerly thought to imply.

Several fossil species of Moles are known, from the Tertiary beds of Europe and North America.

CHRYSOCHLORIDÆ (Golden or Cape Moles; 16 Species). Plate 4, Map i.

The Golden Moles, so called from the fact that their fur glistens with various metallic tints, are entirely restricted to Africa south of the Equator. They feed mainly upon earth-worms, and live in tunnels which are bored so near the surface of the ground that the earth is raised, enabling the course of the tunnel to be easily traced.

CENTETIDÆ (Tenrecs; 18 Species). Plate 4, Map ii.

The *Centetidæ* are curious hedgehog-like animals, entirely confined to Madagascar and the Comoro Islands, but also introduced into Bourbon and Mauritius. The best-known species (*Centetes ecaudatus*) is a strictly nocturnal animal, found principally in the mountains, living upon worms and insects, and hibernating in the cool season. It is, moreover, the largest representative of the order INSECTIVORA, attaining as it does a length of some sixteen inches.

SOLENODONTIDÆ (Solenodons; 2 Species). Plate 4, Map ii.

The two species of this family are confined to the islands of Hayti and Cuba respectively. It is curious that they should be the nearest relatives of the previous family, and yet be so far removed from them geographically.

SORICIDÆ (Shrews; 229 Species). **Plate 4, Map iii.**

As our figures show, these little mouse-like animals constitute by far the largest family of Insectivores. They are equally remarkable for their extremely wide distribution, being characteristic of the temperate and tropical regions of Europe, Asia, Africa and North America. They are absent, however, from Australia, New Zealand, Polynesia and that part of South America lying south of the Equator. The typical Shrews (*Sorex*) are found in Europe (with two species in Britain), Asia north of the Himalayas and North America; while the Earless or Short-tailed Shrews (*Blarina*) are entirely confined to the New World. The Water-Shrew (*Crossopus fodiens*), absent from Ireland, is found in Britain, in many parts of Europe, and ranges eastwards into Asia as far as the Altai Mts. Only three or four species of this genus are known, which are pretty little animals of aquatic habits forming burrows in the banks of clear streams, rivers or lakes. The Musk-Shrews (*Crocidura*), of which over 120 species are known, range over Southern and Central Europe, Africa and Asia. As their name implies, these animals are remarkable for the possession of a powerful musky odour which arises from glands situated at the sides of the body close behind the fore-limbs.

Nearly all the Shrews are nocturnal land-animals of varied haunts, but a few are aquatic. Several fossil species are known from the European and North American Tertiaries.

GALEOPITHECIDÆ (Flying Lemurs; 8 Species). **Plate 4, Map ii.**

The few known species of Flying Lemurs are entirely restricted to the Oriental region, ranging from Tenasserim and Siam to Java, Borneo, and the Southern Philippines. Although placed among the Insectivores these curious creatures are sharply marked off from the other members of the Order by their leaf-eating habits and method of locomotion. Their so-called flight is only a sort of extended leap or glide through the air, this performance being aided by the curious membrane stretched between the limbs and tail and forming a parachute. Their appellation "flying lemur" is really a double misnomer, for they do not fly and they are not lemurs.

POTAMOGALIDÆ (Potamogale and Geogale; 3 Species). **Plate 4, Map iii.**

This small family includes two species belonging to the typical genus *Potamogale*—singular creatures, the largest rather larger than our common rat—confined to West Africa, and a small mouse-like animal from Madagascar placed in a separate genus (*Geogale*). The continental species are aquatic in their habits, feeding upon fish, and are partial to clear streams, in which they swim with astonishing swiftness; while the mode of life of the insular representative appears to be little known.

ERINACEIDÆ (Hedgehogs; 35 Species). **Plate 4, Map iv.**

In the *Erinaceidæ* are included 31 species of true Hedgehogs (*Erinaceus*), which are widely distributed in Europe, Africa and Asia, and three somewhat ratlike and spineless species, which replace them in Burma and the Indo-Malayan region, and constitute the genus *Gymnura*. The European Hedgehog is a familiar animal with very varied diet. Its nocturnal habits and prolonged winter sleep are well-known. About a dozen species have been met with in the fossil state, one of which (*Anomodon*) is from the Pleistocene of North America, and if rightly placed in this family would indicate a former extension of these animals into the New World.

Since the map illustrating this family was printed, a new genus and species (*Podogymnura truei*) has been described from Mindanao, one of the Philippine Islands.

MACROSCELIDÆ (Elephant-Shrews; 30 Species). **Plate 4, Map iv.**

The Elephant-Shrews, or Jumping-Shrews, as they are sometimes called, are exclusively African, representing in that continent the Tree-Shrews of the next family. With the exception of a single species found in Algeria and Tunis, these animals range from the Cape to Angola and Abyssinia. They differ from the Tree-Shrews in being strictly terrestrial animals, progressing over the ground by a series of leaps. They are nocturnal in their habits and appear to be somewhat rare. A single fossil species has been met with, represented by remains in the Eocene of Southern France.

TUPAIIDÆ (Tupaias or Tree-Shrews; 34 Species). **Plate 4, Map iv.**

The members of this family are entirely confined to the Oriental region and somewhat resemble squirrels in appearance. They range from India through Burma, Indo-China and the Malay Peninsula to Borneo, Sumatra, Java and the Philippines, most of the species being found in the Malay Archipelago, where they are often confined to a single island. A new species from Hainan has been recently described, but too late for insertion in the map. As the popular name implies, they are arboreal creatures, and their food consists of fruit and insects. The few fossil species known are from the Miocene of France and Germany.

ORDER CARNIVORA (Carnivores; 611 Species).

The members of the Order Carnivora are widely distributed, and occur in every zoological region. The Australian region, however, only possesses at most four species, namely, a Dog in Australia (doubtfully native), a Cat in the island of Timor, and two others (of the family Viverridæ) which, though chiefly Oriental in their distribution, nevertheless range into some of the Papuan islands. Of the eleven families constituting the Order, three are marine and form a separate Sub-Order, under the name of *Pinnipedia*. These are the *Otariidæ*, *Odobenidæ* and *Phocidæ*. The Polar Bear is probably found further north than any other mammal, while the southern limit of distribution is carried by one of the *Canidæ* as far as Tierra del Fuego. The Bears (*Ursidæ*) are absent from both the Ethiopian and the Australian regions, and found chiefly in the Northern Hemisphere. With two exceptions, the *Procyonidæ* are confined to the New World, while the *Hyænidæ*, *Protelidæ* and *Viverridæ* are exclusively Old World animals. The other families are of general distribution.

PHOCIDÆ (True or Earless Seals; 19 Species). **Plate 4, Map v.**

The members of this family are almost entirely marine creatures, occurring chiefly along the shores of the Arctic and Antarctic Seas, but also found to some extent in warmer latitudes and in the great inland lakes, especially those of Asia. Three sub-families are recognised, the first of which (*Phocinæ*) includes the Grey Seal (*Halichærus grypus*) and eight species of true seal belonging to the typical genus *Phoca*, whose members are purely inhabitants of the Northern Hemisphere. The Grey Seal ranges over North Atlantic shores from Greenland and Scandinavia to North America, and also inhabits the British seas. The genus *Phoca*, which includes, amongst others, the Common Seal and the Greenland Seal, is distributed practically over the whole of the Northern Hemisphere, having representatives from the extreme north southwards to California, New Jersey, Portugal and Japan. The Common Seal (*P. vitulina*) is resident in British waters, and three others of the genus are more or less rare visitors thereto from the north. This genus also possesses several forms worthy of special mention, inasmuch as they are peculiar to inland waters. Among these are the Caspian Seal (*P. caspica*) and the Baikal Seal (*P. sibirica*), each being confined to the inland sea indicated by its popular name, while Lakes Ladoga and Saima have also each a special form.

The second sub-family (*Monachinæ*) comprises seven species, three of which belong to the genus *Monachus* and are known as Monk-Seals, occurring one in the Mediterranean, another in the West Indies (where it verges on extinction), and the third on the shores of Laysan in Mid-Pacific. The remaining species of this sub-family are the Leopard-Seal (*Ogmorhinus leptonyx*), and three allied species, all confined to Southern seas, and occurring on the pack-ice of the Antarctic Ocean.

The third and last sub-family (*Cystophorinæ*) includes the remaining three species of true or earless seals. Two of these belong to the genus *Macrorhinus* and, from the remarkable development of the snout in the males, are known as Elephant-Seals, one formerly occurring pretty generally in the islands of the South Pacific, South Indian and Antarctic Oceans, but now rapidly becoming extinct, while the other, found on the shores of Lower California and Western Mexico, is also practically exterminated. Lastly, the Crested Seal (*Cystophora cristata*), the typical representative of this sub-family, ranges over the Arctic and North Atlantic shores, from Novaya Zemlya, Spitzbergen and Greenland down the American coast to New Jersey, and in Europe southwards along the coast of Scandinavia. It has occasionally wandered as far as our own shores and even those of France.

From the economic point of view the true seals are important as supplying a valuable oil much used for lighting and lubricating purposes. It has been stated that the total annual quantity of seal-oil obtained is about 90,000 barrels. Moreover, the skin of various species is manufactured into leather and used for a variety of purposes. The species principally hunted at the present day is the Greenland Seal (*Phoca grœnlandica*), which in spring is found abundantly on the ice-floes of the Greenland sea, especially in the neighbourhood of Jan Mayen Island. From this hunting-ground alone about 200,000 animals are procured annually by the sealing fleets despatched for that purpose.

Most seals are gregarious and polygamous, showing great affection for their young and being of a gentle and submissive disposition.

It should be here mentioned that the true Fur-Seals belong to a distinct family (*Otariidæ*), and are dealt with below.

The *Phocidæ* of past ages are known to us from the remains of several extinct European species, from beds of Miocene and Pliocene age.

ODOBENIDÆ (Walruses; 2 Species). **Plate 4, Map vi.**

The huge, unwieldy animals known as Walruses are strictly confined to the Arctic regions, occurring in both hemispheres. The two forms are so closely allied that they are considered by some authors as belonging to a single species. The best-known form (*Odobenus rosmarus*) formerly occurred over the whole of the Polar regions of the Old World and even accidentally in Scotland. It has become through persecution much circumscribed in its distribution in European waters. In the New World it is now confined to the Hudson Bay and Baffin Bay regions and the coasts of Greenland, though formerly ranging as far south as Nova Scotia. The second form inhabits the western Arctic and the North Pacific Oceans, and has a much more limited range than the last. On the American coast it appears to extend southwards only as far as 55° N., and in Asia to latitude 60°.

The food of these animals consists principally of bivalve molluscs and occasionally fish and crustaceans. Economically they are of importance on account of the ivory furnished by their tusks, which, however, is not so good as that of elephants. They also yield oil somewhat inferior to seal-oil, while their hides are tanned and manufactured into harness, bootsoles and tiller-ropes, and have of late become of enhanced value in connection with the polishing of certain parts of the fashionable bicycle.

Two fossil species are known, from the Pliocene of England and Belgium.

OTARIIDÆ (Eared-Seals, Fur-Seals, Hair-Seals, Sea-Lions and Sea-Bears; 14 Species). Plate 4, Map vi.

These animals are distinguished from the *Phocidæ* by the presence of a small external ear, and by the fact that their hind limbs are turned forwards in the direction of the head. They are widely distributed along the shores of the Pacific, ranging from Bering Strait down the western coast of America to California, and from the Galapagos Islands to Tierra del Fuego, and up the eastern coast as far as the Rio de la Plata and Rio de Janeiro. They also range southwards down the Asiatic coast to Japan, along the eastern and southern shores of Australia and New Zealand, and thence across to the Cape of Good Hope. They are quite absent from the North Atlantic. A single fossil species is known, from Parana (La Plata).

In addition to the ordinary covering of long, stiff hairs, certain of the species possess an exceedingly fine, dense and woolly fur. The stiff hair is more deeply rooted than the fine fur, so that when the skin is shaved away from within, the former comes away, leaving the beautiful under-fur intact. By this means the valuable material so much used for wearing apparel under the name of "seal-skin" is prepared, realising from £2 to £10 per hide. The best skins are furnished by young males and females. The largest members of the family are useless as fur-producers, their commercial value being limited to their production of oil and leather. They are consequently distinguished from their smaller and more valuable relatives by the name of "hair-seals."

The first of the three genera included in this family is one containing a single species known as the Southern Sea-Lion (*Otaria byronia*). This animal is a "hair-seal," and inhabits the Galapagos Islands and the South American shores from Peru and Chili round by Tierra del Fuego and the Falkland Islands as far up the Atlantic coast as Rio de la Plata.

The second genus (*Eumetopias*) comprises four species. The first of these (*E. jubata* or *stelleri*), known as the Northern Sea-Lion, is a "hair-seal," inhabiting the shores of the Northern Pacific from Bering Strait to California and Japan, and also the Prybiloff Islands. It is the largest member of the family, sometimes measuring 13 feet in length. The other three species of this genus are also "hair-seals," and inhabit the shores of California, the coasts of Australia and adjacent islands, and the Auckland Islands respectively.

With the third genus, known as *Arctocephalus*, we come to the true "fur-seals," nine in number. Four of these are found in the Northern Hemisphere, the best known of which is the Northern Sea-Bear or Fur-Seal (*A. ursinus*). This is the most important species of all from an economic point of view, and its chief resorts at the present day are the two islands of St Paul's and St George's in the Prybiloff group, although smaller herds are found on the Commander Islands. In former years it ranged over the shores of the northern Pacific from Kamchatka to Japan, and from the Prybiloff Islands to southern California. Enormous numbers of animals inhabit the two islands mentioned above in the summer months, but in the winter they migrate southwards to follow the fish upon which they feed. They return northwards in the following May, or June, collecting in certain spots which have been called "rookeries." Here the males engage in fierce conflicts, first for the possession of the soil, and next for their mates, who arrive about the middle of June. The breeding season lasts until September, and during these few months the islands are visited by the sealers, who are limited by law as to the number permitted to be slain. As is well known, the British Government recently successfully contested the claim of the United States to exclusive sealing in these islands.

The remaining five species of *Arctocephalus* range over the shores of the Southern Hemisphere, from the Galapagos Islands, down the South American coast to the Antarctic regions, Kerguelen Island, the Cape of Good Hope, Crozet Island, Australia, and New Zealand. They are similar to the other Fur-Seals in habits, and are also much sought after by the sealers.

PROCYONIDÆ (Raccoons, Cacomistles, Coatis, the Kinkajou and the Panda; 23 Species.) Plate 5, Map i.

With the exception of the curious animal known as the Panda or Cat Bear (*Ailurus*), which inhabits the south-eastern Himalayas, and the single species of *Ailuropus* mentioned below, the members of this family are entirely confined to the New World, especially Central and South America. The Raccoons (*Procyon*), the typical members of the family, are six in number, and range from Alaska to Paraguay. They are essentially carnivorous, feeding upon a variety of smaller animals, and in the colder part of their range hibernating in the depth of winter. About half a million Raccoons are annually slaughtered for the sake of their fur, which resembles that of the Beaver.

The Panda (*Ailurus fulgens*) has been considered by some authors as the type of a distinct family, by others it has been placed with the Bears (*Ursidæ*), as was also the animal known as *Ailuropus melanoleucus*, to be presently mentioned. The Panda is an animal a little larger than a cat, found in the south-eastern portion of the Himalayas at an elevation of from 7000 to 12,000 feet. Eastwards it extends to Yunnan and Sechuen, but in the opposite direction is unknown beyond Nepal. This interesting species is not carnivorous, but feeds principally upon various fruits, young shoots or roots. The species bearing the name of *Ailuropus melanoleucus*, and recently christened in popular parlance the "Great Panda," is a curious bear-like and extremely rare animal inhabiting the most inaccessible parts of Moupin in Eastern Tibet, and said to be entirely herbivorous.

It is interesting to note that a fossil species of Panda has been found in the English Pliocene Crag, thus indicating a much wider range of the family in the past. Several other extinct species, all true *Procyonidæ*, are known from the Tertiary beds of North and South America.

MUSTELIDÆ (Weasels, Martens, Polecats, Badgers, Otters, &c.; 174 Species). Plate 5, Map ii.

The members of this large family are found in all the zoological regions except the Australian, but are most abundant in the Nearctic, Palæarctic and Oriental regions. Africa has only about a dozen peculiar species, while in South America the family is likewise somewhat poorly represented. Britain possesses half a dozen species, namely, the Pine Marten, Polecat, Stoat or Ermine, Weasel, Badger and Otter.

The present family has been divided into three sub-families, the first of which (*Mustelinæ*) contains the typical forms known as Weasels, Polecats and Martens, and the much larger animals called Gluttons or Wolverenes (*Gulo*). The last-named inhabit the wooded regions of Northern Europe, Asia and America, and three species are known. Fossil remains of Gluttons have been found, though very rarely, in cave and other deposits in England and Wales. They are somewhat bear-like in appearance, almost exclusively nocturnal in habits, and remarkable for their voracity.

The typical genus *Mustela* contains 12 species known as Martens, half of which are found in the Old World, ranging from Britain and Scandinavia through Northern Asia to Kamchatka and in a south-easterly direction as far as Java, Borneo and Palawan. The other six are found in North America from California and Pennsylvania northwards to Alaska, Lake Superior and Labrador. The fur of several species of this genus is much valued, that of the Sable (*M. zibellina*)—a Marten inhabiting the forests of Northern Asia and Kamchatka—deserving special mention. A dark skin of this species from Okhotsk has been known to command a price of £90, the poorest qualities ranging from 4s. to 8s. The American Sable (*M. americana*), a species closely allied to the last, is also of much importance as a fur producer, though the individual skin is not nearly so valuable as that of its Asiatic relative. In some years more than 100,000 skins are imported into Great Britain, chiefly from the Hudson Bay district.

The semi-aquatic Minks, the Polecats, Stoats or Ermines, and Weasels together form the genus *Putorius*, some or other of which range in the Old World from the Arctic shores southwards to Northern Africa, and from Ireland eastwards to Borneo and Palawan, while in the New World they occur from Arctic America southwards through Central America as far as Eastern Peru. The Minks and the Ermine furnish us with fur of considerable value, the latter animal being merely the Stoat in its white winter coat.

The second sub-family (*Melinæ*) contains such well-known animals as the Badgers, Skunks and Ratels. Of the true Badgers (*Meles*, see Map) eight species are known, which are found in Europe and Asia, from about latitude 60°, to the Mediterranean countries, Persia, Tibet, and Southern China. In the New World their place is taken by an animal known as the American Badger (*Taxidea americana*). This is a nocturnal species, ranging from Hudson Bay to Mexico, and hibernating in winter in the colder districts. The common Badger (*Meles taxus*) is similar to its American relative in habits, and its fur is put to much the same uses, being also made into brushes. The Skunks (*Mephitis* and *Conepatus*, see Map) are exclusively American and are wide-ranging. There are several species, all of which are more or less nocturnal in habit, and are well protected by the remarkable nauseous secretion which is so well-known. The Ratels (*Mellivora*), sometimes called Honey-Badgers, are three in number, and are confined to India and Africa.

The third and last sub-family (*Lutrinæ*) contains the Otters, of which 16 species are known. The true Otters (*Lutra*) have a remarkably wide distribution, wider in fact than any other genus of Mammals (with the exception of certain Bats). In the Old World they range from Britain and Scandinavia eastwards to Kamchatka and Japan and southwards to the Cape of Good Hope in the Ethiopian region and to Borneo and Java in the Oriental. In the New World Otters are found from Canada to the Straits of Magellan. The Sea-Otter (*Latax lutris*), the only representative of its genus, is, as its English name implies, marine in its habits, occurring along the Pacific coasts of North America, and also on the shores of Kamchatka and northern Japan. The fur of both this animal and the true Otters is of much value for trimmings. About 9000 skins of the North American species and 1500 of the Sea-Otter are used annually. At recent fur sales in London as much as £240 per skin was realised in the case of the latter.

About 100 species of this interesting family are known in a fossil state. Of these, the great majority are Palæarctic, but a few occur in the Oriental, Nearctic and Neotropical regions. In Europe they date back as far as the Upper Eocene period, and they have been abundant in the Northern Hemisphere since the early part of the Pliocene period.

URSIDÆ (Bears; 29 Species). Plate 5, Map iii.

Bears are widely distributed, and found principally in the northern portions of both the Old and New Worlds. In the former they extend southwards to the Atlas Mountains in North Africa and in Asia to Southern India, Ceylon, Sumatra and Borneo. In America they occur from the Arctic regions south to Mexico and Florida, while two species are found in the Andes from Columbia to Bolivia and Chili. They are thus entirely absent from the Ethiopian and Australian regions.

The Polar Bear (*Ursus maritimus*) is met with throughout the whole of the Arctic regions (see Map). It feeds principally on seals and walrus, but also in some parts of its range upon fish and in summer upon vegetable

matter. The Brown Bear (*Ursus arctos*) ranges over the whole of the Palæarctic region, and was within the historical period a member of the British fauna. It has, however, long been extinct in these islands, and even in Europe its present habitats are chiefly confined to Scandinavia, Russia, Hungary and the Pyrenean Mountains. The Grizzly Bear (*Ursus horribilis*) appears to represent this species in North America, ranging from Alaska to Mexico. Other well-known species are the American Black Bear (*Ursus americanus*), confined chiefly to the mountains in the Eastern United States; the Himalayan Black Bear (*Ursus thibetanus*) ranging from Persia through the Himalayas to Burma, Assam, China, Hainan and Formosa; and the small Malayan Bear (*Ursus malayanus*) found in the Malay Peninsula, Sumatra and Borneo, but also extending westwards to North-eastern India. The Spectacled Bear (*Tremarctos ornatus*) is interesting as being the sole representative of the family in South America, in the Andes. The Sloth Bear (*Melursus ursinus*), one of the commonest mammals of India, is especially characteristic of that peninsula, occurring from the foot of the Himalayas to Cape Comorin, and also in Ceylon. It feeds on insects, fruit and honey, does not hibernate, and differs to a marked degree from all other members of the family, being placed in a genus to itself.

About 30 fossil species of Bears have been described from the Tertiary beds of both hemispheres, the Palæarctic region claiming half this number.

VIVERRIDÆ (Civets, Genets, Mungooses, the Fossa, &c.; 144 Species). Plate 5, Map i.

The members of this family are entirely confined to the Old World, and are especially characteristic of the Ethiopian and Oriental Regions. The only species occurring outside these areas are about half a dozen Genets (*Genetta*) found in southern Europe, Asia Minor and Palestine, and the Egyptian Mungoose or Ichneumon (*Herpestes ichneumon*), an animal held sacred by the ancient Egyptians and inhabiting the south of Spain, Asia Minor and Africa north of the Sahara. The Viverridæ are divided into three sub-families, namely, the *Viverrinæ*, *Herpestinæ* and *Cryptoproctinæ*.

The first and typical sub-family (*Viverrinæ*) includes, amongst others, the Civets (*Viverra*), the *Genets* (*Genetta*), the Palm-Civets (*Paradoxurus*), and a number of smaller genera containing less known forms. Both the Oriental and Ethiopian regions possess representatives of this sub-family, whose members are remarkably fierce and rapacious for their size. The typical Civets (*Viverra*), nine in number, are chiefly Oriental, two species only inhabiting tropical Africa, and one being confined to Java, Ceylon, Socotra, Madagascar and the Comoro Islands. The remainder range over India, Ceylon, the Burmese countries, &c., as far as Celebes, the Philippines and Amboyna. The Genets (*Genetta*) include, in addition to the Palæarctic species alluded to above, about 30 others which are purely African, ranging from Senegal and Abyssinia to the Cape. In Madagascar there occurs a remarkable representative of this sub-family, namely, Daubenton's Civet (*Fossa fossa*).

The second sub-family (*Herpestinæ*) contains the animals known as Mungooses (*Herpestes*, &c.), the Meerkat (*Suricata*), and a few small genera. The majority of the species are Ethiopian, only 11 (belonging to the typical genus *Herpestes*) being found in the Oriental and Palæarctic regions. Half a dozen species, placed in four closely allied genera, are peculiar to Madagascar, and have been placed by some authors in a distinct sub-family.

The third sub-family (*Cryptoproctinæ*) contains a peculiar animal confined to Madagascar, known popularly as the Fossa (*Cryptoprocta ferox*), and forming a connecting link between the present family and the *Felidæ*, in which it is sometimes placed. Little is known of this creature's habits, beyond the fact that it is nocturnal. It is about five feet in length and is the largest carnivore found in the interesting island it inhabits.

About 30 fossil species of *Viverridæ* are known, which are chiefly from the European Tertiary beds.

PROTELIDÆ (The Aard-Wolf or Earth-Wolf; 1 Species). Plate 5, Map iv.

The curious and puzzling animal (*Proteles cristatus*) for which this family has been constituted inhabits South and East Africa. It is closely allied to, and somewhat resembles, the Hyænas, though smaller in size and with a different arrangement of teeth. It is a burrowing and nocturnal animal, and feeds on decaying animal substances, larvæ and termites. The Aard-Wolf is of a timid disposition and only rarely met with.

HYÆNIDÆ (Hyænas; 17 Species). Plate 5, Map iv.

At the present day Hyænas are confined to the warmer regions of the Old World, though in former ages they were much more widely distributed. The Brown and the Spotted Hyænas (*Hyæna brunnea* and *crocuta*) are restricted to tropical and South Africa, ranging from Upper Egypt and Somaliland across to Senegal and southwards to the Cape. The Striped Hyæna (*H. striata*) extends from Marocco and Algeria through Asia Minor, Egypt and Arabia to the Transcaspian region and India. It is doubtful whether the other forms recently described should rank as distinct species. Probably they are mere local races. About a dozen fossil species have been described, mostly from the Miocene and Pliocene of Europe and Asia.

The Cave-Hyæna, formerly regarded as a distinct species under the name of *Hyæna spelæa*, but now recognised as a large race of the existing Spotted Hyæna (*H. crocuta*) of Africa, was in prehistoric times a native of Britain, but not of Ireland. Its remains have been found in the Forest bed of Norfolk, and in cavern and other Pleistocene deposits in England and Wales.

CANIDÆ (Dogs, Foxes, Wolves and Jackals; 104 Species). Plate 5, Map v.

This family may almost be called cosmopolitan, as its members occur throughout the New World from Greenland to Patagonia and the Falkland Islands, while in the Old World they are found in every part of Europe, Asia and Africa. The West Indies, Madagascar, the Philippines, New Guinea and New Zealand, however, are entirely without representatives, while the only species found in Australia is a doubtful native, though occurring in a wild state at the present day.

Many well-known species have a remarkably wide distribution. Among these may be mentioned the Common Wolf (*Canis lupus*)—see map—which, excluding some of the domesticated dogs, is the largest living representative of the family. This fierce animal, formerly abundant in the British Islands, but extinct since the reign of Henry VII., now ranges over Europe and Northern Asia from France to Japan and southwards to Persia, Beluchistan and Northern India. An allied species or race is widely distributed in the New World from Greenland to Mexico. The Common Fox (*Vulpes vulpes*) and the Jackal (*Canis aureus*)—see map—also furnish examples of very wide-ranging species, the former occurring in the Palæarctic, Ethiopian and Oriental regions, and also the Nearctic region, if we include several forms from North America, described by some authors as distinct species, but probably only local races.

The Antarctic Wolf (*Canis antarcticus*), a small species inhabiting the Falkland Islands, and the Magellanic Dog (*C. magellanicus*) are interesting as representing the family in the extreme south of the Neotropical region. The Dingo (*C. dingo*) is the only member of the family found in Australia. Some doubt exists as to the origin of this species, and it is commonly supposed to have been introduced by human agency, and to have sprung from some Asiatic form. It is found in considerable numbers throughout wooded districts, and is very destructive to sheep and poultry.

Other interesting species of *Canidæ* are the Arctic Fox (*Vulpes lagopus*), which extends over the Polar regions of both Old and New Worlds, ranging as far south as Iceland and Northern Europe; the Coyote (*Canis latrans*), a species allied to the Common Wolf, and found in many parts of North America; and the pretty long-eared Fennecs of Africa, placed in a separate genus (*Fennecus*) by some writers. The Cape Hunting-Dog (*Lycaon pictus*), found in S. and E. Africa, is a curious-looking blotchy or spotted animal, differing from all other members of the family in possessing only four toes to each foot. The Long-eared Dog (*Otocyon megalotis*), occurring in the same region as the last, but of somewhat more restricted range, is remarkable for its peculiar dental characters.

Lastly, the Bush-Dog (*Icticyon venaticus*) found in Brazil and British Guiana, is worthy of mention as likewise forming a genus to itself, on the ground of its singular tooth-formula.

The fur of many species of *Canidæ* is of high value for cloaks and other articles of clothing. The Silver Fox (*Vulpes argentatus*) of the Canadian region, for instance, furnishes a hide valued at from £100 to £170.

Over 160 fossil species of *Canidæ* have been described, many of which present characters which render the institution of separate sub-families necessary.

FELIDÆ (Cats, including the Lion, Tiger, Leopards, Jaguar, Puma, Serval, Ocelot, Caracal and Lynxes; 84 Species). Plate 5, Map vi.

Representatives of this important family are found in most parts of the world, with the exception of Madagascar and the Australian Region (a single species, however, occurring in the island of Timor). Many well-known animals are included in the typical genus *Felis*, which merit separate treatment. Of these the Lion (*Felis leo*)—see map—is undoubtedly the chief. At the present day it is chiefly found in Africa, occurring from Algeria to the Orange River, but also found in Mesopotamia, Persia and a limited area in the north-west of India. Formerly, within the historic period, this noble species had a more extensive range, covering not only the whole of Africa but also the south of Asia (including most of Northern and Central India), Syria, Asia Minor, and even South-eastern Europe. In Pleistocene times it penetrated as far as France, Spain and the British Isles, as testified by fossil teeth and bones which cannot be distinguished from those of the species as it now exists.

Next in importance is the Tiger (*Felis tigris*)—see map—an animal which can fairly dispute with the Lion its title of "King of Beasts." It is confined to Asia, and has a remarkably wide distribution. Westwards its range is limited by the Caucasus, whence it extends through Northern Persia, Turkestan and Afghanistan across to Manchuria and the island of Saghalien. Southwards it is found all over the Malay Peninsula and Siam, and as far as Sumatra and Java. Although occurring throughout India it is entirely absent from Ceylon. In the Himalayas the Tiger occurs up to a height of 6000 or 7000 feet. In the colder regions it appears to form a distinct race, characterised by a thicker and longer coat.

The Leopard (*Felis pardus*) is still more widely distributed. It is a very variable species, and many names have been applied to its various forms. By the majority of writers, however, these are all considered to constitute a single species, including the larger and more robust varieties for which the popular name of Panther has been used. In Africa the Leopard occurs from Algeria, Egypt and Somaliland southwards to Cape Colony; in Asia it is met with throughout India, Ceylon, Burma and the Malay Archipelago, while further northwards it ranges from Syria and Persia across to Japan, not occurring, however, so far north as Siberia nor, like the Tiger, on the high Tibetan plateau. Remains of the Leopard have been found in caverns in Britain.

The Ounce or Snow Leopard (*Felis uncia*) is a beautiful creature whose habitat was for a long time unknown, but which is now proved to be a native of the high ranges of Central Asia, not occurring below an elevation of 8000 feet. It appears to range from the North-west Himalayas over

the whole of Tibet and northwards to beyond the Altai Mountains. In an easterly direction it reaches Amurland and the island of Saghalien.

Of the smaller Old-World members of the genus *Felis* may be mentioned the Clouded Leopard (*F. nebulosa*) of South-eastern Asia; the Serval (*F. serval*), found throughout Africa; the Caffre or Egyptian Cat (*F. caffra*), an African species of special interest as being the probable ancestor of our domestic pets, and also because it was held sacred by the ancient Egyptians; and the Wild Cat (*F. catus*). The last-named species is widely distributed on the continent of Europe, and in former times was a common inhabitant of our own islands. At the present day, however, it is confined to the northern mountainous districts of Scotland, where it is becoming more scarce every year.

In the New World 35 species of *Felis* are met with, chief of which are the Puma and the Jaguar. The Puma (*F. concolor*)—see map—sometimes called the Cougar, has an exceedingly wide distribution, its range of latitude probably surpassing that of any other Mammal. From the Great Slave Lake and New England in the north, to Patagonia (and perhaps Tierra del Fuego) in the south, it is of pretty general distribution, though becoming scarcer with the march of civilisation. In North America it inhabits principally the Western States, occurring most numerously in Northern Washington. In accordance with the great latitudinal range which it covers, the Puma is subject to a wide variation of temperature, but it is equally at home tracking its prey in the snow or wandering in hot, fetid swamps. It is an expert climber, occurring in the Andes at 11,000 feet, and also lives in the open pampas and prairies. The Jaguar (*F. onca*)—see map—is another very wide-ranging American cat, but does not occur so far north as the Puma. It occurs from Texas and Northern Mexico to 40° S. latitude in Northern Patagonia.

The second genus of *Felidæ* (*Lynx*) is that containing the Caracal and the Lynxes, the latter being the most northern representatives of the family. The former (*L. caracal*) is an animal inhabiting Western Asia from the Transcaspian district to the Eastern Himalayas, and also in Arabia and the greater part of Africa. The true Lynxes, eight in number, are found in the northern and temperate regions of both Old and New Worlds. Five of these are peculiar to North America, while the other three are European and Asiatic. A good deal of difference of opinion exists among zoologists as to the distinctness of all these species, some authorities contending that both Old and New World forms are mere varieties of one. The northern Lynx of the Old World (*Lynx lynx*) inhabits Europe and Northern Asia, from Scandinavia to the Amur district and Saghalien. It seems to have been exterminated from Central Europe, but in Asia it still extends southwards as far as the Himalayas. Its remains have been found in caverns in Britain, but there is no evidence of its occurrence within the historic period. The American species range from the Atlantic to the Pacific, and from the Arctic Ocean and Hudson Bay to Southern California, or even to Mexico.

The third and last genus of *Felidæ* is that known as *Cynailurus*. Only one species is known (*C. jubatus*), which is popularly called the Cheetah or Hunting Leopard. This animal is found in Southern and Western Asia, from Syria and the Caspian region to Central and Western India, and throughout Africa from Algeria and Egypt to the Cape. In South Africa a form occurs (originally described as a distinct species) in which the body is stouter and covered with a thicker and more woolly fur.

The skins of a number of species belonging to this family are of value in commerce, notably the Lion, Tiger, Leopard, Puma, and the Lynxes. They are principally used for rugs, carriage wraps, and saddle-cloths. Of the Canadian Lynx (*L. canadensis*) from 20,000 to 50,000 skins are annually brought into the market.

At least 80 fossil species of *Felidæ* have been described. Of these 50 form a separate and extinct sub-family (*Machærodinæ*), and their distribution is mainly North American and European.

ORDER **RODENTIA (2664 Species).**

The Order of Rodents, or Gnawing Mammals, is a vast assemblage of small or medium-sized animals, all characterised by the habit of gnawing, for which purpose they are provided with a pair of incisor teeth in each jaw, which grow continuously throughout life and which, by their peculiar method of wearing, are always kept chisel-shaped. In this, the largest of the Mammalian Orders, two Sub-Orders are sometimes recognised, the first of which (*Duplicidentata*) contains only the families *Leporidæ* and *Ochotonidæ*, and is characterised by the presence of two pairs of incisor teeth in the upper jaw. The second Sub-Order (*Simplicidentata*), whose members only possess a single pair of such teeth in each jaw, contains all the other families, and is divided into three sections which are distinguished by anatomical characters of a nature that need not be discussed here.

Rodents are cosmopolitan in their distribution, the families having the widest range being the *Leporidæ*, *Hystricidæ*, *Sciuridæ* and *Muridæ*. The last-named possesses representatives in all the regions, while the other three are only absent from the Australian region. The *Ochotonidæ* and *Jaculidæ* are somewhat widely distributed in both North America and the Old World, while the *Octodontidæ* are almost exclusively Neotropical and Ethiopian and the *Castoridæ* Nearctic and Palæarctic. The *Spalacidæ* and *Myoxidæ* are purely Old World inhabitants; the *Lophiomyidæ*, *Pedetidæ*, *Bathyergidæ* and *Anomaluridæ* are confined to the Ethiopian region; the *Geomyidæ* and *Haplodontidæ* only occur in North and Central America; while lastly the *Caviidæ*, *Dinomyidæ* and *Chinchillidæ* are entirely Neotropical in their distribution, and the *Dasyproctidæ* mainly so.

LEPORIDÆ (Hares and Rabbits; 139 Species). Plate 6, Map i.

Hares and Rabbits are of extremely wide distribution, and are found truly indigenous in all the zoological regions save the Australian. Although in Australia and New Zealand Rabbits are at the present day so numerous as to constitute a veritable pest, yet their presence is entirely due to human agency. Only three pairs are stated to have been first turned down in the former country, while now the skins annually exported must be reckoned by millions.

The typical Hares of the genus *Lepus* are widely spread in both the Old and New World. Of the 94 described species 41 are Palæarctic and 28 Nearctic, 19 are Ethiopian, and the remaining half dozen Oriental. The 40 species classed together under the genus *Sylvilagus* are purely American, and the only South American members of the family (about a dozen in number) are placed here. The Common Rabbit is believed to have had its original home in the Spanish Peninsula and other regions in the neighbourhood of the Mediterranean. This familiar animal has been introduced into many parts of the world, and its nearest relative is a species found in South Africa, the two forming the genus *Oryctolagus*.

The British Isles possess three representatives of the *Leporidæ*, viz. the Common Hare (*Lepus europæus*), the Alpine or Mountain Hare (*Lepus timidus*) and the Common Rabbit (*Oryctolagus cuniculus*). The first of these occurs over the whole of England and the greater part of Scotland, but is absent from Ireland. On the other hand, the Mountain Hare occurs throughout the hilly and mountainous portions of Scotland and Ireland, but in England is not indigenous. The third British species is the Common Rabbit, which is abundant in most districts.

About a dozen species of this family are represented by remains in the Miocene, Pliocene and Pleistocene beds of Europe and North America.

OCHOTONIDÆ (Picas; 23 Species). Plate 6, Map i.

These pretty little animals, called also Tailless Hares and Mouse Hares, occur principally in the elevated and desert regions of Northern and Central Asia, a single species just ranging into South-eastern Europe. Seven species occur in the New World, being found in the Rocky and other mountains from Alaska to California. The Picas are shy and active creatures, living chiefly in burrows or the crevices of rocks. Several extinct species have been described, all but one from the European Tertiary beds. *Ochotona pusillus*, the species inhabiting South-eastern Europe, formerly occurred in Great Britain, as evidenced by its remains found in caverns.

DASYPROCTIDÆ or AGOUTIDÆ (Agouties and Pacas; 23 Species). Plate 6, Map ii.

The few species belonging to this family are peculiar to the Neotropical region. One species only is found in the West Indies, occurring in the Lesser Antilles; six are confined to Mexico and Central America; one, known as the Paca (*Agouti paca*) ranges from Mexico to Southern Paraguay; while the remainder are restricted to South America. These elegant rodents are chiefly nocturnal in habit, and dwell in forests or along the banks of rivers. A single fossil species is known, from the Pleistocene of Southern Brazil.

CAVIIDÆ (Cavies; 19 Species). Plate 6, Map iii.

The Cavies, of which the domesticated Guinea Pig (Guiana Pig) is the most familiar example, range over practically the whole of South America, but are absolutely unknown beyond its limits. They are pretty equally distributed over the continent, and the best-known species of the typical genus is that bearing the name of Restless Cavy (*Cavia porcellus*). This creature is generally supposed to be the ancestor of the domestic pet, and ranges from Guiana to the Rio de la Plata. The Patagonian Cavies (*Dolichotis patagonica* and *magellanica*) extend the range of the family southwards to beyond the 50th parallel. The Capybara (*Hydrochœrus capybara*) is noteworthy as being the largest living rodent. This giant of the Order attains a length of about four feet and is found throughout the whole of the eastern part of South America. It is entirely aquatic in its habits, possessing webbed feet, and frequenting the borders of lakes and rivers.

More than 50 extinct species of this family are recognised, the great majority of which are from the Tertiary beds of the Argentine Republic.

DINOMYIDÆ (Dinomys; 1 Species). Plate 6, Map iii.

This family can be dismissed in a few words, since the only representative is the extremely rare creature known as *Dinomys branickii*. This strange rodent, resembling the Paca in general appearance, was first described in 1873 from an example said to have been found wandering in an orchard near a town in Peru. No other example was seen until the year 1904, when Dr. E. A. Goeldi, Director of the Goeldi Museum, Para, received a pair alive in a cage. These animals are described as being of a peaceful and phlegmatic disposition, and devouring great quantities of food, during the disposal of which they maintain an erect position on the hind feet.

CHINCHILLIDÆ or VISCACIIDÆ (Chinchillas and the Viscacha; 14 Species). Plate 6, Map ii.

The members of this small family are of very limited geographical range, the species of true Chinchilla, belonging to the genera *Chinchilla* and *Lagidium*, being confined to the Higher Andes from Peru to the Argentine and Southern Chili, while the animals known as Viscachas (*Viscacia viscacia* and allies), on the contrary, inhabit the open pampas of Argentina. The Chinchillas possess long bushy tails and beautifully soft fur, for the sake of which they are much persecuted. About 30,000 skins are annually brought into the market, the finest of which realise about £5 each. These animals live in burrows in companies of twenty and upwards, and while the Viscachas are mainly nocturnal, seldom venturing out before dusk, the Chinchillas, on the other hand, are frequently met with during the daytime.

At least 60 extinct species have been referred to this family, all of them being from the Tertiary beds of Southern Brazil, the Argentine Republic or Patagonia.

HYSTRICIDÆ and ERETHIZONTIDÆ (Porcupines; 48 Species). Plate 6, Map iv.

Porcupines, taken as a whole, have an extremely wide range, occurring in all the zoological regions save the Australian. In the Old World, however, they are confined to the extreme south of Europe, Southern Asia, and a large part of Africa. These animals may be grouped into two families, which are distinct both zoologically and geographically. The Old World forms, which may be called True Porcupines (family *Hystricidæ*) are terrestrial and nocturnal animals. Some 23 species are known, of which the Common Porcupine (*Hystrix cristata*) is the most familiar. This animal is restricted to the countries bordering upon the Mediterranean, such as Southern Spain and Italy, Sicily, Asia Minor, Palestine and Northern Africa.

The Porcupines occurring in the New World constitute, according to the most modern authorities, the family *Erethizontidæ* (sometimes called *Cœndidæ*). Most of them (genus *Cœndu*) are characterised by the possession of a prehensile tail, fitting them for an exclusively arboreal life, and these are confined to the Neotropical Region. The Canadian and Californian Porcupines, forming the genus *Erethizon*, are, however, purely Nearctic in distribution, ranging from Alaska and Labrador southwards to New Mexico. They are entirely absent from the eastern half of the United States.

About 30 fossil species have been referred to this family, their remains occurring chiefly in the Tertiary beds of Europe and America.

OCTODONTIDÆ (Spiny Mice; 109 Species). Plate 6, Map iv.

This family is characteristic of the Neotropical Region. Only some dozen species are found beyond its limits, and these occur in Algeria, Tunis, tropical and South Africa. The species of *Capromys*, known as *Hutias*, and six in number, are confined to Cuba, Jamaica and the Bahamas, while the genus *Plagiodontia* is represented by a single species in San Domingo. With these exceptions the Spiny Mice are entirely inhabitants of Central and South America, where they range from Nicaragua to Tierra del Fuego. All the members of the family are somewhat rat-like in appearance, and are mostly terrestrial in habit, though some are aquatic and others subterranean. Worthy of special mention is the Coypu (*Myocastor coypus*), an aquatic species about as large again as the Common Rat, which inhabits the banks of rivers and lakes in South America. The under-fur of this animal is of importance in commerce, being used as a substitute for that of the Beaver, and the number of individuals annually sacrificed may amount to half a million.

More than 60 extinct species have been described, only two of which are from the Old World. Most of the others are from the Tertiary beds of Patagonia and the Argentine Republic.

JACULIDÆ (Jumping Mice, Jerboas, &c.; 47 Species). Plate 6, Map vi.

The *Jaculidæ* are practically confined to the Palæarctic and Nearctic regions, only one species occurring beyond the limits of the former, namely, in Western Kordofan. In Central and Northern Europe the family is represented by a single species, belonging to the genus *Sicista*.[1]

The Jerboas, of which there are half a dozen different genera and about 30 species, dwell in the desert regions and steppes of Eastern Europe, Central Asia, and Northern Africa, living in burrows and only venturing out at night, when they hop about like pigmy Kangaroos. The so-called Jumping Mice (*Zapus*), on the other hand, are the sole representatives of the family in the New World. The 12 known species range from the Great Slave Lake and Hudson Bay southwards to California and New Mexico, while within these limits of latitude they occur from Atlantic to Pacific. They frequent damper regions than their Old World relatives, while they are more often seen during the day.

Two fossil species of this family have been described from Southern France.

PEDETIDÆ (African Jumping Hares; 2 Species). Plate 6, Map vi.

As their popular name suggests, these curious animals are confined to Africa. The better known species occurs from the Cape to Angola and the Zambesi, inhabiting both mountains and plains, and possessing habits like those of the Jerboas. The second species was described in 1902 from Ibea, in tropical East Africa.

GEOMYIDÆ (Pouched Rats or Pocket-Gophers; 84 Species). Plate 6, Map v.

The Rodents of this family, together with the Pocket-Mice and their allies of the family *Heteromyidæ* are characterised by having peculiar cheek-pouches, which are lined with hair. They are entirely confined to North and Central America, have a rat-like appearance, and are remarkable from the fact that they pass the whole of their lives underground. The principal genera are *Geomys* and *Thomomys*. The nine known species of the former genus are found to the east of the Rocky Mountains; while the more numerous (about 50) species of *Thomomys*, on the contrary, live chiefly to the west of that range, and penetrate southwards to Mexico. Only eight species of the family are found in Central America.

[1] Since the map was prepared, the discovery of a species of *Sicista* in the island of Saghalien has extended the range of the family eastwards.

HETEROMYIDÆ (Pocket-Mice and Kangaroo Rats; 107 Species). Plate 6, Map v.

These animals are closely related to the *Geomyidæ*, but have a somewhat different distribution, although confined to the New World. The principal genera are *Dipodomys* (Kangaroo Rats), ranging from California and Nevada to Mexico; *Perognathus* (Pocket-Mice), with nearly 40 species occurring from British Columbia to Mexico; and *Heteromys*, with 21 species, three of which occur in South America and one in Trinidad.

SPALACIDÆ (Mole-Rats; 21 Species). Plate 6, Map v.

To this exclusively Old-World family belong a number of strange-looking creatures, all of which are subterranean in their habits, and specially adapted in structure for this mode of life. The three genera of which the family is composed have each a distinct and separate distribution. The members of the typical genus *Spalax*, 13 in number, inhabit South-eastern Europe, South-western Asia, Syria and Northern Egypt. They live in tunnels like those of the Mole, and have their eyes completely covered with skin. The Bamboo-Rats (*Rhizomys*), of which five species are known, are confined to the eastern portion of the Oriental Region; while the three species of the remaining genus (*Tachyoryctes*) are only found in Abyssinia and eastern Central Africa.

Three fossil species of this family have been described, from the Indian Miocene, European Pliocene, and the Pleistocene of Palestine respectively.

BATHYERGIDÆ (African Mole-Rats; 23 Species). Plate 6, Map v.

The *Bathyergidæ* are natives of Eastern and Southern Africa, and differ from the *Spalacidæ* in the nature of the lower jaw and by their possessing premolar teeth. Since the map was prepared a species has been described from Togoland. The most remarkable members of the family are the so-called Naked Sand-Rats (genera *Heterocephalus* and *Fornarina*). They are tiny, almost hairless creatures, which are blind and devoid of external ears, spending the whole of their time burrowing in the sand of the deserts. Three species have been described, two from Somaliland and one from Abyssinia.

MURIDÆ (Rats, Mice, Voles, Lemmings, Hamsters, &c., 1477 Species). Plate 6, Map vi.

This enormous family contains a larger number of species than any other family of Vertebrates, and is cosmopolitan in its distribution. The consideration of the family as a whole, therefore, offers few points of special interest, beyond the fact that it is the only family of Rodents which possesses representatives in either the Australian region or Madagascar.

To accommodate such a large variety of forms 13 sub-families have been formed, based upon certain characters found associated with the molar teeth. The first sub-family (*Hydromyinæ*) contains 11 species, which inhabit Australia, New Guinea, the Ké Islands, and the Philippines. The best-known of these is the Australian Water-Rat or Beaver-Rat (*Hydromys chrysogaster*), an animal of aquatic habits and possessing webbed feet. The next two sub-families (*Rhynchomyinæ* and *Phlæomyinæ*) contain together only four species, which are confined to the Philippines. The fourth sub-family (*Gerbillinæ*) comprises 113 species known as Gerbils, which are found in the Palæarctic, Oriental, and Ethiopian regions, and range from Russia to Mongolia in the north, southwards to Ceylon, and throughout the whole of Africa. The next sub-family (*Otomyinæ*) is purely Ethiopian, containing a dozen species which range from Abyssinia and Somaliland to Angola and the Cape of Good Hope. The *Dendromyinæ* are another Ethiopian sub-family. Twenty-one species belong here, and these occur from Togoland and Abyssinia southwards to the Cape of Good Hope. Next comes the typical sub-family (*Murinæ*) with 463 species. We include among these all the Australian members of the family save the few which belong to the first sub-family. The *Murinæ*, known as true Rats and Mice, are only found in the Old World, with the exception of the Black Rat, the Brown Rat, and the Common House Mouse, which have been carried by ships to all parts of the globe. In Britain there are five representatives of this sub-family, all belonging to the typical genus *Mus*. The Brown Rat (*M. norwegicus* or *decumanus*) was introduced into our islands at a date which is not known with certainty; probably, however, in the eighteenth century. It is now universal, having driven out the Black Rat (*M. rattus*), which was introduced about the fifteenth century and became generally distributed, but is now only locally or occasionally met with. The Common House Mouse (*M. musculus*) is everywhere abundant, while the Harvest Mouse (*M. minutus*) is pretty generally spread over the whole of England and the southern countries of Scotland. The Wood-Mouse or Long-tailed Field-Mouse (*M. sylvaticus*), of which there are several races, is universally distributed in Britain. The eighth sub-family (*Cricetinæ*) includes 28 species of *Cricetus*, known as Hamsters, which are exclusively Palæarctic, and two species of *Mystromys*, found in Central and South Africa. The ninth sub-family (*Nesomyinæ*) is formed for a dozen species of mice found in Madagascar, and these are the only rodents found in that island. The next sub-family (*Sigmodontinæ*) is the largest of all, containing no fewer than 524 species. The whole of these are confined to the New World, and are known as White-footed Mice. The Common White-footed Mouse (*Peromyscus leucopus*) appears to represent the Common House-Mouse of Europe, but is a much prettier animal, owing to the contrast in colour between the upper and under parts of its body. The genera *Percmyscus* and *Oryzomys* contain together nearly half the species of the sub-family. The eleventh sub-family (*Neotominæ*) contains 50 species which are confined to North and Central America, ranging from Alaska and Canada southwards to Guatemala. Then follows an important sub-family, the *Microtinæ*, containing the Voles, the Lemmings, and the

Musquashes. No fewer than 208 species are known, which are about equally divided between the Nearctic and Palæarctic regions. Britain possesses five species, namely, the Common Field Vole (*Microtus agrestis*), the Water Vole (*M. amphibius*), the Orkney Vole (*M. orcadensis*), the Bank Vole (*Evotomys britannicus*), and the Skomer Vole (*E. skomerensis*). The three last-mentioned are peculiar to the British Isles. None of them is known to occur in Ireland. The Lemmings (*Lemmus*), of which half a dozen species are known, inhabit the northern and arctic regions of both Old and New Worlds, and are the only representatives of the *Muridæ* in Greenland, Spitzbergen and Novaya Zemlya. The Musquashes, or Musk-Rats (*Fiber zibethicus*, &c.) are confined to North America, where they range practically over the whole continent. The last sub-family (*Myotalpinæ*) contains six species belonging to a single genus. They are mole-like animals leading a subterranean life and found in Northern and Central Asia.

LOPHIOMYIDÆ (Crested Rats ; 3 Species). Plate 6, Map v.

This small family contains three remarkable Rodents, all belonging to one genus (*Lophiomys*), and found only in North-east Africa from Suakim to British East Africa. Little is known of their habits beyond the fact that they are arboreal, and probably feed upon insects. They are sometimes classed as a sub-family of the *Muridæ*, but present very distinctive features in their skeleton.

MYOXIDÆ (Dormice ; 33 Species). Plate 6, Map vii.

The elegant little animals constituting this family are almost entirely confined to the Palæarctic and Ethiopian Regions. The only two species which occur beyond these limits are the so-called Malabar Spiny Mouse (*Platacanthomys lasiurus*), a native of the extreme south-western portion of the Indian Peninsula and Cochin China ; and a Chinese animal known as *Typhlomys cinereus*, which is confined to the district of Fokien. A single species of the typical genus *Myoxus* is found in the island of Sikok, Japan, the other members of the genus occurring in Europe, Asia Minor, Palestine, Northern Persia, and the Transcaspian region. The Common Dormouse (*Muscardinus avellanarius*), the only British representative of the family, occurs commonly in the southern and central districts of England, ranging as far north as the Lake District. The Ethiopian species of this family are all placed in the genus *Graphiurus*. They are 13 in number, and occur throughout tropical and South Africa, but are entirely absent from Madagascar.

Ten fossil species of Dormice have been described, from the Miocene and Eocene strata of Europe.

CASTORIDÆ (Beavers ; 2 Species). Plate 6, Map v.

The comparatively large Rodents belonging to the present family are represented by only two[1] existing species, namely, the European Beaver (*Castor fiber*) and the American Beaver (*C. canadensis*). The present distribution of the former species in Europe and Asia is for the most part very uncertain, but there are recent records which lead us to conclude that it probably still survives in limited numbers over a wide area. In Norway it certainly survives and is strictly preserved in three districts; on the Lower Rhone one of the writers visited its haunts below the town of Arles in 1896 ; while a few probably still survive in South-eastern Germany, and lower down the Danube in Austria, Hungary and Turkey, in the valley of the Moldau (Bohemia), in Poland and Lithuania, and in Russia in the valleys of the Dnieper and Svislotch. Passing eastwards, we have fairly recent information of its presence in Asia Minor, Mesopotamia, the Caucasus, in the valley of the Pelyin (a tributary of the Obi), and it may possibly be still found in the Lena. The European Beaver was formerly a member of the British fauna to within the historic period.

The New World species was, until quite recently, abundant in North America, ranging from the Arctic Circle to Northern Mexico. Like its Old World relative, however, it is being rapidly exterminated for the sake of its fur. It occurs in Canada, at the present day, in the watershed between the Hudson Bay Rivers and the St Lawrence, in the upper waters of the Fraser and Peace Rivers and along the Rocky Mountain range. It is thinly scattered over the Keewatkin district of the Hudson Bay region, and in Alaska occurs on Stewart River. Formerly abundant over a wide area in the United States, as shown on the map, it is believed by recent writers to be now confined to a few colonies on the slopes of the Rocky Mountains and a few in Wyoming and Montana and as far as the San Pedro river of Sonora.

About 30 extinct species of Beavers are known, all from European and North American Tertiary beds.

HAPLODONTIDÆ (Sewellels ; 5 Species). Plate 6, Map vi.

The few species of this family are confined to a very limited region in the extreme west of North America. They range only from the Columbia River in Washington southwards to California and west of the Rocky Mountains. All are small burrowing animals of semi-aquatic habits, living in small colonies near running water.

SCIURIDÆ (Squirrels, Marmots, &c.; 470 Species). Plate 6, Map vii.

The members of this huge family are found in all the zoogeographical regions except the Australian.[2] They are, however, absent from Madagascar, the southern half of South America, and the West Indies. Three sub-families are usually recognised, the first of which (*Pteromyinæ*) includes only the animals known as Flying Squirrels, of which 53 species have been described. These are, for the most part, natives of the Oriental region, dwelling in the forest, and with nocturnal habits. They range from Kashmir and Eastern Tibet to Southern China, Formosa and Japan, and southwards to Java and Borneo. Although called *Flying* Squirrels, these creatures do not possess the power of true flight, but glide through the air from tree to tree by the aid of an extension of skin which connects their fore and hind limbs. Six species occur in North America, one in Central Asia, and one in Eastern Europe and Siberia.

The diminutive members of this family known as Pigmy Squirrels form another sub-family (*Nannosciurinæ*). Ten species are known, and these have a restricted range in the Oriental and Ethiopian Regions. Seven occur in Malacca, Borneo, Sumatra, and Java, two in the Philippines, while the tenth is confined to the mountains of Gabun in West Africa.

All the remaining species of *Sciuridæ* belong to the typical sub-family (*Sciurinæ*). The creatures known as Spiny Squirrels and their allies (*Xerus*, &c.), of which over 50 species are known, are confined to tropical and South Africa, and are the only representatives of the family in the Ethiopian Region. On the other hand, the typical Squirrels of the genus *Sciurus* (186 species) are entirely absent from this region, though widely distributed in the Palæarctic, Nearctic, Neotropical and Oriental Regions. In Britain the Common Squirrel (*S. vulgaris*) alone represents the family, and is widely spread over the greater portion of our islands, though generally confined to well-wooded districts. The Ground-Squirrels or Chipmunks (*Eutamias*) are mainly confined to North America, where they are exceedingly common. Twenty-eight species have been differentiated, two of which occur in Europe and Northern Asia. The Susliks (*Citellus*), 63 in number, are found only in the Palæarctic and Nearctic Regions, in the latter, however, being confined to the western portion. Lastly, the Marmots (*Marmota*), of which 18 species are known, are natives of the colder portions of both hemispheres. As they range further south they inhabit higher and higher elevations, but towards the northern limit of their distribution they occur on the plains only a little above sea-level. These interesting little animals live in large companies, retiring to their burrows on the approach of winter, and passing the whole of that season there in a deep sleep.

About 40 extinct species have been referred to this family. Most of these are from European Tertiary deposits, but some occur in those of North America.

ANOMALURIDÆ (African Flying Squirrels ; 14 Species). Plate 6, Map vii.

All the species of this family are confined to tropical Africa, and no less than nine out of the total of 14 species are peculiar to the forest regions in the western portion of that continent. They are distinguished from the Flying Squirrels of the family *Sciuridæ* by the fact that the membranous expansion running down both sides of the body is supported by rods of cartilage which proceed from the elbow-joint and not from the wrist. While this membrane assists the animals to perform their flying leaps, their tail affords some aid in climbing from its being provided on its under surface with a row of overlapping hardened scales.

About 40 extinct species have been referred to this family, all from the European Tertiary beds.

ORDER **UNGULATA (542 Species).**

This important Order comprises a number of well-known animals characterised by having their toes enclosed in hoofs, and hence they are sometimes called Hoofed Mammals. All the members of the Order are of large or moderate size, and include the largest known terrestrial Mammals.

The majority of the species are natives of the Old World, only about 60 occurring in America. The most widely distributed families are the *Cervidæ*, which occur in every region except the Ethiopian ; the *Bovidæ*, which are found throughout the Old World and in North America, and the *Suidæ* and *Dicotylidæ*, which, if taken together, are widely represented in every zoogeographical region. Common to the Oriental and Ethiopian regions are the *Elephantidæ*, *Rhinocerotidæ* and *Tragulidæ ;* while the *Hyracidæ*, *Equidæ*, *Giraffidæ* and *Hippopotamidæ* are characteristic of Africa, the two latter not possessing representatives outside that continent. The *Antilocapridæ* are confined to North America, while the *Tapiridæ* and *Camelidæ* are examples of what is known as "discontinuous distribution," the former being represented only in the Oriental and Neotropical regions, and the latter in the Palæarctic and Neotropical regions.

ELEPHANTIDÆ (Elephants ; 2 Species). Plate 7, Map i.

The huge and ungainly animals forming this small family are familiar to all. Only two species are in existence at the present day, namely, the Indian or Asiatic Elephant (*Elephas maximus*) and the African Elephant (*Elephas africanus*), which differ from one another in so many points that they might well be referred to distinct genera, were it not for the fact that they are connected by a long series of extinct forms which present a perfect transition from one to the other.

The well-known Indian species inhabits the forest regions of S.W. and N.E. India, Ceylon, Burma, Assam, Siam, Cochin China, Sumatra and Borneo. Those occurring in Ceylon and Sumatra were at one time regarded as a distinct species, but the slight differences existing in this insular form do not justify its separation. In Southern India and Ceylon Elephants ascend the mountains to a considerable elevation, in the latter sometimes reaching a height of 7000 feet. Being intolerant of the fierce sunshine of their native regions these animals during the hot season

[1] Quite recently three forms from Central Europe have been separated off, under distinct names, but their validity as species is doubtful.

[2] If the island of Celebes, which possesses several species, be regarded as lying in the Australian region, this statement must be modified.

confine their wanderings to the denser parts of the forest, generally near water and in the vicinity of bamboos. When the rains commence, however, they extend their range into the open to feed upon the young and tender grass which springs up at that season.

The African Elephant, distinguished by its enormous ears, is at the present day confined to the wooded districts in the Ethiopian continent south of the Sahara and north of the Cuene and Zambesi Rivers. In Cape Colony it exists and is protected in the Knysna and Addo Bush. Its remains have been found in a fossil state in Spain, Sicily and Algeria, so that it evidently ranged in former ages over a much wider area than it occupies at present. In many districts it is becoming extremely scarce, so persistently has it been hunted for the sake of its ivory, and it must soon become extinct, unless measures—as in the case of the Indian species—are adopted to prevent this lamentable result.

No less than 64 extinct species of *Elephantidæ* have been described, of which 15 belonged to the same genus as the existing species. In the Miocene, Pliocene and Pleistocene periods Elephants roamed over the greater part of Europe (including the British Isles), North Africa, Asia and America from Alaska to the Argentine Republic. The best-known species is that to which the popular name of Mammoth (*E. primigenius*) has been applied. This animal, distinguished by its hairy coat and enormous tusks, had a very extensive range, remains having been obtained from a large number of localities in England, Scotland, Ireland, Central and Southern Europe, Northern Asia and the more northern parts of North America. In Malta and some of the adjacent islands there existed in Pleistocene times a species of Elephant not more than three feet in height, and strange indeed would such a dwarf look to us if restored to the existing fauna of Europe!

PROCAVIIDÆ (Procavia or Conies; 35 Species). Plate 7, Map ii.

The small animals constituting this family (formerly known as Hyracidæ) were at first regarded as Rodents, to which they bear indeed a superficial resemblance. Anatomical investigations have shown, however, that they really belong to the Order Ungulata, though they form a separate Sub-Order to themselves. The various species (all belonging to one genus, *Procavia*) are found in mountainous and rocky districts in Arabia, Syria and Africa, in the latter continent ranging from 20° N. latitude to the Cape, but not occurring in the central portion. They live upon the leaves and shoots of trees and shrubs, and feed principally in the evening or early morning. Nine species possess arboreal habits, and were formerly placed in a distinct genus under the name of *Dendrohyrax*.

RHINOCEROTIDÆ (Rhinoceroses; 5 Species). Plate 7, Map ii.

The unwieldy animals belonging to this family are at the present day absolutely confined to the Oriental and Ethiopian Regions, though, as will be seen below, they had formerly a much more extensive range. Of the three species inhabiting the Oriental Region, that known as the One-horned Indian Rhinoceros (*Rhinoceros unicornis*) is the best known. This species is now practically confined to the great grass jungles of Assam, though it occurred a few years ago in Sikkim and Nepal, and in the sixteenth century also in the Punjab. In a fossil state it has been found far to the south and west, and it evidently at one time ranged over the whole of the Indian Peninsula. The Javan Rhinoceros (*R. sondaicus*) is a smaller animal occurring in Bengal, the Sikkim Terai, Burma, and Assam, ranging also through the Malay Peninsula to Sumatra, Java, and Borneo. The Sumatran Rhinoceros (*R. sumatrensis*) has a similar range to the last, but is absent from Java, and very rare in Assam.

Only two species are found in the Ethiopian Region, namely, the African or Black Rhinoceros (*R. bicornis*) and the Square-mouth, Burchell's, or White Rhinoceros (*R. simus*), as it is variously called. The first of these ranges from Abyssinia through Eastern and Central Africa to Ovampoland and Zululand. The White Rhinoceros is, it is to be feared, verging on extinction, though it is supposed to have formerly inhabited the whole of Cape Colony.

All the members of this family are supposed to feed exclusively upon grass, and consequently their distribution is largely determined by the nature of the vegetation.

When the extinct *Rhinocerotidæ* are taken into consideration, over 100 species have to be dealt with, which have been grouped into five sub-families. These ancient forms roamed over the whole of Europe, Asia, North Africa, and North America, and one species even occurred in the Argentine Republic. Hence this family appears to be gradually disappearing from the face of the earth, and like many other large animals, Rhinoceroses must soon be only represented by museum specimens or fossilised remains.

EQUIDÆ (Horses, Asses, Zebras and Quagga; 15 Species). Plate 7, Map iii.

The few members of this interesting family are at the present day confined to the Old World, and are especially characteristic of Eastern Africa. The Horse (*Equus caballus*), now so universally domesticated and improved for various purposes by breeding, was originally found in both Europe and Asia, probably occurring in a wild state up to near the end of the sixteenth century. At the present day it appears to be confined to Central Asia, where it is known as the Tarpan. Przewalsky's Horse (*Equus przewalskyi*) is an interesting species, or perhaps only a variety, found in the Dzungarian Desert. In America horses in a semi-wild condition now exist in great numbers, but they have all originated from animals introduced since the time of the Spanish Conquest. The Asses, of which about half a dozen species are known, are found in the steppes and deserts of Central Asia and in some parts of North-eastern Africa. The most important of these are the Kiang (*Equus hemionus*), occurring in the high table-lands of Tibet and Mongolia, the Onager (*E. onager*) of Persia and Syria, the Indian and Baluchi Wild Ass (*E. indicus*) of N.W. India and adjoining countries, and the African Wild Ass (*E. asinus*) found in Abyssinia, Somaliland, and adjacent parts of N.E. Africa. Four or five species of Zebra are usually distinguished, including the Mountain Zebra (*E. zebra*), confined to the mountainous districts of Cape Colony, Burchell's Zebra (*E. burchelli*), and its varieties, found in the plains north of the Orange River, and in Damaraland and Angola, and Grevy's Zebra (*E. grevyi*), the largest species, occurring in Shoa and Somaliland. Lastly, the Quagga (*E. quagga*) was formerly abundant in Cape Colony, the Orange River Colony, and Griqualand West, but, thanks to the zeal of the hunter, now exterminated.

The fossil members of this family appear to have had a very extensive range, especially in the New World. Nearly 100 species have been described, and the most interesting fact in connection with these fossil forms is that the series already discovered shows a complete transition from the existing species with a single toe to others long ago extinct with three distinct toes to each foot, while a similar gradation is presented by the structure of the teeth.

BOVIDÆ (Oxen, Musk-Ox, Sheep, Goats, Chamois, Antelopes, &c.; 293 Species). Plate 7, Map iv.

This important family is composed chiefly of Old World forms, only five species occurring in the New World, and these are confined to western and arctic North America. More than half the species are purely African, the other half being distributed over the Palæarctic and Oriental Regions. The Australian and Neotropical Regions and the island of Madagascar are thus without representatives, with the exception of the Javan Ox (*Bibos sondaicus*), which occurs in the island of Timor, and the Anoa (*Anoa depressicornis*), which is confined to Celebes.

The *Bovidæ* are usually divided into ten sub-families, and the significance of their distribution will be best seen by treating of each sub-family separately, commencing with the Antelopes. The first (*Bubalinæ*) contains the animals known as Wildebeests or Gnus (*Connochætes*) and Hartebeests (*Bubalis* and *Damaliscus*) and their allies, of which about 40 species are known. They are confined to Africa, with the exception of one species which ranges into Syria.

The second sub-family (*Cephalophinæ*) contains two genera of Antelopes bearing the names of *Cephalophus* and *Tetraceros*. The first of these contains about 40 species confined to Africa, while the second is represented only by the Four-horned Antelope (*T. quadricornis*), an animal confined to India and differing from all other Ruminants in possessing two pairs of horns in the male.

The third sub-family (*Neotraginæ*) is entirely African, and contains six genera and 33 species. Among the animals placed in this division may be mentioned the Klipspringer (*Oreotragus oreotragus*), the Steinboks (*Pediotragus*, &c.) and Salt's Antelope (*Madoqua saltiana*).

The fourth sub-family (*Cervicaprinæ*) contains three genera and 28 species of Antelope, likewise confined to Africa. Here are placed, amongst others, the Rietbok or Reedbuck (*Cervicapra arundinum*), the Water Buck (*Cobus ellipsiprymnus*) and the Rehbok (*Pelea capreolus*).

The members of the fifth sub-family (*Antilopinæ*) are of much wider range, occurring in the Palæarctic, Oriental and Ethiopian Regions. Thirty-six species are known, of which 26 are known as Gazelles (*Gazella*) and are characteristic of the desert regions of Asia and North Africa. The genus *Æpyceros* contains two species known as Palas, one of which is confined to Southern and South-eastern Africa, and the other to Angola. Most of the other genera are represented by a single species, the best known of which are the Black-buck (*Antilope cervicapra*) of India, the Saiga (*Saiga tatarica*) of South-eastern Europe and Western Asia, the Chiru (*Pantholops hodgsoni*) of Tibet and Sikkim, Clarke's Antelope (*Ammodorcas clarkei*) confined to Somaliland, and the long-necked Waller's Gazelle (*Lithocranius walleri*) occurring in East Africa.

The sixth sub-family (*Hippotraginæ*) contains nine handsome species of Antelopes ranging throughout Africa, Arabia and Syria, and belonging to three different genera. The typical genus *Hippotragus* is represented by the well-known Sable and Roan Antelopes (*H. niger* and *equinus*) and confined to Africa. The five species of *Oryx* are found throughout Africa, and in Arabia and Syria, the best known being that bearing the name of Gemsbok (*Oryx gazella*). The third genus (*Addax*) contains a single species inhabiting North Africa and Arabia.

With the seventh sub-family (*Tragelaphinæ*) we reach the Harnessed Antelopes (*Tragelaphus*), ten in number, the two species of Kudu (*Strepsiceros*), the Elands (*Oreas*), of which likewise two species are known, and the Nilghai (*Boselaphus tragocamelus*). The last-named animal is confined to India, while all the other Antelopes of this group are exclusively African, being found in most parts of that continent.

The eighth sub-family (*Rupicaprinæ*) comprises four genera and 25 species of goat-like animals found in both the Old and New Worlds. The typical genus contains the well-known Chamois (*Rupicapra tragus*), which inhabits the high mountain ranges of Europe from the Pyrenees to the Caucasus, and an allied form occurring in Italy. These familiar animals are gregarious, and extremely agile and sure-footed, jumping from rock to rock with wonderful precision. They feed upon lichen or the scanty herbage clothing the mountain slopes. The Gorals of the Himalayas, Tibet, China and Amurland, and the Serows of South-eastern and Eastern Asia, 20 species in all, form the genus *Nemorrhædus*. Two of the five North American species of *Bovidæ* belongs to the present sub-family. These are (1) the animal inappropriately named from its appearance, the Rocky Mountain Goat (*Haplocerus montanus*), occurring in the mountains from which its popular name is derived, between the latitudes of 36° and 62°; and

(2) an allied species occurring in the mountains of Alaska. Lastly, the remarkable animal known as the Takin (*Budorcas taxicolor*) is placed here. This species inhabits Eastern Tibet and the hills north of Assam, but little appears to be known of it or its habits.

The ninth sub-family (*Caprinæ*) contains the Sheep and Goats—see map—of which 36 species are known, and the curious Musk-Ox. The Palæarctic, Oriental and Nearctic Regions, and also Egypt and South Arabia all possess representatives of this group. The genus *Hemitragus* contains three species of goat from the Himalayas, Southern India and Arabia respectively, while the true Goats (*Capra*) are 16 in number, and range locally over the mountains of Southern Europe, Central Asia and North Africa. The best-known of these are the Spanish Wild Goat (*C. pyrenaica*), the Persian Wild Goat (*C. ægagrus*), and three or four species known as Ibexes. One of the latter, the Alpine Ibex (*C. ibex*), was formerly confined to the Savoy, Swiss and Tyrolean Alps, but is now nearly extinct, occurring only on the Italian side of Monte Rosa. The true Sheep (*Ovis*), 15 in number, are chiefly inhabitants of Asia, but are represented also by one species in Northern Africa, two in Corsica and Sardinia, and four in North America. The Musk-Ox (*Ovibos moschatus*)—see map—of which an eastern and western race may be distinguished, is an interesting animal found in the arctic regions of the New World. It ranges from the 60th up to the 83rd degree of latitude, occurring in Greenland and in America east of the Mackenzie River and Great Slave Lake. In Pleistocene days the Musk-Ox also occurred in Europe and Asia, its remains having been found in Britain, Germany, France and Russia.

The tenth and last sub-family includes the true Oxen, of which six genera and 21 species are known, and which occur in the Palæarctic, Oriental, Australian, Ethiopian, and Nearctic Regions. The first genus contains a single species known as the Anoa (*Anoa depressicornis*). This animal is confined to the island of Celebes, and is the smallest species of Ox known. The Buffaloes (*Buffelus*) comprise seven species, of which the best-known are the Cape Buffalo (*B. caffer*), occurring from the Cape northwards to Abyssinia (one of the four African species), and the Indian Buffalo (*B. bubalus*), occurring truly wild only in India and in a feral state in Burma and the Malay Peninsula. A third species (*B. mindorensis*) occurs in the Philippines (Mindoro). The genus *Bibos* comprises six species, which include the following: The Gaur (*B. gaurus*), a handsome species ranging throughout the forest regions of India, Burma and the Malay Peninsula; the Gayal (*B. frontalis*), occurring wild only in Tenasserim, but domesticated in Assam, Chittagong and the adjoining districts; and the Banting or Javan Ox (*B. sondaicus*), found in Burma, the Malay Peninsula, Java, Borneo, Bali and Timor. The last-mentioned is, as shown above, one of the two representatives of the *Bovidæ* in the Australian Region. The Yaks (*Poëphagus*) are represented by two species inhabiting the high Tibetan plateau and ranging northwards to the Kuen-Luen and Nan Shan mountains, eastwards to Kan-su, and westwards to Ladak. Three species of Bison (*Bison*) are known, one of which, the European Bison (*B. bonasus*), is found at the present day only in the Bielowitza forest of Lithuania, and the Caucasus, where it is protected by law. In the past this species appears to have enjoyed a wide range, its remains having been found over a large area extending from Britain through Central and Southern Europe to Siberia. The American Bison (*B. bison*), now nearly extinct, formerly occupied an extensive area in North America, being most abundant in the west, but occurring eastwards to the Atlantic coast, northwards to the Great Slave Lake, and southwards to Mexico. Lastly, the typical genus *Bos* contains two species, which are at the present day represented only by domesticated breeds. In certain parks in England and Scotland half-wild animals which are descended from *B. taurus* are still preserved, notably at Chillingham Castle in Northumberland and Cadzow Castle in Lanarkshire. The bones of this species have been found over a large area in Europe and also in Algeria.

Of this family about 150 extinct species are known, which occurred chiefly in the Palæarctic and Oriental Regions, with a few in North America. All the sub-families are represented, but the majority of the species belong to the *Bovinæ*, *Hippotraginæ* and *Antilopinæ*. The singular Saiga Antelope (*Saiga tatarica*) was a former member of the British fauna, its remains having been found near London.

TAPIRIDÆ (Tapirs; 5 Species). Plate 7, Map iii.

The members of this family have a most remarkable geographical distribution, the explanation of which must be found in the evidence afforded by the extinct representatives. At the present day a single species, the Malayan Tapir (*Tapirus indicus*) is found in the Old World, ranging from Tenasserim and Southern Siam through the Malay Peninsula to Sumatra. The other four species are found in Central and South America, occurring from Mexico to the northern portion of the Argentine Republic. All the Tapirs are forest-loving creatures, fond of water and feeding on a variety of vegetable substances.

The so-called "discontinuous distribution" presented by these animals is at once explained when cognizance is taken of the fossil forms. At least 60 extinct species are known, the remains of half of which have been found in Europe, one in China, 24 in North America, and the rest (about half a dozen) in South America. It is thus evident that in Tertiary times the family had a wide range, and that the few existing species, separated as they are by a vast extent of sea and land, are merely the remnants of a large group which has been long diminishing in numbers, and which seems eventually doomed to extinction.

ANTILOCAPRIDÆ (the Prong-Buck; 1 Species). Plate 7, Map v.

The Prong-buck or Prong-horned Antelope (*Antilocapra americana*) is an interesting animal, found only in the prairies of western North America, and differing from the true Antelopes in that the horns are shed annually (like those of the Deer family or *Cervidæ*), and are provided with a short lateral branch. To the east its range appears to be limited by the Missouri River, while it extends northwards as far as Saskatchewan and southwards as far as Chihuahua in Mexico.

GIRAFFIDÆ (Giraffes and Okapi; 3 Species). Plate 7, Map v.

The curious and familiar long-necked animal known as the Giraffe is entirely confined to Africa, where it inhabits open districts, from Nigeria, Upper Nubia and Abyssinia, at least as far south as the Kalahari desert and the Transvaal. Several geographical forms have received distinctive names, but these may all be regarded as races of a single species (*Giraffa camelopardalis*). The typical form of the Giraffe was formerly found in Cape Colony, but there is every reason to believe that this is now extinct.

The still more remarkable creature discovered quite recently and bearing the name of the Okapi (*Okapia johnstoni*) has been referred to the present family. The first reliable evidence of the existence of this wonderful new mammal was obtained from some strips of skin (which had evidently been cut from the hind quarters of the animal) sent over to England in 1900 by Sir Harry Johnston, who in the following year managed to procure an entire skin and two skulls. These were obtained in the Semliki Forest, which lies between Lakes Albert and Albert Edward, and further specimens have been obtained in other parts of the great forest region of the Upper Congo. In 1902 an example of the Okapi was secured, which has been supposed to belong to a different species, but as yet this question is far from being settled.

Eighteen extinct species of *Giraffidæ* are known, three of which (from the Tertiary beds of India and Persia) appear to form a separate sub-family. The best known of the latter, the huge *Sivatherium*, exceeded in size any other Ruminant, living or extinct. The other species occurred during the Tertiary period in Southern Europe, Southern Asia and Northern Africa.

CERVIDÆ (Deer; 119 Species). Plate 7, Map vi.

The members of this family have a wide distribution in both the Old and New Worlds, being found in all the zoogeographical regions save the Ethiopian. In the Australian they only occur in certain of the Austro-Malay islands, *e.g.*, Timor and the Moluccas, while the family is totally without representatives in the West Indies.

The *Cervidæ* are divided into four sub-families, which will here receive separate treatment. The first (*Moschinæ*) contains only two species, known as Musk-Deer, and forming a single genus (*Moschus*). The better known of these (*M. moschiferus*) is an animal of some economic importance, since it furnishes the valuable secretion known as musk. This substance is produced by the male alone, in a peculiar scent-gland situated beneath the skin of the abdomen. The species has a wide range, occurring throughout the Himalayas, and extending through Central Asia into Siberia. The second species is confined to the province of Kan-su, in China.

The second sub-family (*Hydropotinæ*) contains two species of Chinese Water-Deer (genus *Hydropotes*), the better known of which inhabits the banks of the Yang-tse-Kiang.

The third sub-family (*Cervulinæ*) comprises 11 species belonging to the genera *Cervulus* and *Elaphodus*. The eight species of *Cervulus* are known as Muntjacs, and inhabit Southern and South-eastern Asia from India and Ceylon to Southern China, Formosa, Sumatra, and Java. Three species of *Elaphodus*, or Tufted Deer, are known, all of which are confined to China.

The last sub-family (*Cervinæ*) includes the true Deer, 104 species in all, of which no less than 42 belong to the typical genus *Cervus*. The members of this genus are found widely distributed in the Old World, ranging from Britain eastwards to Northern China and Japan, and southwards to Algeria, Tunis, Ceylon, Java, and Timor. Two species occur in North and Central America, one of which is the Wapiti Deer (*C. canadensis*), the American representative of our well-known Red Deer. This animal formerly ranged from latitude 60° in Canada southwards to Mexico, but is now much more restricted in distribution. The principal Old World forms are the Red Deer (*C. elaphus*), found throughout temperate Europe, Asia Minor, and North Africa; the Japanese Deer (*C. sika*), occurring in China, Manchuria and Japan; the Indian Spotted or Axis Deer (*C. axis*); and the Fallow Deer (*C. dama*), a native of the countries surrounding the Mediterranean, but introduced many centuries ago into Britain. The eastern limit of this genus is shown by two species occurring respectively in Timor and the Marianne Islands. The Elks (*Alces*) are the giants among existing deer. Five species have been differentiated, one of which ranges from Scandinavia eastwards to the Amur region, while a second, called also the Moose, is North American, until recently occurring from the New England States to British Columbia, and northwards to 70° N. latitude. The genus *Rangifer* (see map) includes the Reindeer (*R. tarandus*), which inhabits the northern regions of the Old World, including Novaya Zemlya and Spitzbergen; the Caribou (*R. caribou*) occurring in Eastern Canada; and about a dozen other forms occurring in the northern portions of both hemispheres, which have received separate names, but which may be mere geographical races. The Roe Deer (*Capreolus*) are represented by five species, of which one is a native of Europe (including Britain) and Western Asia, while another occurs in Northern and Central Asia. The important genus *Cariacus* (called also *Odocoileus*) contains 28 species, all of which are American, ranging from Canada to the Straits of Magellan. Although occurring in Central America, they are absent from the West Indies. Lastly, the genus *Pudua* contains two species found in the Andes of Chili and Ecuador respectively. They are tiny animals, about the size of a hare, with a pair of minute spike-like antlers in the male.

Of extinct species belonging to this family about 130 species are known, whose remains have been found in all the regions inhabited by recent forms.

The most remarkable of all recently extinct species is that inappropriately named the Irish Elk or Irish Deer (*Cervus giganteus*). This animal was really a gigantic Fallow Deer, whose remains have been found in the Irish Peat Bogs, and in the cave deposits and river gravels of England, Ireland and the Isle of Man. The antlers in some specimens measure 11 feet from tip to tip. Remains of the Reindeer are commonly found in caverns and other superficial deposits in Great Britain.

CAMELIDÆ (Camels and Llamas; 4 Species). Plate 7, Map vi.

At the present day this family is represented by two species of Llama found in South America, and two species of Camel found in the Old World. Although containing so few species, this family is extremely valuable to mankind, the Llamas furnishing a beautiful wool much used in the manufacture of articles of clothing, while the Camels are mainly of service as beasts of burden. The smaller of the two species of Llama, known as the Vicugna (*Lama vicugna*), is confined to the mountains of Southern Ecuador, Peru and Bolivia. The other species, known as the Guanaco or Huanaco (*L. huanacus*) has a much wider range, extending from the Andes of Ecuador and Peru as far as the open plains of Patagonia, and even to Tierra del Fuego. From the latter species two domesticated races have arisen, known as the true Llama and the Alpaca. Both these forms have long been bred by man, the former chiefly as a beast of burden and the latter for the sake of its exceedingly long and fine wool.

Of the two known species of Camel, only one is known at the present day in a wild state. This is the Bactrian Camel (*Camelus bactrianus*) found wild only in a restricted desert area in Central Asia, though it is domesticated over a large area extending from the Crimea through Turkestan to Pekin. The other species, known as the Arabian Camel or Dromedary (*C. dromedarius*) is now only known in a domesticated state, but occurring thus throughout Africa, and in Asia Minor and South-Eastern Asia. It is supposed to have originated from some ancestral form in India, and thence to have wandered through Arabia to Africa.

No less than 76 fossil species referable to this family have been described. Of these over 40 are from the Tertiary beds of North America, and form three sub-families unrepresented by any existing species. To the sub-family containing the Llamas and Camels are referred the remaining species, and these are represented by remains in widely separated localities in both Old and New Worlds.

TRAGULIDÆ (Chevrotains; 13 Species). Plate 7, Map v.

The Chevrotains, or Mouse Deer, as they are sometimes called, are represented by two genera, the first of which (*Tragulus*) contains a dozen species which are found in India, Ceylon, Siam, the Malay Peninsula and Archipelago, and the Philippines (Balabac); while the second (*Hyomoschus*) is formed for the reception of a single species known as the Water Chevrotain (*H. aquaticus*), confined to the west coast of Africa, and ranging from Senegambia to the river Congo. The Chevrotains are pretty little creatures without antlers, and intermediate in structure between Deer, Camels and Pigs.

About 30 extinct species of this family are known, of which about half are from the European Tertiary beds.

SUIDÆ and DICOTYLIDÆ (Pigs and Peccaries; 45 Species). Plate 7, Map vii.

These two families, which should perhaps be considered as one, have in conjunction a very wide distribution, and possess representatives in all the zoogeographical regions. The typical genus *Sus*, containing the true Pigs, comprises 29 species, which range over a large area, from Southern and Central Europe to China and Japan, and southwards to Ceylon, Java and New Guinea. Two species occur in Africa, ranging as far south as Senaar and the Sudan. The best known species is the Common Wild Boar (*S. scrofa*), which occurs from Central and Southern Europe to Northern Africa and Western and Central Asia. The Bush-Pigs or River-Hogs (*Potamochœrus*) are five in number, four of which are confined to Africa, and the fifth to Madagascar. The latter is remarkable as being the only Ungulate found in the Malagasy sub-region. In Celebes, Buru, and the Sulu Islands occurs a curious member of the *Suidæ*, known as the Babirussa (*Babirussa babirussa*). This animal is remarkable for its long and peculiarly curved tusks, which bend upwards and backwards, and probably serve as a protection for the eyes when the animal pushes its way through the dense forests which form its home. The genus *Phacochœrus* is represented by two species bearing the popular name of Wart-Hogs, which are confined to Africa, and range from Senegambia and Abyssinia to the Cape.

The Peccaries (*Dicotyles* or *Tayassus*), of which five species are known, are the American representatives of the *Suidæ*, although often regarded as constituting a separate family. They range from Arizona, Texas, and the Red River of Arkansas southwards to the Rio Negro in Patagonia, but are absent from Chili and the West Indies.

The remains of 120 species of Pig-like animals have been described from the Tertiary deposits of both Old and New Worlds. These furnish the evidence upon which the union of the Pigs and Peccaries into one family can be justified. The great majority of these interesting extinct forms lived in Europe and the Western States of North America.

HIPPOPOTAMIDÆ (Hippopotamus; 2 Species). Plate 7, Map vii.

The bulky animals constituting this family are at the present day found in most of the African lakes and rivers south of the Sahara, but are absent from Madagascar. In the extreme south of their range they have become local, and in most localities are in danger of extinction. The common Hippopotamus (*Hippopotamus amphibius*) has a wide range coinciding with that of the family, but the second species (*H. liberiensis*), a much smaller animal, is confined to the district of Liberia in the west of the continent.

Fourteen extinct species of Hippopotamus are known, the remains of which have been found in the Tertiary beds of Europe, Algeria, Madagascar, and South-eastern Asia. The common Hippopotamus was formerly an inhabitant of Britain, as evidenced by fossil remains found as far north as Yorkshire.

ORDER CETACEA (135 Species).

The members of this Order are all aquatic animals, and three out of the four families are purely marine, being found in the seas of practically the whole world. The fourth family, the *Platanistidæ*, is confined to the waters of the Indus, Ganges and Bramaputra in the Old World, and the Amazon, La Plata and some other South American rivers in the New. Cetaceans are animals of large size, and many of them are of economic importance. Some species perform periodical migrations, passing the summer in northern and arctic seas and retreating south on the approach of winter. Others seldom leave the neighbourhood of the ice.

DELPHINIDÆ (Dolphins, Porpoises, &c.; 83 Species). Plate 8, Maps i., ii. and iii.

The *Delphinidæ* are found in the seas of practically the whole world, and some of the species ascend the rivers also to a longer or shorter distance. The Narwhal (*Monodon monoceros*) is an arctic species remarkable for the curious spirally-twisted tusk which sometimes exceeds half the length of the body. This interesting animal is circumpolar, seldom occurring south of 65° N. latitude. It has occurred three times in British seas, while its remains have been found in the Forest bed of S.E. England. The White Whale or Beluga (*Delphinapterus leucas*) is also an arctic species. It occurs as far south as Cape Cod in Massachusetts, and has on several occasions been seen or captured off the British coasts. The Common Porpoise (*Phocæna communis*) is a widely-distributed and well-known species occurring in the North Atlantic and North Pacific Oceans, the European coasts, and the North Sea. It is rare in the Mediterranean, but around the British Isles is exceedingly common. The Killer or Grampus (*Orca gladiator*) is the most formidable member of the family, preying upon other Cetaceans, Seals and Fishes. It is of cosmopolitan distribution and an occasional visitor to British seas. Besides the above, the Pilot-Whale or Black-Fish (*Globicephalus melas*), Risso's Grampus (*Grampus griseus*), two species of Short-beaked Dolphin (*Lagenorhynchus*), the Common Dolphin (*Delphinus delphis*) and the Bottle-nosed Dolphin (*Tursiops tursio*) are also members of the British fauna.

The remains of about 20 extinct species belonging to this family have been described, 16 of which are from the Tertiary deposits of Europe, three from those of North America, and one from the Pleistocene of New Zealand.

PLATANISTIDÆ (Freshwater Dolphins; 3 Species). Plate 8, Map iii.

At the present day this family is only represented by the Gangetic Dolphin (*Platanista gangetica*) inhabiting the Indus, Ganges, Bramaputra and other Indian rivers; the Amazonian Dolphin (*Inia geoffroyensis*), found only in the upper waters of the Amazon and its tributaries, the Orinoco, and certain rivers of Bolivia; and the La Plata Dolphin (*Stenodelphis blainvillei*) confined to the estuary of the Rio de la Plata and the rivers flowing therein. In past ages, however, the family was much more extensive, for the remains of at least 70 species have been found in the Tertiary deposits of Europe, the United States, the Argentine Republic, and Patagonia.

PHYSETERIDÆ (Sperm Whales, &c.; 18 Species). Plate 8, Map v.

The Sperm Whales and their allies are cosmopolitan in their distribution, and hence offer few points of interest to the student of zoological geography. The best-known species, the Sperm Whale (*Physeter macrocephalus*), occurs in all the warmer oceans, ranging about 60° N. and S. of the Equator. It is a gregarious animal, found in "schools" of 15 individuals and upwards. From an economic point of view it is of importance as yielding sperm-oil, spermaceti and ambergris. In British and northern seas males occur only as stragglers. The Common Bottle-nosed Whale (*Hyperoodon rostratus*) is confined to the North Atlantic, ranging northwards as far as Spitzbergen and Baffin Bay during the summer season, and occurring off the British coasts. A second species, however, allied to this, is found in southern seas. The Beaked Whales (*Mesoplodon*) are represented by seven species, occurring in most seas, one of which, known as Sowerby's Whale (*M. bidens*), was originally described from a specimen captured off the coast of Elgin. It is still a somewhat rare species, although widely distributed in the North Atlantic. The other species of this genus occur in southern seas, ranging as far south as New Zealand and the Falkland Islands.

The remains of 78 extinct species have been referred to this family, the majority of which are from the Miocene and Pliocene of Europe.

BALÆNIDÆ (Whalebone Whales; 31 Species). Plate 8, Map iv.

The Whales belonging to this family are easily distinguished from all other Cetaceans by the total absence of teeth, and by the possession of a series of flattened horny plates attached to the palate. These plates are the baleen or "whalebone" of commerce, and hence these animals are of great importance from an economic point of view. Like other families of Cetaceans the Whalebone Whales are represented in all seas, and a number of species

regularly occur around the British Isles. The Right Whales (*Balæna*) are represented by four species, and form a sub-family to themselves. The best-known of these is the Greenland Whale (*B. mysticetus*), which is confined to the Arctic Ocean, but which through persecution is now much restricted in its range. A whale of this species yields about 130 barrels of oil, and from 1000 to 3000 lbs. of whalebone. The price of the latter averages about £3000 per ton, but 20 years ago it realised less than half that amount, owing to the greater abundance of the species. The Southern Right-Whale (*B. biscayensis* or *glacialis*) is still found in the North Atlantic in some numbers, especially to the north-west of Britain. The Hump-Backed Whale (*Megaptera nodosa*) is a rare visitor to our coasts. It has an exceedingly wide distribution in the North Atlantic, while other members of the genus occur in the Southern Hemisphere and in the Pacific, ranging as far south as New Zealand and the Falkland Islands. The Fin-Whales or Rorquals (*Balænoptera*), 18 species of which are known, are the commonest of all the larger Cetaceans, being found in all seas. Sibbald's Rorqual (*B. musculus*)—the largest animal of the present and all times, attaining a length of as much as 85 feet—the Common Rorqual (*B. physalus*), Rudolphi's Rorqual (*B. borealis*) and the Lesser Rorqual (*B. acuto-rostrata*), all occur more or less frequently in British waters. Since the Greenland and Southern Right Whale became comparatively scarce the members of this genus have been much hunted, although the quality of their baleen and the yield of their blubber are much inferior to those of the *Balænas*.

No fewer than 95 extinct species of this family have been described. The majority of these occur in Europe, but they are also represented by remains in the North American Tertiaries and in those of Patagonia and the Argentine Republic.

ORDER **SIRENIA (8 Species).**

In the present Order only two families of existing species are recognised, all of which are purely aquatic in habit. The first of these (*Halicoridæ*) comprises three species found on the shores of the Indian Ocean, and a fourth, now unfortunately exterminated, which formerly occurred in two small islands off the coast of Kamchatka. The second family (*Manatidæ*) likewise contains four species, which inhabit the tropical estuaries and large rivers on both sides of the Atlantic.

HALICORIDÆ (Dugongs; 4 Species). Plate 8, Map vi.

This family comprises three species of Dugong, belonging to the typical genus *Halicore*, and a single species of *Rhytina*, known as the Northern Sea-Cow. The Dugongs are interesting as being probably the originals upon which the fabulous "Mermaids" are founded. The Common Dugong (*Halicore dugong*) is found on the shores of the Indian Ocean, ranging from south of Mozambique to the Philippines, and including Mauritius, the Malabar coast, Ceylon, and the Andaman, Nicobar and Malay Islands. The other two species, only doubtfully distinct from this, occur in the Red Sea and on the Australian coasts respectively. These animals frequent shallow water, where they exist chiefly on various sea-weeds. The Northern Sea-Cow (*Rhytina gigas*), the largest member of the Order, is only known from remains obtained on Bering and Copper Islands off the coast of Kamchatka. By the end of the eighteenth century, and only about 30 years after its discovery, this interesting animal was completely exterminated, and unfortunately is now only represented in our museums by a few imperfect skeletons.

Twenty-three extinct species of this family have been described from the European Tertiary beds, the Eocene of Egypt, the Tertiaries of North America, and the Pliocene of Australia.

MANATIDÆ (called also TRICHECIDÆ) (Manatees; 4 Species). Plate 8, Map vi.

The animals comprised in this family inhabit the bays, estuaries and large rivers on both sides of the tropical portion of the Atlantic Ocean. The American Manatee (*Manatus manatus*) ranges from Florida southwards to about 25° S. latitude, and ascends the great Brazilian rivers almost to their sources. A second species occurs in the Amazon and Orinoco, a third in the rivers of Surinam, and the fourth in those of West Africa from the Senegal to the Congo and Kuanza. Their food consists entirely of various aquatic plants which they devour under water.

Six extinct species are known, one being from the Belgian Oligocene, three from the Miocene and Pleistocene of North America, and one from the Pliocene of the Argentine Republic.

ORDER **EDENTATA (56 Species).**

In this Order are comprised only five families, three of which are inhabitants of the New World and two of the Old. The former are the *Dasypodidæ*, *Bradypodidæ* and *Myrmecophagidæ*, or Armadillos, Sloths and Ant-eaters, which range from Texas southwards to Patagonia. Of the Old World families the *Orycteropodidæ* or Aard-Varks are confined to Africa, while the *Manidæ* or Pangolins are found in tropical and South Africa, and South-eastern Asia.

ORYCTEROPODIDÆ (Aard-Varks; 6 Species). Plate 9, Map iii.

The Aard-Varks, or Earth-Pigs, are exclusively confined to Africa. Six species only are known, the typical one of which is a native of the southern and south-eastern portions of the continent, while the others occur in the more northern regions, from Senegal eastwards. These curious Edentates are insectivorous, feeding upon termites and ants, are nocturnal in habit, and live in burrows which they rapidly excavate by means of their powerful fore-limbs.

Three extinct species of this family are known, one of which belongs to the existing genus.

DASYPODIDÆ (Armadillos; 29 Species). Plate 9, Map i.

The well-protected and singular animals forming this family are exclusively confined to the New World, all but one species (which ranges as far north as Texas) being restricted to Central America and the tropical and temperate parts of South America. The curious external shield upon which they rely for protection and which sometimes is flexible enough to allow the animal to roll itself up into a complete and impenetrable ball, marks these creatures sharply off from all other known mammals. Armadillos vary in size from the tiny form found in the western portion of the Argentine Republic, known as the Pichiciago (*Chlamydophorus truncatus*), which only measures five inches in length, to the Giant Armadillo (*Priodontes giganteus*), a native chiefly of Surinam and Brazil, whose length is a yard. They are all burrowing animals and mainly insectivorous.

The remains of over 100 extinct species have been discovered, all from South American Secondary and Tertiary deposits. Among these are many of gigantic size, of which the best known is the *Megatherium*.

BRADYPODIDÆ (Sloths; 7 Species). Plate 9, Map ii.

Sloths are confined to Central and South America, ranging from Nicaragua to about 30° south of the Equator. They are exclusively arboreal in habit and hence are confined to the forest-regions. By their peculiar structure they are eminently adapted for progression along the branches of the trees among which they live, usually hanging under them by means of their long curved claws. The two genera are distinguished by the number of toes in the fore-limb, and are hence known as Three-toed (*Bradypus*) and Two-toed Sloths (*Cholœpus*). Five species are known of the former genus and two of the latter. Four extinct species have been described, three of which are from the Eocene of Patagonia and the fourth from Madagascar.

MANIDÆ (Pangolins; 8 Species). Plate 9, Map iii.

The strange, scaly animals comprised in this family are exclusively confined to the Ethiopian and Oriental Regions and Celebes. Four species occur in the former, inhabiting Africa south of the Sahara, and being especially characteristic of the western portion of the continent. The four Oriental species range from India and Ceylon to Southern China, the Malay Peninsula and the Archipelago as far east as Celebes. These animals are absolutely toothless, subsisting principally on termites, and dwelling in burrows or the crevices of rocks. Several of them, however, are partially arboreal in their habits.

Two extinct species are known, namely, one from the Eocene of Southern France, and the other from the Pliocene of India.

MYRMECOPHAGIDÆ (Ant-eaters; 6 Species). Plate 9, Map iii.

The Ant-eaters, or Ant-Bears as they are sometimes called, are confined to the Neotropical region, ranging from South-western Mexico to Southern Brazil and Paraguay. The Great Ant-eater (*Myrmecophaga tridactyla*) is the only representative of the typical genus, and is distributed over Central and South America from Guatemala to Paraguay and Northern Argentina. It is a nocturnal and terrestrial animal, feeding entirely upon ants and termites. The Lesser Ant-eater (*Tamandua tetradactyla*) has an equally extensive range, occurring in the forest regions from Mexico to Paraguay. It is, moreover, an essentially arboreal creature, though like its larger relative being mainly nocturnal and feeding upon the same insects. The third genus (*Cycloturus* or *Cyclopes*) is represented by a single species about the size of a rat, known as the Two-toed Ant-eater (*C. didactylus*). This animal is also nocturnal and arboreal, but of more restricted range than either of the preceding. It occurs only in the hottest parts of Central and South America, ranging from Guatemala to Northern Brazil and Peru. No fossil representatives of this family are known.

ORDER **MARSUPIALIA (241 Species).**

The members of this Order, characterised by the possession of a marsupium, or pouch, in which the newly-born young are suspended and protected, are confined to America and the Australian Region. The only American representatives are the *Didelphidæ*, which range from the United States to the Argentine Republic, and the *Cænolestidæ* which are confined to Ecuador and Bogota. The *Macropodidæ*, *Peramelidæ*, *Dasyuridæ* and *Phalangeridæ* are common to Australia, Tasmania, and the Papuan Islands, four species of the last-mentioned family extending the range of the Order as far west as Celebes. The small families of *Phascolomyidæ* and *Notoryctidæ*, on the other hand, are confined to South-eastern Australia and Tasmania, and Central Australia, respectively.

MACROPODIDÆ (Kangaroos; 63 Species). Plate 9, Map iv.

The peculiar leaping Marsupials, known as Kangaroos, are absolutely confined to the Australian Region, 49 being restricted to Australia and Tasmania; one common to North Australia and New Guinea; while the remaining 13 are found in New Guinea and a few small neighbouring islands. The true Kangaroos and Wallabies (*Macropus*) are represented by 25 species,

all but three of which are confined to Australia and Tasmania. The best-known species is the Great Grey Kangaroo (*M. giganteus*) ranging widely over the continent, and called also by the colonists the "boomer," "old man," and "forester." The genus *Dorcopsis*, containing six species, is confined to New Guinea, while the Tree-Kangaroos (*Dendrolagus*), which are remarkable for being chiefly arboreal in their habits, are represented by five species in New Guinea and two in North Australia.

Thirty fossil species of Kangaroo are known, all from the Pleistocene deposits of Australia.

PHALANGERIDÆ (Phalangers; 45 Species). Plate 9, Map v.

The Phalangers are entirely natives of the Australian region. The typical genus *Phalanger* contains thirteen species found principally in the Papuan Islands and North Australia. These animals are popularly known as Cuscuses, and the genus contains the most easterly representative of the family, namely the species found in the Solomon Islands. A few members of this family are able to perform flying leaps by means of a membrane stretched between their fore and hind limbs, and hence are known as Flying Phalangers. The Great Flying Phalanger (*Petauroides volans*) is the largest of these, and occurs only from Queensland to Victoria. The true Flying Phalangers (*Petaurus*) are three in number, two of which are confined to Australia, and the third common to Australia and New Guinea. The beautiful little Shrew-like animal known as the Long-snouted Phalanger (*Tarsipes spenceræ*) is confined to West Australia. Lastly, the curious-looking Koala or Native Bear (*Phascolarctos cinereus*) must be mentioned. This species, the only representative of its genus, is confined to Eastern Australia, ranging from Queensland to Victoria. It is a herbivorous creature, mainly arboreal in its habits, and differing from all other members of the family by being destitute of a tail.

Seven extinct species of *Phalangeridæ* have been described, all from the Pleistocene of Australia.

PHASCOLOMYIDÆ (Wombats; 4 Species). Plate 9, Map vi.

At the present day this family is only represented by four species, viz., the Tasmanian Wombat (*Phascolomys ursinus*), confined to the island indicated by its name; the Common Wombat (*P. mitchelli*) occurring in New South Wales, Victoria, and South Australia; the Hairy-nosed Wombat (*P. latifrons*) found only in South Australia; and a recently described species from Queensland. These creatures are herbivorous and exclusively nocturnal.

Eight fossil species are known, all from the Pleistocene of Australia.

CÆNOLESTIDÆ (Selvas; 1 Genus, 2 Species). Plate 9, Map viii.

This family was constituted in 1895 for the reception of two small Rat-like animals found respectively in Ecuador and Bogota. Their nearest relatives appear to be the members of the *Epanorthidæ*, all of which are extinct, and whose remains occur principally in the Eocene beds of Patagonia.

PERAMELIDÆ (Bandicoots; 20 Species). Plate 9, Map vii.

Bandicoots are confined to Australia, Tasmania and the Papuan Islands. They are small animals, the largest being about the size of a Rabbit, possessing fossorial habits and feeding either entirely on insects or preferring a mixed diet. The typical genus *Perameles*, containing the true Bandicoots, is represented by eight species confined to Australia and Tasmania, and seven in New Guinea and the neighbouring islands. The Rabbit-Bandicoots (*Peragale* or *Thylacomys*) are four in number, and are confined to Australia, while the single species of the genus *Chœropus* is found only in South-eastern Australia. No fossil remains have yet been found which can be referred to this family.

DASYURIDÆ (Thylacine and Dasyures; 42 Species). Plate 9, Map viii.

This family is represented by 23 species in Australia and Tasmania, and 19 in New Guinea and the adjacent islands. The largest of these, and indeed of all the carnivorous Marsupials, is that known as the Tasmanian Wolf or Thylacine (*Thylacinus cynocephalus*). This animal is confined to Tasmania, as is also that known as the Tasmanian Devil (*Sarcophilus satanicus*). The typical genus *Dasyurus* contains seven species known as Dasyures, or Native Cats, four of which are found in Australia and Tasmania and three in New Guinea.

Seven extinct species are known, of which two belong to the genus *Thylacinus* and one to *Sarcophilus*.

NOTORYCTIDÆ (The Pouched or Marsupial Mole; 1 Species). Plate 9, Map vii.

In the year 1891 a curious creature resembling the Mole, both in appearance and habits, was described as the type of a distinct family. This interesting Marsupial appears to be restricted to the deserts of northern South Australia, where it perpetually burrows in the sand by means of its powerful and peculiarly constructed limbs. It has been named *Notoryctes typhlops*.

DIDELPHIDÆ (Opossums; 64 Species). Plate 9, Map viii.

With the exception of the two little-known members of the family *Cænolestidæ*, the Opossums are the sole existing representatives of the Marsupialia in the New World. They are especially characteristic of Central and South America, only two species (with several races) being found in North America, where they range over the Eastern and Southern United States. Only three genera are recognised in this family, and all but two of the species belong to the typical genus *Didelphys*. The members of this genus, the true Opossums, range from the United States through Central and South America to the Argentine Republic. They occur in Trinidad, Dominica, Grenada and St Vincent, but are absent from the remaining West Indies. The true Opossums are arboreal creatures with an insectivorous or omnivorous diet. The Water-Opossum (*Chironectes minimus*), ranging from Guatemala to Southern Brazil, is worthy of special mention, owing to its aquatic habits, for which it is specially adapted by having the hind toes webbed.

In this family 38 extinct species are known. These are from the Tertiary deposits of Europe, North America, and the Argentine Republic.

ORDER MONOTREMATA (5 Species).

The primitive and peculiar egg-laying Mammals which form this Order are limited in their distribution to the Australian region. Only two families are known, namely, the *Echidnidæ*, containing four species found only in Australia, Tasmania and New Guinea; and the *Ornithorhynchidæ* represented by a single species confined to Australia and Tasmania.

ECHIDNIDÆ (Spiny Ant-eaters; 4 Species). Plate 9, Map ix.

The Echidnas, or Spiny Ant-eaters, are confined to Australia, Tasmania, and New Guinea. They are burrowing animals, mainly of nocturnal habits, and feeding upon ants. The typical genus *Echidna* is represented by a single species, inhabiting the whole of Australia, but also occurring as sub-species or races in Tasmania and New Guinea. The Three-toed Echidnas (*Proechidna*), of which three species are known, are confined to New Guinea. In addition to the above-mentioned existing species, remains of a fourth have been unearthed from the Pleistocene deposits of New South Wales.

ORNITHORHYNCHIDÆ (Duck-Bill; 1 Species). Plate 9, Map x.

The curious animal, known as the Duck-bill (*Ornithorhynchus anatinus*), is a creature from 18 to 20 inches in length, possessed of aquatic habits, and only found in the fresh waters of Southern and Eastern Australia and Tasmania. It is an extremely shy animal, living in pairs in burrows which it constructs in the banks of creeks and rivers, feeding upon aquatic insects, small crustaceans or worms, and the female laying a couple of eggs at a time, which in the manner of their development resemble those of Reptiles.

From the Pleistocene deposits of Queensland the remains of a second species of this remarkable genus have been obtained.

CLASS AVES (Birds).

ORDER PASSERIFORMES (Perching Birds; 11,287 Species).

The Passeriformes or Perching Birds are a vast group which head the list in our modern classification of Birds, and which contain considerably more than half the known species of the whole class. The Order contains 58 families, of which 13 have an almost world-wide distribution; 12 have a wide range in, but are confined to, the Old World; while in the New World half-a-dozen are common to the Nearctic and Neotropical Regions. Of the remaining families nine are peculiar to the Neotropical Region, six to the Australian, five to the Ethiopian, and one to the Nearctic, while three are common to the Nearctic and Palæarctic Regions, one to the Ethiopian and Oriental, and two to the Oriental and Australian. They are, as a rule, birds of small size, the Raven being the largest species.

CORVIDÆ (Crows, Choughs, Jays, Nutcrackers, &c.; 330 Species). Plate 10, Map i.

This important family is of world-wide distribution, and over 40 genera are recognised, which may be arranged in four sub-families, as shown on our Map. The true Crows and their relatives the Ravens, Rooks and Jackdaws constitute the typical genus *Corvus*, of which about 70 species have been described. The great majority of these are natives of the Northern Hemisphere, while five, viz., the Jackdaw, Rook, Carrion Crow, Hooded Crow, and Raven, are resident species in Britain. Magpies and Jays may be taken together as forming the sub-family *Garrulinæ*. The former are characteristic of the Palæarctic Region, with one species (*Pica pica*) in Britain, while Jays are more widely distributed, occurring in the Palæarctic, Oriental, Nearctic and Neotropical Regions. The brilliantly coloured members of the genera *Cyanocorax* and *Xanthura* are the South American representatives of the Jays, and are the only *Corvidæ* in that country. Choughs (*Pyrrhocorax*, *Graculus*, and *Corcorax*) are chiefly Palæarctic, but *Corcorax* is an Australian genus, with a single species found in the south-eastern half of that continent. Nutcrackers (*Nucifraga*) are represented by eight species, one of which occurs in North America west of the Rocky Mountains, while the rest are purely Palæarctic, with two species separated from the rest, in the Himalaya Mountains.

PARADISEIDÆ (Birds of Paradise; 70 Species). Plate 10, Map ii.

The Birds of Paradise, so well known for their gorgeous and striking plumage, are confined to the Papuan Islands and the extreme eastern portion of Australia. Only four species are known from the latter country, and five from the Moluccas. All the rest are natives of New Guinea and the small islands adjacent. These beautiful birds inhabit chiefly thickly-wooded hills and ravines, and many of them have a very restricted range.

PTILONORHYNCHIDÆ (Bower-Birds; 36 Species). Plate 10, Map ii.

The Bower-Birds, so named from their interesting habit of constructing bowers or "play-houses," which they decorate with shells, bones, flowers and other objects, are confined to Australia and New Guinea, with a single species in the neighbouring Aru Islands. New Guinea possesses 26 species, while the Australian forms are mostly restricted to the north and east. One of the most familiar is the Satin Bower-Bird (*Ptilonorhynchus violaceus*) which inhabits the coast region of Queensland and New South Wales and is well-known to the natives for its habit of carrying off bright and attractive objects with which to adorn its home. The Cat-Birds (genus *Ælurœdus*) are exceptional members of the family, inasmuch as they do not build bowers, but merely clear a space of ground in which the males assemble for sport.

STURNIDÆ (Starlings; 60 Species). Plate 10, Map ii.

This interesting Old World family apparently has its headquarters in the Oriental Region, for no less than 44 species find either their permanent home there or occur within the area in winter. A dozen genera are differentiated, the typical one (*Sturnus*) containing three out of the four European representatives of the family, and including the common British Starling (*S. vulgaris*) found throughout our islands. *Pastor* contains a single species, the Rose-coloured Pastor (*P. roseus*), which is a native of S.E. Europe and Central Asia, wintering in India and occasionally wandering as far west as Britain. The genera *Sturnopastor*, *Graculipica*, *Acridotheres*, and *Æthiopsar* are purely Oriental in their distribution, while the only species found in the Ethiopian Region is the African Wattled Starling (*Creatophora carunculata*).

EULABETIDÆ (Grackles and Glossy Starlings; 145 Species). Plate 10, Map ii.

The members of this family differ from the true Starlings, to which they are closely allied, by their possessing the so-called rictal bristles, by their laying spotted eggs, and by their mainly arboreal habits. They are characteristic of the Ethiopian and Oriental Regions, but one species occurs in Palestine and the Sinaitic Peninsula. About 40 genera are recognised. The Ethiopian Region is the richest in species, containing nearly half the known members of the family; while the Grackles (genus *Eulabes*) are 11 in number, and range from Northern India to Flores and the Philippine Islands.

EURYCEROTIDÆ (Helmet-Bird; 1 Species). Plate 10, Map ii.

Since Plate 10 was printed the systematic position and scientific name of this family have been changed. It is therefore dealt with under its new name of **Aërocharidæ** (*q.v.*) in its more correct position.

DICRURIDÆ (Drongos; 63 Species). Plate 10, Map ii.

The Drongos, or King-Crows as they are sometimes called, are a family of typically black birds arranged in a dozen different genera and characteristic of the tropical regions of the Old World. About half the species are found in the Malay Archipelago, only one in Australia, and eight in Africa. They inhabit forest as well as open country and are of active habits, strong flight, pugnacious disposition, and insectivorous.

ORIOLIDÆ (Orioles; 70 Species). Plate 10, Map iii.

Although so many species are known, only three genera of Orioles are distinguished. These birds, in which brilliant yellow is a characteristic feature of their plumage, especially of the males, are widely distributed, but confined to the Old World. Only five species occur in Australia, and 15 in Africa, all the latter belonging to the typical genus *Oriolus*. Only one, the Golden Oriole (*O. galbula*), occurs in Europe, where it is a summer visitor, and this has bred occasionally in England.

ICTERIDÆ (Cassiques, Troupials and Hangnests; 186 Species). Plate 10, Map iii.

This large assemblage of birds, although sometimes called "American Orioles," may be more correctly regarded as the New World representatives of the Starlings (family *Sturnidæ*). No fewer than 33 genera have been differentiated, but many of these contain only a single species. Five sub-families are recognised, founded upon the nature of the bill. The great majority of the species are natives of Central and South America, but the best known, bearing the name of the Baltimore Oriole (*Icterus baltimore*) and a few others, range collectively throughout the greater part of the United States and Canada. The Cassiques, forming a sub-family, are principally South American, as are also the parasitic Cow-Birds (*Molothrus*). Many of the members of this family construct wonderful pensile nests, hence one of their popular names.

PLOCEIDÆ (Weaver-Birds; 488 Species). Plate 10, Map iii.

These interesting birds, closely resembling the Finches (*Fringillidæ*) in external appearance, are widely distributed in the Old World, but especially characteristic of the Ethiopian Region, where about two-thirds of the species find their home. Their popular name alludes to the clever manner in which they construct their nests, which are in general shaped something like a chemist's retort, although great variety of form is met with. The birds themselves are often strikingly coloured, possess social habits, and are of a confiding disposition. No fewer than 75 genera have been founded for the reception of this vast assemblage of forms, and these are grouped into two sub-families, namely, the *Ploceinæ*, which includes the typical Weaver-Birds, and the *Viduinæ*, comprising the so-called Whydah or Widow-Birds, the Waxbills, and their allies. With the exception of two genera (*Ploceus* and *Plocella*), containing together seven species, all the members of the *Ploceinæ* are purely Ethiopian. The *Viduinæ* have a much wider distribution.

TANAGRIDÆ (Tanagers; 824 Species). Plate 10, Map iii.

The Tanagers are brilliantly coloured Finch-like birds, confined entirely to the New World, and particularly characteristic of the great forests between the tropics. Only five species, indeed, occur without this region, and these all belong to the genus *Pyranga*. They pass the winter in Tropical America and migrate in summer as far north as Canada and Nova Scotia, so that even these widely-wandering species really belong to the Neotropical fauna. The genera of this family are no less than 69 in number. The birds are described as "bold, lively, and restless," feeding on fruits, insects, and a variety of small invertebrate animals, such as molluscs and worms.

CŒREBIDÆ (Honey-Creepers or Quit-quits; 103 Species). Plate 10, Map iv.

These Tit- and Creeper-like little birds are confined to the Neotropical Region, with the exception of a single species which ranges into Florida. Eleven genera have been described, the typical one (*Cœreba*) containing 23 species. *Certhidea*, a genus comprising nine species peculiar to the Galapagos Islands, is included here, but since our Map was prepared it has been shown by a study of its anatomy to belong more properly to the family *Mniotiltidæ*.

FRINGILLIDÆ (Finches; 700 Species). Plate 10, Map iv.

This important and vast assemblage has an extremely wide distribution, occurring throughout the continents of Europe, Asia, Africa and America. As yet they are unrecorded from the Australian Region, with the exception of three birds, of doubtful affinity, occurring in the Sandwich Islands, and which perhaps ought to be included in the *Drepanididæ*, a family entirely peculiar to those islands. No fewer than 80 genera are recognised, many of which have a very restricted range. Thus *Geospiza*, with 27 species, and *Camarhynchus* with 10, are peculiar to the Galapagos Islands, while *Chaunoproctus*, with a single species, is confined to the Bonin Islands. Finches are characteristic of the Palæarctic Region, and Britain possesses 18 species, of which 10 are resident. Many well-known birds belong to this family, but it is impossible to do more in this place than give their names. Greenfinches, Hawfinches, Chaffinches, Siskins, Linnets, Redpolls, Sparrows, Serin Finches, Grosbeaks, Bullfinches, Crossbills, and a host of others, are all more or less familiar examples.

EMBERIZIDÆ (Buntings; 400 Species). Plate 10, Map iv.

The *Emberizidæ* are so closely related to the *Fringillidæ* or Finches that they are often united with them to form one vast family. Indeed it is sometimes a difficult matter to say to which particular group certain species should be referred. As a rule Buntings may be distinguished by a peculiarity in the bill, namely, the presence of a gap or angle between the tip and the gape. There is generally, too, a hard bony knob on the palate. The distribution of Buntings closely agrees with that of Finches, but they range much further north. About 60 genera are recognised, the typical one (*Emberiza*) containing at least 50 species. Eleven species are on the British list, the commonest being the well-known Yellow Bunting or Yellow Hammer (*E. citrinella*). Of much interest is the Snow Bunting (*Plectrophenax nivalis*), an Arctic species and the most boreal of all birds, which migrates south in winter, and has recently been proved to breed sparingly on the highest mountains in Scotland. *Nesospiza* is also an interesting genus, containing three species confined to the remote islands of Tristan da Cunha and Gough Island.

ALAUDIDÆ (Larks; 230 Species). Plate 10, Map iv.

Larks are specially characteristic of the Palæarctic, Ethiopian, and Oriental Regions, but about a score species are found in the New World, chiefly North America. All the latter are members of the genus *Otocorys*, and are known as Horned Larks. Only some half-dozen forms occur in the Australian Region, and belong to the genus *Mirafra* (Bush-Larks), while Madagascar possesses one species which also belongs to this genus. Six species are on the British list, but only one, the Skylark (*Alauda arvensis*) is a common resident. The Shore-lark (*Otocorys alpestris*) is a winter visitant, while the rest are only of very local or irregular occurrence. Africa seems to be the country best adapted for the Lark family, and many of these birds are specially adapted to dwell in desert regions.

MOTACILLIDÆ (Wagtails and Pipits; 101 Species). Plate 10, Map v.

The members of this family may be readily separated into two groups, viz., the Wagtails (*Motacillinæ*) and the Pipits (*Anthinæ*) and their distribution is shown separately on our Map. The former comprise about 40 species, all belonging to the typical genus *Motacilla*. These are widely distributed over and characteristic of the Old World, although practically absent from the Australian Region. Five species breed in Britain, but two of them only rarely.

The Pipits have a much wider range, indeed they are almost cosmopolitan. Six genera are recognised, but the great majority of the species belong to the typical one (*Anthus*). Only three species occur in North America, one in Australia and Tasmania, and two in New Zealand. The remote island of South Georgia possesses one, as do also the Chatham and Antipodes Islands. Three nest commonly in Britain and four others more or less frequently visit our country.

MNIOTILTIDÆ (Wood-Warblers; 223 Species). Plate 10, Map v.

The Wood-Warblers, sometimes called "American Warblers," are confined to the New World, and no fewer than 27 genera have been differentiated. The genus *Certhidea*, with nine species peculiar to the Galapagos Islands, is regarded by some authorities as belonging to the present family, but is included by us in the *Cœrebidæ* (q.v.). Most of the species have a wide range, since they migrate north and south for long distances to reach their seasonal haunts. They are most plentiful in the central regions, while four genera are peculiar to the West Indies and three to Central America. They are mainly insectivorous in their habits, and are of a shy and restless disposition.

CERTHIIDÆ (Creepers; 48 Species). Plate 10, Map v.

In proportion to the number of known species the Creepers have a very wide range. Only five genera are distinguished, half the species belonging to the typical one *Certhia*, including the only British representative, the Common Tree-Creeper (*Certhia familiaris*). This is a common and generally-distributed resident in these islands, while the genus in general ranges over Northern Europe, Asia and America, as shown in our Map. *Salpornis* contains two species, one Indian and the other Ethiopian, *Rhabdornis* has three, which are confined to the Philippine Islands, while *Climacteris* contains 10 species, all of which are natives of Australia and New Guinea. The beautiful Wall-Creeper (*Tichodroma muraria*) is the sole representative of the remaining genus, and ranges over the mountains of Southern Europe, N.E. Africa, the Himalayas, Central Asia, and Northern China.

MELIPHAGIDÆ (Honey-Eaters; 257 Species). Plate 10, Map v.

These interesting birds are essentially creatures of the Australian Region, only one species crossing the boundary into the Oriental Region, namely *Stigmatops limbata*, which occurs in the island of Bali. Three genera are peculiar to the New Zealand Sub-region and two to the Sandwich Islands. The best-known species are the "Parson-Bird" of New Zealand, and the "Bell-Bird" of the same country. The latter appears to be rapidly becoming extinct, and owes its popular name to the peculiar nature of its song; it must not, however, be confounded with the South American birds of the family *Cotingidæ* bearing the same popular name.

In addition to the distribution indicated on the Map, the family is represented in the Auckland and Chatham Islands.

DREPANIDIDÆ (Drepanis and Allies; 39 Species). Plate 10, Map vi.

These curious and interesting birds, of which 19 genera are known, are entirely confined to the Hawaiian Archipelago. They have some resemblance to Sun-birds in general appearance, but the shape of the bill varies greatly in the different genera, in some being stout and finch-like, and in others long, curved and slender. Many of these birds possess bright and beautiful colours, and they inhabit chiefly the damp hilly forests of the remote islands which form their home.

PROMEROPIDÆ (Promerops; 2 Species). Plate 10, Map vi.

These purely South-African birds were formerly regarded as Sun-birds (*Nectariniidæ*) but are now considered sufficiently distinct to constitute a separate family. One species ranges from Cape Town to Grahamstown, while the second is a native of Natal and the Eastern Transvaal.

NECTARINIIDÆ (Sun-Birds; 244 Species). Plate 10, Map vi.

These beautiful creatures, reminding one strongly of the glorious Humming-birds of the New World, are essentially Ethiopian and Oriental in their distribution. Twenty-one genera are recognised, and the species are almost equally divided between the two regions concerned. Small and graceful, these attractive birds feed mainly on insects. They are fond of honey, but do not, as a rule, hover in front of flowers in the fashion of the well-known Humming-birds. A single species occurs in Syria and Palestine.

DICÆIDÆ (Honey-Peckers; 110 Species). Plate 10, Map vi.

The Honey-Peckers, sometimes called "Flower-peckers," are a peculiarly Oriental and Australian family, the great majority of the species belonging to the typical genus *Dicæum*. All the species inhabiting Australia and Tasmania, nine in number, belong to the genus *Pardalotus*, the best-known form bearing the popular name of Diamond-bird (*P. affinis*). Honey-Peckers are small insectivorous and frugivorous birds, many of them with bright combinations of colour in their plumage. They frequent woods and gardens, and dart about in a lively fashion after the manner of the Titmice.

ZOSTEROPIDÆ (White-Eyes; 175 Species). Plate 10, Map vi.

The great majority of these birds are placed in a single genus *Zosterops*, and have a wide range in the Ethiopian, Oriental, and Australian Regions, but they appear to be most plentiful in the Malay Archipelago. The popular name of "White-Eyes" is due to the fact that in most of the species a characteristic ring of tiny white feathers surrounds the eye. The affinities of the members of this family are somewhat doubtful. They have been placed by ornithologists among the Honey-Eaters, Sun-Birds, and Honey-Peckers, but are usually regarded at the present day as a separate family.

SITTIDÆ (Nuthatches; 60 Species). Plate 11, Map i.

The Nuthatches, of which some five genera are distinguished, have a wide, but interesting, distribution. The typical genus *Sitta*, containing 40 species, includes all the Nearctic and Palæarctic forms of the family, together with a few of Oriental distribution. Four species are found in Europe, one of which, the Common Nuthatch (*S. europæa*), is a native of Britain; and one is peculiar to the Island of Corsica. Eleven species are found in North America. *Dendrophila* is Oriental, with eight species; *Neositta* and *Daphænositta* are confined to Australia and New Guinea, with ten and one species respectively, while Madagascar possesses a single peculiar form, known as *Hypositta corallirostris*. All these birds are small and non-migratory, with climbing habits, and feeding on insects and nuts.

REGULIDÆ (Goldcrests and Kinglets; 27 Species). Plate 11, Map i.

The members of this group are often regarded as a part of the great Warbler family (*Sylviidæ*), but for purposes of geographical distribution it is more convenient to consider them alone. They are essentially Nearctic and Palæarctic creatures, and the majority of the species belong to the typical genus *Regulus*, which includes the two British representatives, the Goldcrest (*R. regulus*) and the Firecrest (*R. ignicapillus.*) The former is a common resident in and winter visitor to these islands, the latter an occasional visitant. They are both inhabitants of pine forests.

CHAMÆIDÆ (Wren Tits; 4 Species). Plate 11, Map i.

This peculiar group of birds is one of the *two* families which are confined to the Nearctic Region. The four species known at the present day have a very restricted range in Oregon and California, where they inhabit arid plains and bushy hill-sides, flitting about in a wren-like fashion and feeding entirely on insects.

PARIDÆ (Tits or Titmice; 241 Species). Plate 11, Map ii.

Although very widely distributed, the *Paridæ* are most numerous in the Palæarctic and Oriental Regions. Twenty-four genera have been differentiated, the chief of which are *Parus*, *Poecile*, *Lophophanes* and *Ægithalus*. They are active little birds, entirely arboreal in their habits and feeding principally on insects. Half-a-dozen species are resident in Britain, the Blue Tit (*Parus cæruleus*) being one of our most familiar birds. The Coal Tit and the Marsh Tit are interesting, inasmuch as the British representatives are regarded as distinct from those of the Continental bird, and hence peculiar to our islands. The Long-tailed Tits (*Acredula*) and the Crested Tits (*Lophophanes*) are worthy of special mention, as are also the members of the genus *Anthoscopus*, which are confined to Tropical and South Africa, the purely Australian *Aphelocephala* and *Sphenostoma*, and the genus *Certhiparus*, with one species, confined to New Zealand.

LANIIDÆ (Shrikes; 354 Species). Plate 11, Map ii.

The Shrikes are a group of variable character and hence difficult to define. Over 30 genera are differentiated, and these are arranged in four sub-families. The first sub-family comprises about two dozen species, including the so-called Piping-Crows (*Gymnorhina*). With the exception of one Bornean species and about four in the Papuan Islands, all these are confined to Australia and Tasmania. The second sub-family is the typical one, including the true Shrikes or Butcher-Birds, of which four have a place in the British avifauna, though one only breeds in this country. The true Shrikes are principally Palæarctic, Oriental and Ethiopian, but they include also seven species which inhabit North America, and which are remarkable as being the only representatives of the family in the New World. The third sub-family (*Malaconotinæ*) includes 12 genera and 100 species entirely confined to Africa, while the last sub-family is purely Oriental and Australian, with eight genera and 119 species, most of which belong to the genus *Pachycephala*.

AEROCHARIDÆ (Helmet-Bird; 1 Species). Plate 11, Map ii.

This family is founded for the reception of a single remarkable species inhabiting Madagascar, and formerly bearing the name of *Euryceros prevosti*. The generic name has been quite recently altered to *Aerocharis* in conformity with the rules of priority. Known popularly as the Helmet-Bird, this singular creature is clothed in black and chestnut plumage, and possesses a swollen, compressed, steely-blue beak.

PRIONOPIDÆ (Wood-Shrikes; 98 Species). Plate 11, Map iii.

The *Prionopidæ* are closely allied to the true Shrikes (*Laniidæ*) and by some authors regarded as only of sub-family rank. They are arranged in 16 genera, and the species are natives of the Oriental, Ethiopian and Australian Regions. About a quarter of the known species are found in Africa, while 11 are natives of Australia proper, and they inhabit Southern Asia and the Malay Islands.

VANGIDÆ (Vanga, &c.; 13 Species). Plate 11, Map iii.

This small group of birds is confined to the island of Madagascar. Six genera have been separated, all of which are related to the Shrikes and appear to represent this group in the Malagasy Sub-region.

ARTAMIDÆ (Swallow Shrikes; 22 Species). Plate 11, Map iii.

These birds, divided into two genera, are of somewhat doubtful affinity. The genus *Pseudochelidon* contains a single species, which is confined to the Gaboon district in Western Tropical Africa. Nine species of the typical genus *Artamus* are peculiar to Australia and Tasmania; one is found in the Indian Peninsula and Ceylon, while the rest are scattered over the Oriental and Australian Regions as far east as the Fiji Islands. They are woodland birds, and from the peculiar nature of their flight are sometimes called "Wood-Swallows."

AMPELIDÆ (Waxwings; 10 Species). Plate 11, Map iii.

Of the ten known species of this family eight are confined to the New World, and one to the Old. The best-known of these, the Bohemian Waxwing (*Ampelis garrulus*), is common to the Arctic and Subarctic regions of both Hemispheres. Breeding near the Arctic circle it visits our shores occasionally in winter, sometimes in large flocks. Three out of the five genera of Waxwings, with six species, are confined to Central America and the island of San Domingo.

VIREONIDÆ (Vireos or Greenlets; 122 Species). Plate 11, Map iv.

These birds, which are allied to the Shrikes, are peculiar to the New World, but have there a wide range. Half-a-dozen genera are recognised, the typical one (*Vireo*) containing about half the known species and all the North American representatives. Most of these birds are of a greenish or olive tint, hence their popular name of "Greenlets." They are lovers of the forest, and are found up to 10,000 feet elevation.

SYLVIIDÆ (Warblers; 521 Species). Plate 11, Map iv.

This family, although so numerous in species, is confined to the Old World, with the exception of a single form which visits Alaska. In the Old World they are found practically everywhere, but are entirely absent from New Zealand. At least a score of species may be included as British, the great majority of which are purely summer visitants. Among the more familiar may be mentioned the Common and Lesser Whitethroats, Blackcap, Willow Wren, Wood Wren, Chiffchaff, and the Reed-, Marsh-, Sedge-, and Garden-Warblers. The members of this huge family are with difficulty separated from the Thrushes and their allies (*Turdidæ*). They are more addicted to migration, however, and their diet is more purely insectivorous.

TURDIDÆ (Thrushes, Chats, &c.; 598 Species). Plate 11, Map iv.

This family, although little larger than the *Sylviidæ* as regards the number of species, is much more heterogeneous. This is evidenced by the fact that the genera, practically the same in number as the *Sylviidæ*, are grouped into no fewer than nine sub-families. As seen from our Map, the family as a whole is cosmopolitan in its distribution, ranging well into the Arctic regions, and containing representatives in such remote places as the Sandwich Islands and Tristan da Cunha. Australia and New Zealand are very deficient in representatives, only possessing eight and two species respectively. About 20 species find a place on the British list, including some of our most familiar birds. The Mistletoe Thrush, Song Thrush, Blackbird, Hedge Accentor and Redbreast, are all well-known residents, while almost equally familiar are the Fieldfare and Redwing, which are winter visitants, and the Ring-Ouzel, Redstart, Whinchat, and Wheatear, which come to us in the summer.

The distribution of the Accentors, which form one of the sub-families of *Turdidæ*, is shown separately on the same Map. Only two genera are known, with 19 species. The Hedge Accentor, mentioned above, is the most familiar species, a second, known as the Alpine Accentor, only rarely visiting Britain.

MIMIDÆ (Mocking-Birds; 75 Species). Plate 11, Map v.

The Mocking Birds, of which there are 14 genera, are entirely confined to the New World. The best-known species is *Mimus polyglottus*, whose powers of imitation are well-known to the inhabitants of the United States. The genus *Nesomimus* is of interest, since it is composed of 11 species which are entirely confined to the Galapagos Islands. Four genera, with eight species, are peculiar to the West Indies.

CINCLIDÆ (Dippers; 26 Species). Plate 11, Map v.

The Dippers, sometimes called Water-Ouzels, have a peculiar distribution, frequenting mountain streams in the Palæarctic Region, the western part of the Nearctic Region, and the Andean slopes in South America. About half-a-dozen forms occur in Europe, and one is a resident in Britain, especially in the northern and western portions. They are interesting little birds, often seen bobbing up and down on stones in the water, and occasionally diving in after aquatic insects and molluscs. All the Dippers are placed in one genus (*Cinclus*).

TROGLODYTIDÆ (Wrens; 285 Species). Plate 11, Map vi.

The Wrens are a large and widely-distributed group, with 22 genera. The great majority of the species are found in Tropical America, while strangely enough they are entirely absent from the Ethiopian Region. Only about a dozen are found in the Palæarctic Region, while the Oriental is equally deficient in representatives. The Common Wren (*Troglodytes troglodytes*) is a common and familiar resident in Britain, while the forms occurring in St Kilda, the Faroes and Iceland are usually regarded as distinct and peculiar races.

TIMELIIDÆ (Babbling-Thrushes, &c.; 635 Species). Plate 11, Map vi.

This is a large and heterogeneous family, whose limits are as yet vague and uncertain. Half-a-dozen distinct sub-families may be recognised, with more than 120 genera. These birds are confined to the Old World, and are especially characteristic of the Oriental Region. Australia and Tasmania possess 26 species, New Zealand only four, while the sole representatives in Europe are two species of *Panurus*. The latter are the so-called "Bearded Tits," one of which is resident in a few counties of England. Their location in the present family is somewhat doubtful and they are sometimes placed in a family to themselves.

PYCNONOTIDÆ (Bulbuls; 291 Species). Plate 11, Map vi.

Bulbuls are especially numerous in the Oriental Region, but are also well represented in the Ethiopian, ranging over the whole of Africa and Madagascar. A single species enters Europe, occurring in the Cyclades Archipelago, and this belongs to the typical genus *Pycnonotus*. On account of its sweet song and interesting habits, the Gold-fronted Green Bulbul (*Chloropsis aurifrons*), an Indian species, is a favourite cage-bird.

CAMPOPHAGIDÆ (Cuckoo-Shrikes; 196 Species). Plate 12, Map i.

This is a characteristic Oriental and Australian family, but it also possesses a few representatives in the Ethiopian Region. Twelve genera are recognised, the typical one (*Campophaga*) containing most of the African species. Australia only possesses nine species, and the Palæarctic Region only three, one of which is confined to Japan, and a second to the Liu Kiu Islands.

MUSCICAPIDÆ (Flycatchers; 796 Species). Plate 12, Map i.

Excluding the single genus *Polioptila*, whose distribution is shown separately on our Map, the Flycatchers are exclusively inhabitants of the Old World Nearly a hundred genera have been differentiated, whose species exhibit great variety of form and plumage. The Oriental and Australian Regions are particularly rich in these birds; the Palæarctic, on the other hand, very deficient. The handsomest members of the family are the so-called "Paradise Flycatchers" (*Terpsiphone*), owing their beauty largely to their wonderfully long tail-feathers and their crested heads. Two species occur in Britain as regular summer visitants, namely, the Spotted and the Pied Flycatcher (*Muscicapa grisola* and *atricapilla*).

The American Flycatchers, sometimes called Gnatcatchers, are sometimes regarded as constituting a separate sub-family (*Polioptilinæ*). About two dozen species are known, which occur within the limits shown on our Map.

HIRUNDINIDÆ (Swallows and Martins; 143 Species). Plate 12, Map ii.

This family is remarkable, not only for its wide range as a whole, but also for the vast extent covered by many of the species through their migratory habits. Thus the Common Swallow (*Hirundo rustica*) ranges northwards of the Arctic Circle in summer, while the winter is passed in Africa, India, China, and the Malay Peninsula. Thirteen genera have been described, three of which are peculiar to the New World, two to Africa, and one to Australia. New Zealand, curiously enough, does not possess any representatives. Three species occur commonly in Britain as summer visitants, namely, the Common Swallow (*Hirundo rustica*), the House-Martin (*Chelidonaria urbica*) and the Sand-Martin (*Clivicola riparia*).

ATRICHORNITHIDÆ (Scrub-Birds; 2 Species). Plate 12, Map ii.

This small group contains only two species, namely, *Atrichornis clamosa*, confined to Western Australia, and *A. rufescens* found only in New South Wales. They are described as very shy birds, inhabiting dense scrub (hence their popular name). Little is recorded of their habits.

XENICIDÆ (Xenicus and Allies; 6 Species). Plate 12, Map ii.

These birds, for which no general popular name can be used, are entirely confined to New Zealand. Three genera are distinguished, the two species of *Xenicus* being found only in the South Island, where they are known as the "Bush Wren" and the "Rock Wren" respectively.

PHILEPITTIDÆ (Philepitta; 2 Species). Plate 12, Map ii.

The two species forming this family are confined to the island of Madagascar. In general appearance they remind one of the *Pittas*, but in habit they are more arboreal. Both belong to a single genus, *Philepitta*, which gives its name to the family.

PITTIDÆ (Pittas; 69 Species). Plate 12, Map iii.

The Pittas have a very remarkable distribution, the great majority of the species being found in the Malay Archipelago. A single species, known as *Pitta angolensis*, inhabits the forest regions of Tropical Africa, far removed from its allies, and offering one of the best-known examples of what is known as "discontinuous distribution." Two species are found in Australia, one of which occurs also in New Guinea. Only one occurs in the peninsula of India and Ceylon, while three find a home in the Eastern Himalayas. The Pittas, sometimes called Old World Ant-Thrushes, are beautiful birds with bright plumage, crimson, green and blue being predominant colours.

PHYTOTOMIDÆ (Plant-Cutters; 4 Species). Plate 12, Map iii.

This family consists only of four Finch-like birds inhabiting the temperate portion of South America. They have powerful serrated, Finch-like bills, which they use in hewing down plants apparently without any special object, and often causing much damage to gardens and plantations. *Phytotoma rara*, a native of Chili, is the best-known species.

COTINGIDÆ (Chatterers; 150 Species). Plate 12, Map iii.

This is a large, interesting, and varied family, including some of the most gorgeously-coloured of South American birds. They are essentially inhabitants of Tropical America, although one species ranges as far north as Southern Arizona, and others occur in the southernmost parts of Brazil and Uruguay. *Platypsaris niger*, confined to the island of Jamaica, is the only member of the family occurring in the West Indies. Many remarkable creatures belong to the Cotingidæ. The singular Umbrella-Bird of the Upper Amazons (*Cephalopterus ornatus*) and the musically-voiced Bell-Birds (*Chasmorhynchus*) are the best known, and familiar to the traveller in the great tropical forests of the New World.

PIPRIDÆ (Manakins; 95 Species). Plate 12, Map iv.

These interesting little birds are essentially forest dwellers, and are confined to the Neotropical Region. Nineteen genera are recognised, which are ranged in two sub-families. They are absent from the West Indies, and only half a dozen species occur in Central America. The great majority of these birds are brilliantly-coloured, and in habits they resemble Titmice, flitting about the branches of trees and feeding on insects and fruit of all sorts.

OXYRHAMPHIDÆ (Oxyrhamphus; 3 Species). Plate 12, Map v.

The three species forming this family, placed in a single genus, are allied to the *Tyrannidæ*, and inhabit South-eastern Brazil, Central America (from Costa Rica to Panama), and British Guiana, respectively. No forms have yet been found inhabiting the intermediate regions.

TYRANNIDÆ (Tyrant Flycatchers; 617 Species). Plate 12, Map v.

These birds, sometimes called Tyrant-Birds, are a vast assemblage of mostly small creatures found almost throughout the New World. But although so wide-ranging as a whole, their metropolis appears to lie in the tropical portion of South America, where the majority of the species are found. About 40 species occur in North America, ranging as far north as Alaska, 33 are found in the West Indies, three are peculiar to the Galapagos Islands, one occurs in the Falkland Islands, and three in Tierra del Fuego. Some are dwellers in the dense forest regions, while others are adapted for a terrestrial life. The King-bird (*Tyrannus tyrannus*) is well-known in the United States for its boldness in defending its nest even from the attacks of birds of prey.

DENDROCOLAPTIDÆ (Wood-Hewers or American Creepers; 458 Species). Plate 12, Map vi.

This purely Neotropical family contains a vast and somewhat heterogeneous assemblage of insectivorous birds, somewhat sombre in coloration and of diverse habits. Over 50 genera are distinguished, which are grouped into seven sub-families. By far the greatest number of species occur in the Brazilian Sub-region, while they are entirely absent from the West Indies. About 50 species find their home in Central America, two in the Falkland Islands, and one in Juan Fernandez. Perhaps the most interesting birds of this family are the so-called "Oven-birds" (*Furnarius*), of which 14 species are described. These interesting creatures build a nest of mud, mixed with horsehair or fibrous roots, so wonderfully constructed as to be almost unbreakable. It possesses an inner chamber, access to which is through a long curved passage.

CONOPOPHAGIDÆ (Conopophaga and Corythopis; 19 Species). Plate 12, Map vi.

This is a small Neotropical group of curious birds with a prevailing brown coloration, large heads, and a peculiar type of sternum or breast-bone. Only two genera are recognised, whose names are given above.

FORMICARIIDÆ (Ant-Birds or Ant-Thrushes; 408 Species). Plate 12, Map vii.

A purely Neotropical family, containing 38 genera. Like the *Dendrocolaptidæ* and the *Conopophagidæ*, their metropolis is in the Brazilian Sub-region, and they are, too, entirely unrepresented in the West Indies. They are lovers of the forest and are of a shy and retiring disposition. Their names, both scientific and popular, bear allusion to their at one time reputed fondness for ants, but it is now believed that they feed on the swarms of insects which the foraging ants drive before them, and not on the ants themselves.

PTEROPTOCHIDÆ (Tapacolas; 31 Species). Plate 12, Map viii.

This is a small group of Wren-like birds, divided into eight genera, and inhabiting the western and southern portions of South America. One species occurs in the Falkland Islands, and one is peculiar to Costa Rica. About half the species are found in Chili, the Argentine Republic and Patagonia. They are remarkable for their large and robust feet, and for the elevated position in which they carry their tails.

ORDER MENURIFORMES (3 Species).

MENURIDÆ (Lyre-Birds; 3 Species). Plate 12, Map viii.

These remarkable birds, which owe their popular name to the beautiful shape of their tails, are restricted to the south-eastern portion of Australia. They may be regarded as an aberrant group of the great Order Passeriformes, or may be placed in an Order to themselves, under the name of *Menuriformes*. They have a remarkable general resemblance to a Game-Bird, but in structure are quite distinct. Of a shy disposition, they live in brush country, and feed on insects and small molluscs. All the known species belong to a single genus (*Menura*).

ORDER EURYLÆMIFORMES (16 Species).

EURYLÆMIDÆ (Broad-Bills; 16 Species). Plate 12, Map viii.

The Broad-Bills, so-called from the great and unusual breadth of the beak, are essentially an Oriental group, ranging from the Eastern Himalayas to Java, Borneo and the Philippines. Seven genera are distinguished, which are placed in two sub-families. Bright colours adorn most of the species, which are essentially dwellers in the forests, where they search for fruit and insects. It is supposed that they are the descendants of a much larger and more wide-ranging group.

ORDER PICIFORMES (508 Species).

GALBULIDÆ (Jacamars; 22 Species). Plate 13, Map i.

This is a purely Neotropical family of chiefly brilliantly metallic-plumaged birds, which are found on the outskirts of forests and in the vicinity of water. All are insectivorous. Six genera are described, one of which, containing only the so-called Broad-billed Jacamar (*Jacamerops aurea*), constitutes a separate sub-family.

BUCCONIDÆ (Puff-Birds; 45 Species). Plate 13, Map i.

This, again, is a purely Neotropical family, with a geographical range almost coinciding with the *Galbulidæ*. Seven genera are recognised, the typical one (*Bucco*) containing 21 species. These birds are closely allied to the Woodpeckers (*Picidæ*). They are insectivorous, and most abundant in the great tropical forests of Amazonia and Colombia, but little is recorded of their habits.

PICIDÆ (Woodpeckers; 437 Species). Plate 13, Map i.

This large family has a wide distribution, possessing representatives in all the zoögeographical regions. The Australian Region, however, is only just entered by a very few species, which occur in the islands of Lombok and Flores, while Madagascar is entirely without representatives. They are most abundant in the great forests of the Neotropical and Oriental Regions. Some, however, never enter forests, but seek and obtain their food on the ground, where they run with ease. Forty-nine genera have been founded for the reception of these well-known birds. Of these, 20 are peculiar to the New World, 14 to the Oriental Region, six to the Ethiopian, and three to the Palæarctic. Woodpeckers are birds of retiring habits; their prevailing colours are black, white, green and yellow. Three species are resident in Britain, namely the Green Woodpecker (*Gecinus viridis*), the Greater Spotted Woodpecker (*Dendrocopus major*), and the Lesser Spotted Woodpecker (*D. minor*). The first and last named are only doubtfully to be regarded as Scottish birds, while they are unknown in Ireland.

IYNGIDÆ (Wrynecks; 4 Species). Plate 13, Map i.

The Wrynecks are sometimes regarded as a sub-family of the *Picidæ* or True Woodpeckers, from which they differ in having soft tails without spiny shafts, while the nostrils are not concealed by bristles. They are arboreal and insectivorous. Of the four known species, one, the Common Wryneck (*Iynx torquilla*) is found in the greater part of Europe, Asia, and North-eastern Africa, occurring also in Senegal. It is a summer visitant to England, and a bird of passage in Scotland, but is not known in Ireland. The other three species, belonging to the same genus, are natives of Southern, Equatorial and North-eastern Africa respectively.

ORDER SCANSORES (218 Species).

INDICATORIDÆ (Honey-Guides; 18 Species). Plate 13, Map ii.

This is a characteristic African family, only two species occurring elsewhere than in this continent. One of these is confined to the Himalayas and the other to the Malay Peninsula and Borneo. They both belong to the typical genus *Indicator*, which contains 14 of the known species. The popular name of these birds is due to their remarkable habit, generally regarded as quite an intentional one, of attracting the attention of the traveller to bees' nests which, when torn out of their place, furnish food to the intelligent bird in the form of either bees, grubs, or honey.

CAPITONIDÆ (Barbets; 140 Species). Plate 13, Map ii.

Although the members of this family occur in the Oriental, Ethiopian, and Neotropical Regions, about half the known species are confined to Africa. The typical genus, *Capito*, however, is purely Neotropical, its 16 species and two of another genus constituting the entire series of New World representatives. Of the 19 remaining genera 11 are African, while the Oriental Region claims 8. The Barbets are purely arboreal in habit, being found chiefly in forests or well-wooded districts. They are mostly birds of brilliant plumage and live chiefly on fruits.

RHAMPHASTIDÆ (Toucans; 60 Species). Plate 13, Map ii.

These curious birds, easily recognised by their enormous bills, are entirely Neotropical, and may be regarded as the New World representatives of the ungainly Hornbills (*Bucerotidæ*). Five genera are adopted for their reception, and the great majority of the species are found in the great tropical forests of South and Central America. Fruits and seeds form the chief article of diet, but insects are also taken, and sometimes the eggs and young of small birds.

ORDER COCCYGES (237 Species).

MUSOPHAGIDÆ (Plantain-Eaters; 35 Species). Plate 13, Map iii.

This purely African family, whose members are sometimes called Touracos, contains half-a-dozen genera. These birds inhabit wooded country in the neighbourhood of water, are usually met with in pairs or very small flocks, and are fruit-eaters. The most remarkable feature connected with the Plantain-eaters is that the pigment colouring their red feathers is so soluble as to be washed out during rain, although afterwards the colour is regained.

CUCULIDÆ (Cuckoos; 202 Species). Plate 13, Map iii.

This important family is practically cosmopolitan, being found in all parts of the world except the extreme north, where suitable insect food is not to be met with. They are birds of arboreal or terrestrial habit. The Oriental and the Australian Regions are by far the richest in representatives. In these two Regions there are nearly 100 peculiar species belonging to 24 peculiar genera. The Ethiopian Region possesses seven peculiar genera containing 22 species, 12 of which are confined to Madagascar. Only 43 species are found in the New World, belonging to 11 genera. Of these one only, *Coccyzus*, belongs to the typical sub-family (*Cuculinæ*). Two species of Cuckoo occur in Europe, namely the Great Spotted (*Coccystes glandarius*) and the well-known British representative, the common Cuckoo (*Cuculus canorus*). The latter is a common and widely-distributed summer visitant to these islands. The true Cuculi, which are remarkable for their parasitic habits, are confined to the Old World.

ORDER TROGONES (55 Species).

TROGONIDÆ (Trogons; 55 Species). Plate 13, Map iv.

The Trogons are a group of brilliantly-coloured birds, found principally in the Neotropical, Ethiopian, and Oriental Regions, but most abundant in the tropics of America. Nine genera are distinguished, five of which are confined to America (with 34 species), two to Africa (with four species), and two to the Oriental Region (with 17 species). The typical genus *Trogon* contains 25 American species, one of which is a native of Arizona and Central America, and is remarkable as being the only member of the family occurring in the Nearctic Region. The handsomest Trogon is that known as the Quezal (*Pharomacrus mocinno*), which ranges from Guatemala to Panama, and has few equals in beauty in the bird world. The Trogons are arboreal in their habits, frequent dense forests and feed chiefly on insects.

ORDER CORACIIFORMES (1236 Species).

STEATORNITHIDÆ (The Oil-Bird or Guacharo; 1 Species). Plate 13, Map iv.

This curious bird inhabits caves near the sea or on mountains in the north-western part of South America, and also in the island of Trinidad. It possesses nocturnal habits, and is in many respects reminiscent of the Nightjars. The name of Oil-bird is due to the large amount of fat or oil contained in the young nestlings, which are killed by the natives in order to supply this commodity for both cooking and illuminating purposes.

PODARGIDÆ (Frog-Mouths; 32 Species). Plate 13, Map iv.

These peculiar birds are restricted to the Oriental and Australian Regions. Three genera are recognised, namely *Podargus*, with seven species, *Batrachostomus* with 12, and *Ægotheles* with 13. The first and last are confined to Australia, Tasmania and the Papuan Islands, with a single species in New Caledonia. *Batrachostomus*, on the other hand, contains all the Oriental species, including one in Southern India and Ceylon, and one in the Eastern Himalayas. They strongly resemble the Nightjars (*Caprimulgidæ*) in appearance, and feed on insects and fruits.

LEPTOSOMATIDÆ (Kiroumbos; 2 Species). Plate 13, Map iv.

These birds, sometimes regarded as a sub-family of the Rollers (*Coraciidæ*) are confined to Madagascar and the Comoro Islands. They are said to live near the margins of woods in parties of about a dozen, and in habits they resemble the Rollers to which they are allied.

CORACIIDÆ (Rollers; 32 Species). Plate 13, Map v.

The Rollers are a small family of brilliantly-coloured birds, possessing representatives in all the Old World zoögeographical regions. Half-a-dozen genera have been defined, four of which (containing five species) are confined to the island of Madagascar. The typical genus (*Coracias*) contains 16 species, 12 of which are confined to Africa, one to the Oriental Region, and one to the island of Celebes. The Common Roller (*C. garrulus*) is a wanderer to Britain, chiefly to England, but is a summer visitor to Central and Southern Europe, Central Asia as far as Kashmir, and is found throughout Africa and N.W. India in winter. The broad-billed Rollers of the genus *Eurystomus* are 11 in number, and include *E. australis*, the only member of the family which occurs in Australia.

ALCEDINIDÆ (Kingfishers; 200 Species). Plate 13, Map v.

The Kingfishers are a large and varied family of practically cosmopolitan distribution, but are poorly represented in the New World, only about a dozen species being found in the whole American Continent. The 20 genera which are recognised may be arranged in two sub-families, the distribution of each of which is shown separately on our Map. The *Alcedininæ* are the so-called "Water" Kingfishers, and are lovers of shady haunts near streams, feeding principally on fishes. Although much more widely distributed than the other sub-family, they only comprise five genera and 51 species. The only British representative, the Common Kingfisher (*Alcedo ispida*), is a member of this group, and a common resident species. The *Daceloninæ* may be termed "Wood" Kingfishers, since they are usually found in wooded regions feeding on insects and reptiles. They are entirely Old-World creatures, and mainly inhabitants of the Oriental and Australian Regions. The principal genus is *Halcyon*, with over 70 species.

BUCEROTIDÆ (Hornbills; 70 Species). Plate 13, Map vi.

These ungainly birds are confined to the Old World, being apparently represented in South America by the Toucans (*Rhamphastidæ*). Twenty-one genera have been differentiated, six of which (with 34 species) are confined to Tropical and South Africa, while the rest are natives of the Oriental and Australian Regions. Hornbills are terrestrial or arboreal in their habits, feeding on a variety of small animals, such as rodents, worms and insects. The most remarkable feature of these birds is their habit of imprisoning the female, generally in some hollow tree, by means of clay, until her eggs are hatched.

UPUPIDÆ (Hoopoes; 6 Species). Plate 13, Map vi.

The Hoopoes are all placed in a single genus, *Upupa*. The best-known species, the Common Hoopoe (*U. epops*), is the most wide-ranging in the family, occurring in the greater part of temperate Europe as a summer bird, also in Northern and Central Asia, N.W. India, and N.E. Africa. In Britain it occurs as an irregular spring and autumn migrant, but is frequent in its visits to the south of England, always attracting attention on account of its peculiar style of coloration and its remarkable crest. Of the remaining species, one is Oriental, two are African, one confined to Madagascar, and the remaining one only recorded on Tunis.

IRRISORIDÆ (Wood-Hoopoes; 15 Species). Plate 13, Map vii.

The Wood-Hoopoes, of which three genera are recognised, are confined to Tropical and South Africa. They are distinguished from their allies, the true Hoopoes (*Upupidæ*), chiefly by their longer and more curved bill, wedge-shaped tail and absence of a crest.

MEROPIDÆ (Bee-Eaters; 41 Species). Plate 13, Map vii.

The Bee-Eaters are a group of brightly-coloured birds, found in all the zoögeographical regions of the Old World. More than half the species are confined to Africa, while only two occur in Europe and one in Australia. The Common Bee-Eater (*Merops apiaster*) is a regular summer visitor to Southern Europe, and in Spain becomes a pest to the bee-keeper, where, true to its name, it plays havoc with the worker-bees as they enter and leave the hives.

MOMOTIDÆ (Motmots; 24 Species). Plate 14, Map i.

These birds appear to represent the *Meropidæ* or Bee-Eaters in the New World. They are practically confined to the Neotropical Region, and seven genera are distinguished. Green is the prevailing tint in the plumage of the Motmots, which are inhabitants of dense forests.

TODIDÆ (Todies; 5 Species). Plate 14, Map i.

The Todies are tiny little birds, of a green and red coloration, related to the Motmots, and confined to the West Indies. Two species are found in Jamaica, and one each in Cuba, San Domingo, and Porto Rico. All belong to a single genus (*Todus*).

CAPRIMULGIDÆ (Nightjars; 124 Species). Plate 14, Map i.

The *Caprimulgidæ* are an interesting group of insect-eating birds, lovers of the twilight, and clothed in sombre mottled plumage. They are practically cosmopolitan in distribution, but are most numerous in the Tropics. They are divided into two sub-families, the range of each of which is shown separately on the Map. The first sub-family (*Nyctibiinæ*) contains a single genus, *Nyctibius*, with seven purely Neotropical species. The second sub-family has 19 genera, mostly with few species, but the typical one (*Caprimulgus*) contains 65 species, which are found in every zoögeographical region. Three occur in Europe, one of which is a common summer visitor to Britain, and bears the name of the Common Nightjar or "Goatsucker" (*C. europæus*). Of the remaining genera, 10 are pecular to the Neotropical Region, three to the Ethiopian Region, and one to the Australian.

CYPSELIDÆ (Swifts; 100 Species). Plate 14, Map ii.

These interesting birds are essentially aerial in habit, spending most of the day in flight and seldom alighting on the ground or perching until night fall. They are usually divided into three sub-families, as given in our Map, where the distribution of each is shown separately. The typical sub-family (*Cypselinæ*) is of world-wide distribution, with representatives in every region. In this group is placed the familiar British species, known as the Common Swift (*Cypselus apus*), a summer visitor of almost universal distribution in our islands. The *Micropteryginæ*, which are known as Tree-Swifts, comprise seven species, inhabiting the Oriental and Australian Regions, and all belonging to a single genus (*Micropteryx*). The *Chæturinæ* include three genera, two of which (*Chætura* and *Cypseloides*) may be called Spine-tailed Swifts, from the fact that their tails are provided with rigid feathers, having projecting spring shafts. *Chætura pelagica* is the so-called "Chimney Swallow" of the United States. *Collocalia*, containing 18 species, is of special interest, inasmuch as some of its members build the well-known edible birds' nests.

TROCHILIDÆ (Humming-Birds; 570 Species). Plate 14, Map iii.

These interesting and beautiful little creatures are essentially inhabitants of the great tropical forests of the Brazilian Sub-Region. A few species, however, occur in North America, one even ranging as far north, in summer, as Alaska. Two species are found in the island of Juan Fernandez, and about 20 in the West Indies. Southwards they range to Tierra del Fuego, where one species is found even in snowy weather. Several range to a remarkably high altitude in the Andes, where particular mountains have species peculiar to them. No fewer than 118 genera of Humming-Birds have been described. They are almost entirely insectivorous, taking their food on the wing or from flowers, in front of which they may be seen hovering, darting away suddenly with remarkable swiftness. This family includes some of the smallest known birds, and most of the species are adorned with brilliant metallic plumage.

COLIIDÆ (Colies; 14 Species). Plate 14, Map iii.

These birds, sometimes called Mouse Birds, are entirely confined to Tropical and South Africa, and form only a single genus (*Colius*). They inhabit forest districts and feed principally, though not exclusively, on berries and fruits. In external appearance they are somewhat finch-like, the most remarkable feature to the ordinary observer being that their four toes are all directed forward, giving the feet a curious appearance.

ORDER PSITTACIFORMES (580 Species).

NESTORIDÆ (Nestor Parrots; 4 Species). Plate 14, Map iv.

This small family, including only a single genus, is confined to New Zealand. The best-known species is that called by the Maories the "Kea" (*Nestor notabilis*). This is restricted to the South Island, and is remarkable for its carnivorous habits, attacking sheep by alighting upon their backs and tearing open the flesh until the kidneys are reached, upon the fat of which it feeds greedily. This destructive habit is said to have arisen since sheep were introduced into the island. Another species familiar to the Maories is the "Kaka" (*N. meridionalis*), which feeds on fruits and insects.

LORIIDÆ (Lories and Loriquets; 87 Species). Plate 14, Map iv.

The Lories and their allies are confined to the Australian Region, the majority of the species (about 70) being natives of New Guinea and the neighbouring islands, while nine occur in Australia and Tasmania, and eight in the more remote islands of Polynesia. Fourteen genera of these parrots have been differentiated, and most of the species are clad in bright and beautiful colours. The principal genera are *Trichoglossus*, with 16 species, *Eos*, with 15, and *Lorius*, with 13. They live on the nectar and pollen which they extract from flowers.

CYCLOPSITTACIDÆ (23 Species). Plate 14, Map v.

This family contains a number of small fruit-eating Parrots, the majority of which are confined to New Guinea and the small adjacent islands, but Eastern Australia possesses two and Timor likewise two. Only two genera are known, containing nineteen and four species respectively. The prevailing colours of these Parrots are red, green, blue and yellow.

CACATUIDÆ (Cockatoos; 30 Species). Plate 14, Map v.

At the present day Cockatoos are confined to the Australian Region, with the exception of a single species, which inhabits the Philippine Islands. It is interesting to note, however, that the remains of an extinct form have been found in the distant island of Mauritius. Seven genera have been described, the typical one (*Cacatua*) containing 17 species. From the true Parrots (Family *Psittacidæ*), which have a remarkably wide distribution, Cockatoos may be readily distinguished by the presence of a crest of feathers on the head. In coloration also they are very different, the prevailing tints being white, grey, brown and black, while the green so characteristic of true Parrots is conspicuous by its absence.

PSITTACIDÆ (Typical Parrots; 434 Species). Plate 14, Map vi.

The *Psittacidæ* are an important group, with representatives in all the zoögeographical regions except the Palæarctic. Roughly speaking, they are about equally divided between the Old and New Worlds, although the former possesses a slight majority. The genera, 58 in number, are grouped into six sub-families, two of which (*Conurinæ* and *Pioninæ*) contain all the New World forms and a score of African ones. The *Conurinæ* include the fine and brilliantly-coloured Macaws and the only species of Parrot which occurs in North America; while the *Pioninæ* comprise, amongst others, the well-known Amazon Parrots, in whose plumage green is a characteristic tint. The typical sub-family (*Psittacinæ*) includes three species of *Psittacus* from West Africa, five peculiar "Vasa" Parrots from Madagascar, the Comoro Islands and the Seychelles, and a single form confined to New Guinea. The remaining sub-families (*Nasiterninæ*, *Palæornithinæ* and *Platycercinæ*) belong mainly to the Oriental and Australian Regions, with a few Ethiopian representatives. The *Palæornithinæ* include the true Parrakeets and so-called Love Birds, while in the *Platycercinæ* are placed the well-known Grass-Parrakeets and Ground-Parrakeets.

STRINGOPIDÆ (Owl Parrots; 2 Species). Plate 14, Map vi.

This family includes only the peculiar flightless Owl Parrots of New Zealand. Two species have been described, but one of these is considered by some authorities as only a slight varietal form. Although the bird cannot fly, yet its wings are fully developed, and the loss of power is really due to the absence of a keel on the breast-bone, brought about by long disuse of the wings. The Owl-Parrot (*Stringops habroptilus*) has a peculiar soft greenish plumage, and this, together with its nocturnal habits and the ring of feathers round the eye, is responsible for its popular name. It feeds on a variety of vegetable substances, and is of greedy habits.

ORDER STRIGIFORMES (320 Species).

BUBONIDÆ (True Owls; 294 Species). Plate 14, Map vii.

The *Bubonidæ*, with 30 genera, have a cosmopolitan distribution, some of the species having a remarkably wide range. They vary much in size, the Eagle-Owls of the typical genus *Bubo* being large enough to pounce upon and kill fawns, while some of the Pigmy Owls (*Glaucidium*) are hardly bigger than sparrows. Europe possesses about a dozen species, of which three are resident in Britain. These are the Tawny Owl (*Syrnium aluco*), the Long-eared Owl (*Asio otus*), and the Short-eared Owl (*A. accipitrinus*). The last-named is one of the most widely-distributed species of birds, visiting at various seasons nearly all parts of the globe, including the Sandwich, the Falkland, and the Galapagos Islands.

STRIGIDÆ (Barn-Owls; 26 Species). Plate 14, Map vii.

These birds are all comprised within a single genus (*Strix*), and have a much more restricted range than the members of the previous family, although occurring in all the zoögeographical regions. One species occurs in Europe namely the White or Common Barn Owl (*Strix flammea*), and this bird is, moreover, a widely-distributed resident in Britain. Seven species occur in the New World, only one of which is North American.

ORDER ACCIPITRIFORMES (507 Species).

SERPENTARIIDÆ (Secretary Birds; 2 Species). Plate 15, Map i.

The Secretary Birds are peculiar to Africa, and it is a matter of opinion whether the two species are really distinct. They owe their popular name to a peculiar tuft of feathers on the nape, which gives the birds some sort of resemblance to a clerk with pens stuck in his ears. They feed on snakes, birds, lizards, and other small animals, and being thus useful in the farmyard, are protected by law. They are handsome birds, about four feet in height, and of a crane-like appearance.

VULTURIDÆ (Old-World Vultures; 17 Species). Plate 15, Map i.

The members of this family, are, as their popular name implies, confined to the Old World. Seven genera have been differentiated, and most of the species have a wide range. Three species inhabit Southern Europe and a fourth occasionally. The Black Vulture (*Vultur monachus*) is one of the best-known forms, occurring chiefly in the countries round the Mediterranean, but also found on the Lower Danube. The Egyptian Vulture (*Neophron percnopterus*), is also well-known and has a similar distribution. Seven species, known as Griffon Vultures, constitute *Gyps*, the largest genus in the family.

FALCONIDÆ (Hawks, Kites, Eagles, &c.; 482 Species). Plate 15, Maps i. and ii.

This large assemblage of well-known Birds of Prey comprises no fewer than 77 genera, which are grouped into five sub-families. The distribution of each of these is shown separately on our Maps, and from these it will at once be noticed that, although the family as a whole is cosmopolitan, yet there is considerable difference in the range of the various smaller groups. The first sub-family (*Polyborinæ*) comprises three genera and 13 species, known as Carrion-Hawks or "Caracaras." They are confined to the New World, where, however, only one occurs in North America. The second sub-family (*Accipitrinæ*) is practically cosmopolitan, containing 10 genera and 147 species. These include Harriers (*Circus*), the Neotropical Harrier-Hawks (*Micrastur*), the African Whistling Hawks (*Melierax*), Goshawks (*Astur*), and Sparrow-Hawks (*Accipiter*). Five species claim a place on the British list, the commonest and best known of which is the Common Sparrow-Hawk (*Accipiter nisus*). The third sub-family (*Buteoninæ*), is almost as widely distributed as the previous one, not being well represented, however, in the Australian Region. It contains 16 genera and 75 species, and includes the

birds known as Buzzards, two of which may be reckoned as British. The next sub-family (*Gypaëtinæ*), includes only a single genus and three species of so-called Bearded Vultures, which are confined to Africa and the Palæarctic Region. All the remaining members of this large family are placed in the *Aquilinæ*, a group of world-wide distribution, containing 47 genera and 244 species. In this section of the family come the Eagles, Kites and Falcons, about a dozen of which are natives of Britain. Chief among these are the Golden Eagle (*Aquila chrysaëtus*), White-tailed Eagle (*Haliaëtus albicilla*), the Kestrel (*Cerchneis tinnunculus*), the Merlin (*Falco æsalon*), and the Peregrine Falcon (*Falco peregrinus*).

PANDIONIDÆ (Ospreys; 6 Species). Plate 15, Map ii.

The Ospreys or Fish-Hawks are chiefly inhabitants of the Old World, only one species being found in America. The other five species, taken as a whole, range over most of the Eastern Hemisphere, but are absent from Madagascar and New Zealand. A single species is peculiar to Australia and the Austro-Malayan Islands, while the Common Osprey (*Pandion haliaëtus*) has only recently been exterminated as a native of Britain. It formerly nested at Ullswater, and in Scotland in a few isolated localities in the Highlands. Some ornithologists regard the various species as only racial forms of one.

ORDER CATHARTIDIFORMES (9 Species).

CATHARTIDÆ or SARCORHAMPHIDÆ (American Vultures; 9 Species). Plate 15, Map iii.

As their popular name suggests, these ungainly birds are confined to the New World, ranging from about the northern boundary of the United States to Cape Horn and the Falkland Islands. The 9 known species are divided among 5 genera, and include some of the largest known flying birds. Among them may be mentioned the huge Condor of the Andes (*Sarcorhamphus gryphus*); the King Vulture (*Gypagus papa*), a brilliantly-coloured bird found in Central and the tropical portion of South America; the Californian Vulture (*Pseudogryphus californianus*) confined to the country whence it derives its name; and the Turkey-Buzzards of the typical genus (*Cathartes*), of which four species are known.

ORDER PELECANIFORMES (75 Species).

PHALACROCORACIDÆ (Cormorants; 42 Species). Plate 15, Map iii.

These birds have a cosmopolitan distribution, and all the species save one belong to a single genus (*Phalacrocorax*). The exception is *Nannopterum harrisi*, a peculiar form confined to one of the Galapagos Islands. The northern species of Cormorant are more or less migratory, and hence have a wider range than their southern relatives. Britain is the home of two species, the Common Cormorant (*P. carbo*) and the Shag (*P. graculus*), both of which are common residents on our coasts; while New Zealand and the neighbouring islands are the haunt of no fewer than 10 forms, which are peculiar to these remote regions. About a dozen species are found in the New World, and about half-a-dozen in Africa. Some of the species are essentially marine, while others haunt both the coast and inland waters.

PLOTIDÆ (Darters; 4 Species). Plate 15, Map iii.

These birds frequent lakes, rivers, and swamps, as well as inlets of the sea, in practically all the tropical and subtropical regions of the globe. All belong to a single genus (*Plotus*), and only one inhabits the New World. One species ranges over Africa and Madagascar (occurring also in Syria), another is mainly Oriental, while the remaining one is confined to Australia, New Zealand, and New Guinea. In appearance they resemble the Cormorants (*Phalacrocoracidæ*), and are sometimes called "Snake-birds," on account of their long, thin, serpent-like necks.

SULIDÆ (Gannets; 11 Species). Plate 15, Map iii.

The Gannets and "Boobies" (as some of the species are called) are ocean-loving birds, feeding on fish and nesting on rocky coasts and islands. Britain claims one species, the well-known *Sula bassana* of the Bass Rock and other stations chiefly on our western coasts. South Africa and Australia each possess a form very like the British one, while about half-a-dozen frequent the American coasts, both in the Atlantic and Pacific.

TACHYPETIDÆ or FREGATIDÆ (Frigate-Birds; 2 Species). Plate 15, Map iv.

These birds are essentially marine, seldom visiting the land except for roosting and nesting purposes. They are extremely active on the wing, feeding mainly on the fishes which swim near the surface. They also have the curious habit of forcing other marine birds, when on the wing, to disgorge their food, which they manage to catch before it falls into the water. Only two species are known, one of which occurs over the tropical and subtropical oceans of both Hemispheres, while the other is only found in the Indian and Pacific Oceans.

PHÆTHONTIDÆ (Tropic Birds; 6 Species). Plate 15, Map iv.

These Birds, which resemble large Terns, are even more exclusively oceanic than the members of the previous family, and are often seen hundreds of miles from land. Their range is similar to that of the Frigate-Birds, their food also consisting mainly of fish. The most striking feature in the appearance of these birds is the remarkable elongated middle pair of tail-feathers.

PELECANIDÆ (Pelicans; 10 Species). Plate 15, Map iv.

These remarkable birds inhabit lakes, swamps, and tidal waters in portions of all the zoögeographical regions, four species occurring in America, and six in the Old World. Three species occur in Southern and South-eastern Europe, and the bones of Pelicans have been found in the fens of Norfolk and Cambridge, thus proving that such birds inhabited Britain at a comparatively recent period.

ORDER ANSERIFORMES (206 Species).

ANATIDÆ (Swans, Geese, Ducks, &c.; 206 Species). Plate 15, Maps v. and vi.; Plate 16, Maps i. and ii.

The members of this large and important family are found all over the globe. The numerous species are arranged in 70 genera, and these are grouped into no fewer than 11 sub-families. The distribution of these latter is shown separately on the maps, and they may be discussed here in the same manner. The first sub-family (*Cygninæ*) contains the Swans, of which two genera and eight species are known. Seven of these belong to the typical genus (*Cygnus*), and are, with the exception of one species confined to the southern half of South America, found over the whole of the Nearctic and Palæarctic Regions. Two species of Swan, namely, the Whooper, (*Cygnus cygnus*) and Bewick's Swan (*C. bewicki*), occur regularly in Britain as winter visitors. The Black Swan of Australia is placed in the other genus, and is known as *Chenopsis atrata*. The second sub-family (*Anseranatinæ*) comprises only the so-called Pied or Half-webbed Goose (*Anseranas semipalmata*) of Australia and Tasmania. The third sub-family (*Plectropterinæ*) contains nine genera and 17 species, including the African Spur-winged Geese (*Plectropterus*), the Muscovy Duck (*Cairina*) of Central and tropical South America, the Wood Duck (*Lamprouessa*) of North America, the Mandarin Duck (*Aex*) of China, and others occurring in various parts of the world. The fourth sub-family (*Cereopsinæ*) is formed solely for the reception of the Cape Barren Goose (*Cereopsis novæ-hollandiæ*) of Southern Australia and Tasmania. The fifth sub-family (*Anserinæ*) comprises nine genera and 30 species of typical geese, which are spread over the whole of the Temperate and Arctic Regions of the Northern Hemisphere. The typical genus (*Anser*) contains 11 species, four of which occur regularly in Britain as winter visitants (one breeding in some parts of the Highlands and islands of Scotland). Other noteworthy members of this sub-family are the Snow Geese (*Chen*) and the Brent Geese (*Branta*). The sixth sub-family (*Chenonettinæ*) comprises southern forms only. Three genera are included here, with eight species, six of which occur in South America, one in N.E. Africa, and one in Australia. The seventh sub-family (*Anatinæ*) contains the typical Ducks, of which 21 genera and 78 species are described. They are cosmopolitan in distribution, and nine species occur more or less regularly in Britain. These comprise two species of Sheld-Duck (*Tadorna*), the Mallard (*Anas boscas*), Gadwall (*Chaulelasmus streperus*), Shoveller (*Spatula clypeata*), Pintail (*Dafila acuta*), Teal (*Nettium crecca*), Garganey (*Querquedula querquedula*), and Wigeon (*Mareca penelope*). The eighth sub-family (*Fuligulinæ*) include 14 genera and 35 species of diving ducks, which range over the greater part of the world, but are absent from the northern half of South America and West Africa. Britain possesses a dozen species belonging to this group, including two Pochards, the Tufted Duck, and the Scaup-Duck (*Fuligula*), the Goldeneye (*Clangula clangula*), Long-tailed Duck (*Harelda glacialis*), Eider-Duck (*Somateria mollissima*) and three Scoters (*Œdemia*). The ninth sub-family (*Erismaturinæ*) contains four genera and 11 species of so-called Lake and Musk Ducks, five of which are American, three Ethiopian, two Australian, and the remaining one confined to the countries surrounding the Mediterranean, N.W. India, and Central Asia. The tenth sub-family (*Merganettinæ*) is a small one, containing three genera and eight species. Six of these are confined to the Andes, one is found in New Guinea and the island of Waigion, and one, known as the Blue Duck, is confined to New Zealand. The eleventh and last sub-family (*Merginæ*) comprises the Mergansers, of which three genera and nine species are known. These have a wide distribution in the Northern Hemisphere, while one species occurs in S.E. Brazil, and one in the Auckland Islands. Britain possesses three, namely, the Smew (*Mergus albellus*), Goosander (*Merganser merganser*) and Red-breasted Merganser (*M. serrator*), the two latter being nesting species.

ORDER PHŒNICOPTERIFORMES (6 Species).

PHŒNICOPTERIDÆ (Flamingoes; 6 Species). Plate 16, Map iii.

These extraordinary-looking birds have a wide range in the warmer portions of both Hemispheres, but are entirely absent from the Australian Region. Three genera are recognised, the typical one (*Phœnicopterus*) containing two American species which range from Florida and the Greater Antilles far southwards, and the well-known European Flamingo (*P. roseus*) which ranges from Southern Europe to Lake Baikal (omitted from the Map), India and the Cape of Good Hope.

ORDER **PALAMEDEIFORMES** (3 Species).

PALAMEDEIDÆ (Screamers; 3 Species). Plate 16, Map iii.

The members of this small family are strange-looking birds, entirely confined to the Neotropical Region. They are divided into two genera, the first of which includes only the Horned Screamer (*Palamedea cornuta*) of the Amazonian forest-region. The second genus (*Chauna*) contains the other two species, or Crested Screamers, one of which is found in Southern Brazil and as far south as Argentina, while the other is a native of Columbia and Venezuela.

ORDER **ARDEIFORMES** (162 Species).

IBIDIDÆ (Ibises; 27 Species). Plate 16, Map iv.

No fewer than 19 genera of these interesting birds are differentiated, most of which contain only a single species. Considering the small number of species, they have a remarkably wide range, occurring practically everywhere save the northern temperate regions and New Zealand. The best-known members of the family are the Sacred Ibis (*Ibis aethiopica*) of Africa, whose portrait figures so abundantly on the monuments of Ancient Egypt, the beautiful Scarlet Ibis (*Eudocimus ruber*) of South America; and the Glossy Ibis (*Plegadis falcinellus*), a species with an extraordinarily wide range in both Old and New Worlds, and occasionally visiting the British Islands.

PLATALEIDÆ (Spoonbills; 6 Species). Plate 16, Map iv.

The Spoonbills have almost as wide a distribution as the Ibises, although only half-a-dozen species are known. Only one form (*Ajaja ajaja*) occurs in America; of the rest, two are confined to the Australian Region, and one to Tropical Africa and Madagascar. The other two have an extensive range, occurring from Central and Southern Europe to Japan, Formosa, India and Eastern Africa. The White Spoonbill (*Platalea leucorodia*) appears to have nested in the south-east of England about 300 years ago, but it is now only a casual visitor to Britain, chiefly to the south-east coast of England.

CICONIIDÆ (Storks; 19 Species). Plate 16, Map iv.

The Storks have a similar distribution to that of the Ibises and Spoonbills. Eleven genera are recognised, which are grouped into two sub-families. The first of these (*Tantalinæ*) contains two genera and four species which are known as Wood-Storks or Wood-Ibises, and which are intermediate in character between the true Storks and the Ibises. The American Wood-Stork (*Tantalus loculator*) is the only representative of its genus, and one of the two species of the family occurring in the United States. The true Storks (*Ciconiinæ*) comprise nine genera and fifteen species, all but two of which are natives of the Old World. Two species occur in Europe, viz., the White Stork (*Ciconia ciconia*), and the Black Stork (*C. nigra*). Both find a place on the British list, but only as occasional visitors. The so-called Adjutants or Marabous of the genus *Leptoptilus*, of which two are Oriental and one Ethiopian, are also well-known members of the Stork family.

SCOPIDÆ (The Hammer-Head; 1 Species). Plate 16, Map v.

The single species (*Scopus umbretta*), for which this family is constituted, is a curious-looking bird which inhabits wooded districts near water. It occurs, but not very abundantly, all over Tropical and South Africa, in Madagascar and in Southern Arabia.

BALÆNICIPITIDÆ (Whale-Headed Stork; 1 Species). Plate 16, Map v.

This family is formed for the reception of an extraordinary-looking bird called the Whale-headed Stork or Shoebill (*Balæniceps rex*). It is only found in the region of the White Nile and its tributaries, but is always rare and is protected by law. Its food consists principally of fish, but other small animals are also occasionally devoured. As a rule, it lives in places far removed from human habitations.

ARDEIDÆ (Herons and Bitterns; 108 Species). Plate 16, Map v.

This great family of fish-eating birds has a cosmopolitan distribution, and several of its members have an extraordinarily wide range. The European Night-Heron (*Nycticorax nycticorax*), for instance, occurs in every zoögeographical region, while other members of the family are found over practically the whole of the Old World. Some 35 genera have been differentiated, 14 of which contain only a single species. Ten species claim a place on the British list, only one of which, the Common Heron (*Ardea cinerea*) is a resident, the Bittern (*Botaurus stellaris*), a former native, having been banished from our midst.

ORDER **GRUIFORMES** (34 Species).

PSOPHIIDÆ (Trumpeters; 7 Species). Plate 16, Map v.

The Trumpeters are a small group of fowl-like birds which are entirely restricted to the Amazonian forest region. In their native country they are domesticated for the purpose of protecting poultry, and when tamed show great affection for their owners. All the species belong to a single genus (*Psophia*).

CARIAMIDÆ (Seriemas; 2 Species). Plate 16, Map v.

This family contains only two species of birds, which are confined to a comparatively small area in South America, and whose affinities have long been a matter of discussion. By some authorities they have been regarded as birds of prey, and placed near the Secretary-bird, to which, indeed, they bear a close superficial resemblance. The Brazilian species (*Cariama cristata*) occurs from Pernambuco to Paraguay and Matto Grosso, while the more southern member of the family (*Chunga burmeisteri*) is confined to the districts of Tucuman and Catamarca in the Argentine Republic. Both species frequent open and grassy plains, and feed principally on small mammals, reptiles and insects.

GRUIDÆ (Cranes; 19 Species). Plate 16, Map vi.

The Cranes are widely distributed in the Old World, ranging from a little north of the Arctic Circle to South Africa and Australia. Their principal home is in North-eastern Asia, while on the other hand they are entirely absent from the southern half of India, the Malay Archipelago, Madagascar, Tasmania and New Zealand. Australia possesses only a single species, which does not occur in the south-western portion; and Africa has seven, two of which, however, are only winter visitants to its northern portion. In the New World only three species are found, which are confined to North America, migrating as far south as Florida and Mexico on the approach of winter. The Neotropical Region is thus entirely without representatives of the Crane family. The Common Crane (*Grus grus*) formerly bred in England, but now only occurs as an occasional visitant.

ARAMIDÆ (Courlans or Limpkins; 2 Species). Plate 16, Map vi.

This small family appears to form a natural link between the Rails (*Rallidæ*) and the Cranes (*Gruidæ*). The two species at present known are entirely confined to the tropical or subtropical parts of America. The more northern of the two, that known as the Clucking Hen or Limpkin (*Aramus giganteus*), is found in Southern Florida, the Greater Antilles and Central America; while the other (*A. scolopaceus*), bearing the names of the Brazilian Courlan, Lamenting Bird, or Crazy Widow, ranges from Venezuela and Guiana to the Argentine Republic. These birds, whose cries are of a melancholy, wailing character, varied with a clucking noise (hence their popular names), frequent marshy and reedy districts, feeding principally upon molluscs, insects and small reptiles.

RHINOCHETIDÆ (The Kagu; 1 Species). Plate 16, Map vi.

The solitary member of this family (*Rhinochetus jubatus*) is a somewhat crane-like bird, remarkable for its strange dancing antics. It is entirely confined to the island of New Caledonia, where it used formerly to be tolerably common, but it is now only found in the wildest and most remote parts of the island.

MESŒNATIDÆ (Mesœnas or Mesites; 1 Species). Plate 16, Map vi.

Mesœnas (or *Mesites*) *variegata*, the only known representative of this family, is confined to the island of Madagascar. It is nearly allied to the Kagu (*Rhinochetus jubatus*) found in New Caledonia, and is by some authorities placed with it in the same family. It nests upon the ground, but beyond this fact nothing appears to be known of its habits.

EURYPYGIDÆ (Sun-Bitterns; 2 Species). Plate 16, Map vi.

The Sun-Bitterns, so-called from their fondness for basking in the sun, are exclusively confined to Central and South America. The better known of the two species (*Eurypyga helias*) frequents swampy and wooded banks of rivers from Venezuela and Guiana to Bolivia and Central Brazil; while the other (*E. major*) inhabits similar localities in Central America, Colombia, and Ecuador. These birds are usually solitary, but are sometimes seen in pairs, feeding principally upon insects and nesting in the low branches of trees.

ORDER **CHARADRIIFORMES** (292 Species).

CHIONIDIDÆ (Sheath-Bills; 3 Species). Plate 17, Map i.

The members of this family are curious pigeon-like birds, inhabiting the southern extremity of South America and certain remote islands and districts in the Antarctic regions, and are possibly surviving links between the *Charadriidæ* (Plovers, &c.) and the *Laridæ* (Gulls, &c.). *Chionis alba*, the best-known species, is sometimes called the "Kelp Pigeon." It is found in Southern Patagonia, the Falkland Islands, South Georgia, the South Orkney Archipelago, and portions of the Antarctic Continent. The other two species have their home in Kerguelen, Marion Island, Prince Edward and the Crozet Islands.

THINOCORYTHIDÆ (Seed-Snipes; 5 Species). Plate 17, Map i.

The Seed-Snipes, though somewhat partridge-like in appearance, are structurally most nearly related to the Plovers (*Charadriidæ*), and are restricted to the southern and extreme western portions of South America and the Falkland Islands, where they inhabit the desolate ground of the Andes in the north, and similar districts at low levels in the southern portion of their range. Two genera have been described, containing three and two species respectively.

CHARADRIIDÆ (The Plover Tribe; 201 Species). Plate 17, Map i.

The members of this large family are, as the Map shows, cosmopolitan. Although fairly uniform in character, they have been grouped into several sub-families, the number of which varies according to the views of different authors. Following the Map, three sub-families may be here considered. The first of these (*Charadriinæ*) contains the typical Plovers, several of which inhabit the British Isles. Among them are the Lapwing (*Vanellus vanellus*), Golden Plover (*Charadrius pluvialis*), Oystercatcher (*Hæmatopus ostralegus*), and others. The second sub-family (*Tringinæ*) includes the Phalaropes (*Phalaropus*), Dunlin (*Tringa alpina*), Stints and Sandpipers (*Tringa* spp.), the Ruff (*Machetes pugnax*), Godwits (*Limosa*), Curlews (*Numenius*), and many other well-known birds, of which Britain possesses its due share. Lastly, the *Scolopacinæ* contain the familiar Woodcock (*Scolopax rusticula*) and its relatives, with numerous species of Snipe (*Gallinago*). The Common Snipe (*Gallinago gallinago*) and Jack Snipe (*G. gallinula*) are regular winter visitants to Britain, the former remaining to breed in suitable localities.

PARRIDÆ (Jacanas and Water-Pheasants; 11 Species). Plate 17, Map ii.

The curious long-toed, marsh-frequenting birds belonging to this family are for the most part confined to the Southern Hemisphere, one species in the New World occurring as far north as Texas, while in the Old they range in Africa from the Soudan southwards, and in Asia from India and Cochin-China through the Malayan and Papuan Islands to Northern and Eastern Australia. They occur also in Madagascar, but are absent from New Zealand. The Jacanas (*Jacana*, &c.), range well over the area mapped for the family, but the Water-Pheasant (*Hydrophasis chirurgus*) occurs only in the Oriental Region, ranging from India and Indo-China to the Greater Sunda Islands.

CURSORIIDÆ (Coursers; 15 Species). Plate 17, Map ii.

The members of this family are chiefly natives of Africa and India, one species occasionally wandering as far north as Europe and even Britain. Four genera are differentiated, and of the 15 species no fewer than 12 are African. The best-known form is the Cream-coloured Courser (*Cursorius gallicus*), which inhabits the deserts of Northern Africa, ranging also eastwards through Arabia and Persia to North-western India, and is the species which has visited our islands.

GLAREOLIDÆ (Pratincoles; 10 Species). Plate 17, Map ii.

The Pratincoles, of which three genera are described, are confined to the Old World, although possessing there a wide distribution. The Common Pratincole (*Glareola pratincola*) has occurred on several occasions in the British Islands, but its usual home is in Southern Europe, Central Asia and India; the European birds, however, migrate to Africa for the winter.

DROMADIDÆ (The Crab-Plover; 1 Species). Plate 17, Map iii.

The curious species for which this family has been founded (*Dromas ardeola*), is a bird which inhabits sandy places along the shores and islands of the Red Sea and Indian Ocean. It is white, with black wings and grey tail, and is by some authors placed in the same family as the Pratincoles (*Glareolidæ*). Its food consists of small crustaceans.

ŒDICNEMIDÆ (Thick-Knees; 13 Species). Plate 17, Map iii.

These birds are principally inhabitants of the Old World, where they have a wide range. One species, however, occurs in Central and part of South America, another in Peru, and a third in San Domingo. Four genera are differentiated, but the typical one (*Œdicnemus*) contains most of the species. Britain claims one species, the Stone Curlew (*Œ. œdicnemus*), which occurs as a summer migrant in the south and east of England.

OTIDIDÆ (Bustards; 33 Species). Plate 17, Map iii.

The Bustards are rather handsome birds (some of them of considerable size), exclusively confined to the Old World, extending from Central Europe, Southern Siberia and Japan southwards to the Cape and Australia. Madagascar, the Malay Archipelago and New Zealand are entirely without representatives, while the greater number of species occur in Africa. Bustards are chiefly found in open grassy or sandy plains, and are capable of prolonged and rapid flight. Their food is principally of a vegetable nature, but they are also fond of insects, molluscs and even small reptiles and mammals. Three species are included in the British list, the best-known being the Great Bustard (*Otis tarda*), a bird formerly breeding on downs, warrens and other open country in England and Ireland, but now only occurring as a rare straggler from the Continent.

ORDER **LARIFORMES (122 Species).**

LARIDÆ (Terns, Skimmers and Gulls; 115 Species). Plate 17, Map iv.

Very little need be said regarding the distribution of this family, since its members are cosmopolitan. They are essentially marine birds, but many species breed in localities far inland. Their nests are placed either on precipitous rocks near the sea, on rocky islands, on the edges of inland lakes or marshes, or even in heathery and grassy places, according to the species. They are omnivorous in their diet, but feed principally on fish, crustacea and other marine animals.

Of this important family three sub-families are usually distinguished, the distribution of each of which is shown separately on the Map. The first (*Sterninæ*) includes the various species of Terns (*Sterna*, &c.), and the birds known as Noddies (*Anous*). The latter are chiefly inhabitants of the Tropics, but the Terns are cosmopolitan, and include 11 species which are reckoned as members of the British fauna, being summer visitors to our islands. The second sub-family (*Larinæ*) comprises the true Gulls (*Larus*), of which there are over 40 species, 11 of these occurring in Britain; the Kittiwakes (*Rissa*), two species, one of which is British; Sabine's Gull (*Xema sabinii*) and the Ivory Gull (*Pagophila eburnea*), both of which are occasional stragglers to this country; and a few other less notable species. The third sub-family (*Rhynchopinæ*) contains only 5 species, known as Skimmers or Scissor-bills, three of which are American, one is an inhabitant of Africa, and the other is confined to India, Ceylon and Burma.

STERCORARIIDÆ (Skuas; 7 Species). Plate 17, Map iv.

Skuas are extremely wide-ranging marine birds, but their distribution presents some interest, inasmuch as there is a considerable gap in the Indian and Pacific Oceans where they do not occur. Only two genera are differentiated, viz. *Megalestris*, with four species; and *Stercorarius*, with three. Four species occur in Britain, two of which breed in our islands, viz. the Great Skua (*Megalestris catarrhactes*), and Richardson's Skua (*Stercorarius parasiticus*). Three are natives of the southern regions, one of them being found as far south as the Antarctic Continent. All the species are remarkable for their parasitic habits, namely, the robbing of Gulls and Terns of the results of their labours—*i.e.* of their food.

ORDER **ALCIFORMES (29 Species).**

ALCIDÆ (Auks; 29 Species). Plate 17, Map iv.

The members of this family are marine birds frequenting the shores of the Northern Hemisphere, and ranging as far south as Mexico, New York, the Canary Islands and Japan. Like the Penguins, whose distribution is shown on the same plate, they habitually stand and waddle about in an upright position, and also swim and dive well. The most interesting species, perhaps, on account of its extinction, within a comparatively recent period, is the Great Auk or Gare-Fowl (*Plautus impennis*), which formerly inhabited the shores of the North Atlantic, south of the Arctic Circle, and including the British Isles. Specimens of this bird commonly fetch at a sale between £200 and £350, while the eggs are of about equal value. The last living examples were obtained in the year 1844 on an island off the west coast of Iceland.

This family includes half a dozen British species, which comprise the Razorbill (*Alca torda*), three species of Guillemot (*Uria*)—one a rare visitant from Arctic Seas—the Little Auk (*Alle alle*) and the Puffin (*Fratercula arctica*).

ORDER **PROCELLARIIFORMES (120 Species).**

PROCELLARIIDÆ (Typical Petrels; 25 Species). Plate 17, Map v.

The members of this family are essentially marine, and are found over the whole world. Eight genera are distinguished, which are usually grouped into two sub-families. The most familiar species is the interesting little Storm-Petrel (*Procellaria pelagica*), which breeds on our coasts and is noteworthy as being the smallest of British web-footed birds. Another member of the family worthy of special mention is Leach's Petrel (*Oceanodroma leucorrhoa*), which breeds on St Kilda and on some other islands off the west coast of Scotland and of Ireland.

PUFFINIDÆ (Shearwaters, Fulmars, &c.; 74 Species). Plate 17, Map v.

The *Puffinidæ* are cosmopolitan, and comprise 13 genera, which are arranged in two sub-families. The first of these (*Puffininæ*) contains eight genera and 63 species, including the Manx Shearwater (*Puffinus anglorum*), the commonest British member of the family. The other sub-family (*Fulmarinæ*) comprises five genera and 11 species, the best-known of which are the Giant Petrel (*Ossifraga gigantea*) a native of Southern seas; the Fulmar (*Fulmarus glacialis*), which breeds at St Kilda and other Scottish localities; and the Cape Pigeon (*Daption capensis*), which has a wide distribution in the waters of the southern hemisphere.

PELECANOIDIDÆ (Diving Petrels; 4 Species). Plate 17, Map v.

The Diving Petrels, all contained in a single genus (*Pelecanoides*) are entirely confined to southern seas. They owe their popular name to the fact that they spend much of their time in diving below the surface of the water, a habit little indulged in by any other Petrels. Of the four known species, one occurs in the neighbourhood of Australia, New Zealand, Cape Town and the Falkland Islands; the second in the southern Indian Ocean; the third in the Southern Pacific, from Peru to Chili; and the fourth at the Tristan da Cunha group.

DIOMEDEIDÆ (Albatrosses; 17 Species). Plate 17, Map v.

The members of this family are large oceanic birds, found chiefly in Southern seas, and rarely visiting land save for breeding purposes, and even then the most remote oceanic islands are usually chosen. One species occurs in the North Pacific as far north as Alaska, while others are found.

in the neighbourhood of the Sandwich Islands, Fiji Islands and other isolated groups, and in the waters of the Antarctic Ocean. The majority, however, occur about the latitude of Patagonia and New Zealand. They are birds of extremely powerful flight, and the best known species, the Wandering Albatross (*Diomedea exulans*) has been-known to follow a ship for many hundreds of miles for the sake of morsels of food which may be thrown overboard.

ORDER **SPHENISCIFORMES (19 Species).**

SPHENISCIDÆ (Penguins; 19 Species). Plate 17, Map vi.

These very interesting birds are entirely inhabitants of the Antarctic and Southern Oceans, ranging from the shores of the Antarctic Continent northwards to the coasts of Peru and the Galapagos Islands, Uruguay, South Africa, Southern Australia and New Zealand. All are absolutely flightless, but are expert swimmers and divers, and when below the surface use their peculiarly modified wings as paddles and their feet for steering purposes. Their curious erect, waddling gait when on land is both familiar and amusing. The largest known species are the King Penguin (*Aptenodytes patagonica*) and the Emperor Penguin (*A. forsteri*), both of which are exceedingly handsome birds. Specimens of the latter measure, when standing erect, 3½ feet in height.

ORDER **COLYMBIFORMES (5 Species).**

COLYMBIDÆ (Divers; 5 Species). Plate 17, Map vi.

The few members of this family are entirely northern in their distribution, and occur far into the Arctic Realm. They have, nevertheless, a wide range, for in winter they occur in the New World as far south as California and Florida, and in the Old as far as the Mediterranean, Egypt and Japan. Three out of the five species occur regularly in Britain, and two of these, the Black-throated Diver (*Colymbus arcticus*) and the Red-throated Diver (*C. septentrionalis*), breed in the northern portion of our islands. All the Divers are handsome birds, feeding on fish and nesting in exposed situations close to the margin of sheets of fresh water.

ORDER **PODICIPEDIDIFORMES (25 Species).**

PODICIPEDIDÆ (Grebes; 25 Species). Plate 17, Map vi.

The Grebes, though not numerous in species, have an exceedingly wide distribution, ranging practically over the whole world save the regions north of the Arctic circle. Although some species are more or less oceanic at some portions of the year, all Grebes visit lakes and rivers for the purpose of breeding, and many have an exceedingly wide range. Five species occur in Britain, two of which breed and three are winter visitants only. These birds feed principally on small fishes, but molluscs, insects and vegetable matter also form part of their diet.

ORDER **RALLIFORMES (212 Species).**

RALLIDÆ (Rails and Crakes; 207 Species). Plate 18, Map i.

This family is practically cosmopolitan in its distribution, and is remarkable for the number of flightless forms which it contains, a number of which have become extinct in comparatively recent times. Two sub-families are recognised, the distribution of each of which is shown separately on the Map. The first (*Rallinæ*) includes the great majority of the species, while the other (*Fulicinæ*) contains only the Coots, of which 13 species are known, belonging to a single genus (*Fulica*). Seven species of this family are included in the British fauna, the most familiar of which are the Water-Rail (*Rallus aquaticus*), the Corn-Crake (*Crex pratensis*), the Moorhen (*Gallinula chloropus*) and the Coot (*Fulica atra*). The *Rallidæ* chiefly inhabit moist localities near lakes and rivers where there is a luxuriance of vegetation, although to this rule there are many exceptions. They indulge in an extremely mixed diet.

HELIORNITHIDÆ (Finfoots; 5 Species). Plate 18, Map i.

These birds, of which three genera are described, have a tolerably wide distribution in spite of the paucity of species. One form is found in the New World and is known as the American Finfoot (*Heliornis fulica*). It ranges from British Honduras to Southern Brazil. Africa possesses three species, belonging to the genus *Podica*. Two of these are found in the western forest region and the other in Damara Land and the south-eastern portion of the Continent. The remaining member of the family is Oriental, ranging from Cambodia and Burma through the Malay Peninsula as far as, and including, Sumatra. Like the typical Rails (*Rallidæ*), these birds frequent moist localities where there is an abundance of vegetation.

ORDER **OPISTHOCOMIFORMES (1 Species).**

OPISTHOCOMIDÆ (The Hoatzin; 1 Species). Plate 18, Map i.

The sole representative of this Order and family is a curious bird known popularly as the Hoatzin or "Anna" (*Opisthocomus hoazin*). It is confined to the great Amazonian forest region, frequenting rivers and lagoons where there is a low growth of underwood, amid which it dwells and builds its nest, and feeds entirely on fruits and leaves. Mention must not be omitted of the remarkable nature of the young birds, which climb about the bushes as soon as hatched, and are provided with claws on two of the fingers of each wing, by means of which they are able to climb about the thickets. This bird presents many interesting peculiarities, and is, no doubt, the sole survivor of a primitive type.

ORDER **COLUMBIFORMES (551 Species).**

TRERONIDÆ (Fruit Pigeons, &c.; 223 Species). Plate 18, Map ii.

This, the largest, family of Pigeons is entirely confined to the Old World, and includes 36 genera which are arranged in three sub-families. The first sub-family (*Treroninæ*), contains seven genera and 50 species, including seven belonging to the genus *Vinago*, which are the only African representatives of the family. Practically all the rest are restricted to the Oriental region, four, however, occurring in Japan, Formosa and the Loo Choo Islands. The genus *Phabotreron*, with nine species, is confined to the Philippine Islands. The second sub-family (*Ptilopodinæ*) comprises 17 genera and 102 species. Four of these, constituting the genus *Alectrœnas*, and known as Wart-Pigeons, are confined to Madagascar, the Seychelles, and neighbouring islands. All the other members of the sub-family are natives of the Oriental and Australian regions, many being found in the remote islands of Polynesia. The true Fruit-Pigeons, of which 12 genera and 71 species are known, constitute the third sub-family (*Carpophaginæ*). On the whole, they are the largest members of the family, and many of them are birds of remarkable beauty of plumage. One of the best-known species is the so-called Nutmeg Pigeon (*Carpophaga ænea*), which ranges from India and Ceylon to the Sulu and Philippine Islands.

COLUMBIDÆ (Typical Pigeons; 118 Species). Plate 18, Map ii.

Of this family some nine genera have been differentiated, yet *Columba* with 70, and *Macropygia* with 31 species, contain most of its members. These pigeons occur in most parts of the globe, and possess representatives in every zoögeographical region. About one-fifth of the species are natives of the New World, only two of Australia, while none occur in either New Zealand or Madagascar. Three species are found in Britain, namely, the Wood Pigeon (*Columba palumbus*), the Stock Dove (*C. œnas*), and the Rock Dove (*C. livia*). All are resident species, the first-named being the most generally distributed. The Passenger-Pigeon (*Ectopistes migratorius*) of Eastern and Central North America is worthy of special mention on account of the enormous flocks which formerly occurred there on migration, and because it is now on the verge of extinction.

PERISTERIDÆ (Turtle-Doves and Ground Pigeons; 198 Species). Plate 18, Map ii.

The members of this family have an even wider distribution than the *Columbidæ*, their range including the whole of Australia and Madagascar. No fewer than 42 genera have been founded for the reception of the various species, and these are arranged in seven sub-families. The species are fairly equally divided between the Old and New Worlds, but the majority occur in the warmer regions of the earth. The best-known form is probably the Common Turtle-Dove (*Turtur turtur*), which is a summer visitor to England and Wales, and occasionally to Scotland. It ranges over the greater part of Europe, wintering in Northern Africa and Western Asia. Other noteworthy members of the family are the Nicobar Pigeon (*Calœnas nicobarica*) of the Malay Archipelago, the Wonga-Wonga (*Leucosarcia picata*) of Australia, the Cinnamon Dove (*Haplopelia larvata*) of South Africa, and the Mourning Dove (*Zenaidura carolinensis*) of North and Central America.

GOURIDÆ (Crowned Pigeons; 8 Species). Plate 18, Map ii.

The handsome birds which constitute this family were, until quite recently, only known from New Guinea. A few years ago, however, the range of the group was extended by the discovery of a form, constituting a distinct genus, in the Solomon Islands. The popular name of these birds, which are the largest members of the COLUMBIFORMES, is due to the presence of a beautiful crest of feathers adorning the top of the head.

DIDUNCULIDÆ (Tooth-Billed Pigeon; 1 Species). Plate 18, Map iii.

The sole representative of this family is a remarkable bird, regarded by some as being allied to the well-known Dodo, and confined to the Samoa Islands. In addition to the name given above, it is also known as the Manumea or Red Bird. It was discovered in the year 1839, during the United States Exploring Expedition under Commander Wilkes, and since that time several examples have been procured. Curiously enough, a change in the habits of the bird, which formerly was a ground-feeder and is now mainly arboreal, has led to a great increase in its numbers and probably saved it from extinction.

DIDIDÆ (Dodos and Solitaire; 3 Extinct Species). Plate 18, Map iii.

The members of this interesting family are all now extinct, but formerly they inhabited the Islands of Mauritius, Réunion and Rodriguez. They were large birds quite incapable of flight. The Dodo of Mauritius (*Didus ineptus*) is the best-known of the three species. It was discovered in 1598, and less than one hundred years later (in 1691) had apparently ceased to exist. An allied species, about which little is known, inhabited the Island

of Réunion. The third member of the family was the so-called Solitaire (*Pezophaps solitarius*), which occurred only on the Island of Rodriguez, where it survived until the year 1761. It is reported to have been somewhat larger than a swan, with longer legs than the Dodo, and quite rudimentary wings.

ORDER **PTEROCLIDIFORMES (17 Species).**

PTEROCLIDIDÆ (Sand Grouse; 17 Species). Plate 18, Map iii.

The Sand Grouse, of which three genera are described, were at one time considered to be close allies of the true Grouse (*Tetraonidæ*), but they are now placed in a sub-order to themselves. They are essentially inhabitants of desert regions, and in suitable districts are found in the Oriental, Ethiopian and Palæarctic Regions. A single species is peculiar to Madagascar, six are confined to Africa, one to India and one to Tibet. Pallas' Sand-Grouse (*Syrrhaptes paradoxus*) is remarkable for the great irruptions it has made on several occasions into Europe and even into Britain, although its normal home is in the Kirghiz Steppes and eastwards through Turkestan into Mongolia. The chief of these immigrations occurred in 1863 and 1888, when the species spread over Western Europe in enormous flocks, occurring on those occasions in practically every part of the British Isles.

ORDER **HEMIPODII (28 Species).**

TURNICIDÆ (Bustard-Quails or Hemipodes; 28 Species). Plate 18, Map iii.

The Bustard-Quails are entirely confined to the Old World, ranging from Southern Spain (where a single species occurs), Northern Africa, Northern India and Manchuria to the Cape, Madagascar, Australia, and Tasmania. Of the 28 known species no less than eight are peculiar to Australia, while Africa possesses only four and Madagascar one. The remainder are found in China, India and the Malayan Region, ranging as far east as New Caledonia, but not occurring, curiously enough, in the large island of Borneo. These birds are like miniature partridges in general appearance, running swiftly but not flying well, dwelling in open grassy plains and feeding on seeds and insect larvæ. A remarkable feature in this family is the superior size of the female, while the males perform the important duties of incubation and tend the young when hatched.

ORDER **GALLIFORMES (479 Species).**

CRACIDÆ (Curassows and Guans; 62 Species). Plate 18, Map iv.

The members of this family are all natives of tropical and sub-tropical America, ranging from Texas and Northern Mexico southwards to the Argentine Republic and Uruguay. About two-thirds of the species are found in the great forests of the Amazonian sub-region, while on the other hand Chili and the West Indies are entirely without representatives. They are handsome birds, some of them as large as Turkeys, and spend most of their time perched high up in the trees of the forest. Three sub-families are sometimes recognised, the first (*Cracinæ*) containing the Curassows (*Crax*) and their allies; the second (*Penelopinæ*) comprising the birds known as Guans (*Penelope*), and a few others; and the third (*Oreophasinæ*) represented by a single species, the rare and beautiful "Faisan" (*Oreophasis derbianus*) of the Volcan de Fuego in Guatemala.

PHASIANIDÆ (Pheasants, Partridges, &c.; 244 Species). Plate 18, Map iv.

This large and important family of Game-Birds, containing 47 genera, is entirely confined to the Old World, throughout which it has an almost universal distribution. The great majority of the species are Oriental, but they are also well represented in Africa and the southern portion of the Palæarctic Region. It is impossible to deal with all the well-known members of the family here, but a few of the more important may be alluded to. The genus *Caccabis* includes nine species. known as Red-legged Partridges, occurring in Central and Southern Europe, Asia, Arabia, and North Africa. The Francolins (*Francolinus*), are an important group of 49 species, most of which are African. The true Partridges (*Perdix*) are eight in number, and range over a wide arca in Europe and temperate Asia, with one species (*P. cinerea*) resident and generally distributed in Britain. The Quails (*Coturnix*), six species of which are known, have an interesting distribution, one species occurring in Britain chiefly as a summer visitant, ranging throughout Europe, North Asia, and the Indian Peninsula, and wintering in Africa. Two others are African, the fourth Oriental, the fifth Asiatic, and the sixth confined to Australia and Tasmania. The Tragopans, or Horned Pheasants (*Tragopan*) are handsome birds, inhabiting the wooded mountains of Northern India and China. Five species are known, which are remarkable for the blue fleshy "horns" on the head of the males. Other fine members of the family are the Monals (*Lophophorus*), the Eared Pheasants (*Crossoptilum*), the Golden Pheasant (*Chrysolophus pictus*), and the Argus Pheasant (*Argusianus argus*). The true Pheasants (*Phasianus*) include about a score of species with many local races, the distribution of which is shown separately on the map. In Great Britain and the greater part of Europe the Common Pheasant has long been established for sporting and domestic purposes, but its true home is South-eastern Europe and Asia Minor. The Jungle-Fowls of the genus *Gallus* (see Map) comprise four species, which are of much interest as being the origin of all our various breeds of domestic fowls. Lastly, the Peacocks (*Pavo*)—see Map—three species of which are known, are familiar to all through their gorgeous coloration. Their original home is India, Ceylon, Java and the Indo-Chinese countries, but one species (*P. cristatus*), has long adorned the gardens of the West, having been introduced into Britain at a very early date.

MEGAPODIDÆ (Megapodes and Brush-Turkeys; 28 Species). Plate 18, Map v.

The members of this family are mainly, though not exclusively, confined to the Australian Region. Seven genera have been described, but more than half (seventeen) of the species belong to the typical genus (*Megapodius*), and these include the two species which occur beyond the limits of the Australian Region, viz., one in the Nicobar Islands and one in N.W. Borneo and the Philippine Islands. The Brush-Turkeys of the genus *Talegallus* are four in number, and confined to New Guinea and the Moluccas, while the Australian Brush-Turkey (*Catheturus lathami*) is a well-known member of the family. Many of the *Megapodidæ* are remarkable for their habit of raising mounds in which the eggs are deposited. These are afterwards hatched by the heat produced by the fermentation of the decaying vegetable matter of which the mounds are composed.

TETRAONIDÆ (Grouse; 45 Species). Plate 18, Map v.

The well-known birds which constitute this family are confined to the Nearctic and Palæarctic Regions, ranging as far north as Spitzbergen and Franz Joseph Land. Eleven genera are distinguished, six of which are confined to the New World, four to the Old, and one common to both (*Lagopus*). The best-known Old World members of the family are the Red Grouse (*Lagopus scoticus*), one of the few birds peculiar to the British Isles; the Ptarmigan (*L. mutus*), confined to the mountains of Europe (including Scotland); the Black Grouse (*Lyrurus tetrix*), ranging over Europe and northern Asia (including many parts of Britain); and the Capercaillie (*Tetrao urogallus*), occurring in Europe and Asia as far east as Lake Baikal. The last-named was formerly indigenous in Scotland and Ireland, became extinct about the year 1760 or 1770, and was re-introduced into Scotland in 1838. The American *Tetraonidæ* include the so-called Prairie-Hens of the genus *Tympanuchus*; the Sage-Grouse (*Centrocercus urophasianus*); and the Ruffed Grouse of the genus *Bonasa*.

NUMIDIDÆ (Guinea-Fowls; 23 Species). Plate 18, Map v.

These interesting birds, of which five genera are recognised, are entirely confined to the Ethiopian Region. They have a wide range in Africa south of the Sahara, while one species extends into Madagascar and another into the Cape Verde Islands. As a general rule these birds occur in large flocks, frequenting bushy or scrubby places, and possessing great running powers.

MELEAGRIDÆ (Turkeys; 5 Species). Plate 18, Map v.

The true Turkeys, of which two genera are known, have a restricted range in North and Central America. The typical genus (*Meleagris*) contains four species which occur in the Southern and Eastern United States and the tablelands of Mexico. From the best-known of these (*M. gallopavo*) our common Turkey of the farmyard is descended. The second genus, *Agriocharis*, includes only the Ocellated Turkey (*A. ocellata*) of Guatemala, British Honduras and Yucatan.

ODONTOPHORIDÆ (American Partridges and Quails; 72 Species). Plate 18, Map v.

These somewhat small Game-Birds are divided among 11 genera, and are fairly widely distributed in the New World. The largest members of the family are about the size of a common Partridge, but many are much smaller. They are sometimes called Toothed Partridges, owing to the fact that their lower mandible is serrated. The best-known species are the Californian Quail (*Lophortyx californicus*), a handsome bird, sometimes kept as a pet in aviaries, and the Virginian Quail (*Colin virginianus*).

ORDER **TINAMIFORMES (72 Species).**

TINAMIDÆ (Tinamus; 72 Species). Plate 18, Map vi.

The Tinamus are an interesting group of Partridge-like birds, which are entirely confined to Tropical and South America, and ranging from Mexico (about the Tropic of Cancer) to Patagonia. They are essentially ground-dwellers, and seem to take the place of such true game-birds as Partridges, Pheasants and Grouse, all of which are entirely absent from the Neotropical Region. They feed on seeds and roots, as well as insects, and cause some little damage to maize- and potato-crops, while in compensation for their destructive habits they offer such good sport and delicate eating that in many districts they have been almost exterminated.

ORDER **APTERYGIFORMES (6 Species).**

APTERYGIDÆ (Kiwis; 6 Species). Plate 18, Map vi.

The curious flightless birds known as Kiwis, are only found in New Zealand, and are among the most remarkable of all the feathered inhabitants of that interesting group of islands. They are much smaller birds than the Emus, their nearest living relatives, and are characterised by their long, somewhat slender beak, four toes, and remarkable hair-like plumage. They inhabit wooded districts chiefly in hilly regions, and are nocturnal in their habits. Of the six existing species two are confined to the South Island, one to the North Island, and one to Stewart Island, while the other two are found in both the North and South Islands.

ORDER CASUARIIFORMES (21 Species).

DROMÆIDÆ (Emus; 2 Species). Plate 18, Map vi.

The Emus are represented at the present day by two species, which are entirely confined to Australia. The Common Emu (*Dromæus novæ-hollandiæ*) inhabits the interior of the eastern portion of that country, having become, through incessant persecution, extremely rare, and in danger of complete extinction. In former times its range was more extensive, and it even inhabited Tasmania and the Islands in Bass Strait. In Western Australia its place is taken by the second species, known as the Spotted Emu (*D. irroratus*), a more slender bird, whose feathers are barred with dark grey and white. Both species are sometimes placed in the same family with the Cassowaries, from which, however, they differ in the absence of the bony prominence of the skull, in having no wattles on the neck, and in the still more rudimentary condition of the wings, which are without the bare quills. Moreover, the Emus inhabit sandy plains or open country rather than the wooded districts tenanted by the Cassowaries.

CASUARIIDÆ (Cassowaries; 19 Species). Plate 18, Map vi.

The Cassowaries are only found in New Guinea, New Britain, Ceram, the Aru Islands and a narrow band of country in the extreme north-eastern portion of Australia. They are large and handsome birds like the Ostriches, but inhabit a different kind of country, preferring as a rule districts which are rather densely wooded. They are remarkable in having a large bony prominence at the top of the skull, and in the neck being naked and sometimes furnished with brightly-coloured wattles which hang down, and with the helmet, give the bird a very handsome and characteristic appearance. Their wings are merely represented by a few stout barbless quills.

ORDER STRUTHIONIFORMES (4 Species).

STRUTHIONIDÆ (Ostriches; 4 Species). Plate 18, Map vi.

The Ostriches are confined to Arabia, Southern Palestine and Africa, ranging in the latter country from the Soudan and Somaliland to the Equator, and also in the southern portion of the continent. Formerly they also occurred in Morocco, Algeria, Egypt and Central Asia. It is a matter of some doubt whether there is really more than one species. Yet there is a marked difference between the birds (and also in the texture of the shells of their eggs) from Somaliland and the neighbouring regions and those from Southern Africa, while the form found in the north, and ranging from the Soudan to Arabia, is sometimes recognised as a third species. Quite recently (in 1898) a form was described (making the fourth so-called species) from Masailand.

These birds are the largest of all living birds, though their size was much exceeded in the past by other birds belonging to allied and now quite extinct families. They always inhabit dry, sandy regions or such as are covered with low stunted bushes. The handsome wing- and tail-feathers are well-known articles of commerce, for the supply of which these birds are much persecuted. In some parts they are extensively domesticated, and the annual value of the plumes disposed of is about a million sterling.

ORDER RHEIFORMES (3 Species).

RHEIDÆ (Rheas or American Ostriches; 3 Species). Plate 18, Map vi.

The members of this family are entirely confined to South America, ranging from North-eastern Brazil to Patagonia. They represent in this continent the well-known Ostriches of Africa, but the plumes furnished by them are much less valuable. The Rheas differ from the true Ostriches in possessing three toes instead of two, and these have claws instead of nails. The neck is well feathered, while there is no distinct tail.

CLASS REPTILIA (Reptiles).

ORDER OPHIDIA (Snakes; 1917 Species).

CROTALIDÆ (Pit-Vipers and Rattlesnakes; 72 Species). Plate 19, Map i.

The members of this family are all poisonous, and may be divided into two divisions, viz., the Pit-Vipers and the Rattlesnakes. The former occur in both temperate and tropical America and also in the southern half of Asia, ranging as far as Timor and the Moluccas. Some 53 species are known, which belong to two genera. The Rattlesnakes on the other hand, are restricted to the New World, only one of the 19 known species extending into South America. They are distinguished from the Pit-Vipers by the possession of a series of horny bells at the end of the tail which form a rattle, the vibration of which may be heard at some distance.

The *Crotalidæ* may be distinguished from the true Vipers by the presence of a deep pit on each side of the snout, between the nostril and the eye, whence their popular name of "Pit-Vipers."

VIPERIDÆ (Vipers; 54 Species). Plate 19, Map i.

True Vipers are entirely confined to the Old World, but are widely distributed, occurring throughout the whole of Africa and over the greater part of Europe and temperate and tropical Asia. They are entirely absent from Madagascar and the Australian region. In Britain one species occurs, the Common Viper or Adder, which is widely distributed in England and Scotland but absent from Ireland.

All Vipers are poisonous, and many of them deadly. About 10 genera have been distinguished. The Puff-Adders (*Bitis*) are characteristic of Africa, while the genera *Atheris* (5 species) and *Atractaspis* (20 species) are practically confined to the tropical and southern portions of that continent.

AMBLYCEPHALIDÆ (Blunt-Heads; 46 Species). Plate 19, Map i.

The so-called "Blunt-Heads" may be distinguished from their close allies the *Colubridæ*, by the absence of a chin-groove. The principal genus, *Leptognathus*, contains 29 species, which range over Central and South America, while 12 species of *Amblycephalus* occur in South-eastern Asia. These Snakes are of moderate or small size, and perfectly harmless.

HYDROPHIDÆ (Sea-Snakes; 64 Species). Plate 19, Map i.

Sea-Snakes are creatures of marine habit, and their headquarters are the Indian and Pacific Oceans. They do not seem to occur on the east coast of Africa, while, on the other hand, a single species is recorded from the western coast of the same continent. One species of *Distira*, strangely enough, inhabits a fresh-water lake in the island of Luzon, in the Philippines. The principal genera are *Hydrophis*, with 24 species, and *Distira*, with 25. All Sea-Snakes are very poisonous.

ELAPIDÆ (Coral-Snakes, Cobras, &c.; 170 Species). Plate 19, Map ii.

All the members of this family are poisonous, and some of them very deadly. They are widely distributed, and possess representatives in all the zoögeographical regions. They are especially abundant in Australia, where they constitute the great majority of Snakes, including the notorious species known as the Death-Adder (*Acanthophis antarcticus*). Over 60 species are known from this region. The Coral-Snakes (*Elaps*) are entirely American, about 40 species being known. Owing to their narrow gape, these snakes, which are brilliantly coloured, are practically harmless to man. Africa, on the other hand, possesses several dangerous species of this family, including several Cobras of the genus *Naja*. The Asiatic species, about two dozen in number, may be termed in general "Kraits," the best known of which is the justly dreaded *Bungarus candidus*, which ranges from India and Southern China to Java and Celebes.

HOMALOPSIDÆ (Oriental Fresh-water Snakes; 28 Species). Plate 19, Map ii.

The members of this family inhabit the rivers and estuaries of the Oriental and part of the Australian region, one species occurring also some distance out at sea. The principal genus is *Hypsirhina*, with 17 species.

ELACHISTODONTIDÆ (Elachistodon; 1 Species). Plate 19, Map ii.

This family has been formed for the reception of a very rare species of Snake, which is confined to Bengal and only a few examples of which have been obtained. Nothing definite is known of its habits, but the structure of certain parts of its vertebral column, which resemble similar parts in the South African *Dasypeltis*, suggests that it also feeds on eggs, which are broken in passing down the gullet and the fragments of the shell afterwards ejected.

DIPSADOMORPHIDÆ (Tree-Snakes and their Allies; 320 Species). Plate 19, Map ii.

This family is of wide distribution, with over 70 genera. The species are divided about equally between the Old and New Worlds. Although found in Northern and Eastern Australia, only two species occur in that continent, while a similar paucity is characteristic of the eastern part of the Malay Archipelago. Four species are found in Europe, but only in the extreme south. The best known of these is *Cœlopeltis monspessulana*, which occurs along the borders of the Mediterranean and eastwards to the Caucasus and Persia. It is one of the largest Snakes in Europe, attaining a length of 6 feet. South America is the country most richly represented by members of this family, possessing over 90 different species.

RHACHIODONTIDÆ (Dasypeltis or Egg-eating Snake; 2 Species). Plate 19, Map ii.

The remarkable Snakes constituting this family, of which only two species are known, are distributed over a wide area in Africa, as our Map shows. They are harmless to man and feed entirely on eggs. For this purpose they are provided with a wonderful arrangement of bones which pierce the gullet and are used for breaking the egg, the contents of which are then swallowed and the fragments of the shell ejected. A similar arrangement is found in the *Elachistodontidæ*, as pointed out above.

COLUBRIDÆ (Colubrine Snakes; 853 Species).
Plate 19, Map iii.

This large family comprises about half the number of known Snakes, and is distributed over practically the whole world except the extreme northern and southern portions. Of all large countries inhabited by these Snakes, Australia is the poorest in representatives, possessing only about half a dozen species. The European species are about 18 in number, and two of these are found in Britain, namely, the Ring Snake (*Tropidonotus natrix*) and the Smooth Snake (*Coronella austriaca*). The former is most plentiful in the south of England, becoming scarcer in the north, and practically absent from Scotland. The Smooth Snake is, in Britain, restricted to the extreme south of England, occurring chiefly in Dorset, Hants and Surrey.

All the *Colubridæ* are harmless to man; about 130 different genera have been described.

ACROCHORDIDÆ (Wart-Snakes; 7 Species).
Plate 19, Map iii.

Wart-Snakes are chiefly aquatic creatures, inhabiting the rivers and estuaries of South-eastern Asia, ranging from the east of India to New Guinea and the Isthmus of Darien in Central America. Five genera are distinguished, most of which contain only a single species. The best-known Snake of this family is the Javan Wart-Snake (*Acrochordus javanicus*), a native of the Malay Peninsula, Java, and New Guinea. It attains a length of over 4 feet, spends most of its time in the water, and feeds on fishes and frogs. The genus *Nothopsis* is remarkable, inasmuch as the single species it contains lives far removed from its allies, namely in the Isthmus of Darien.

XENOPELTIDÆ (Xenopeltis; 1 Species). **Plate 19, Map iii.**

The single species of Snake constituting this family, and bearing the name of *Xenopeltis unicolor*, forms a remarkable connecting link between the *Colubridæ* and the *Boidæ*. Occurring in South-eastern Asia, it attains a length of about 3 feet. It possesses fierce habits and feeds on small mammals.

BOIDÆ (Boas; 52 Species). **Plate 19, Map iii.**

The *Boidæ* in general have a wide distribution, but that of the genera when considered separately is of some interest. Tropical America, including the West Indies, possesses 32 species, Africa and Asia together 14, North America 3, and Madagascar 3. Of the South American Boas those known as *Boa constrictor* and *Eunectes murinus* are the most familiar. The latter is the aquatic so-called "Anaconda," a huge creature growing to a length of 33 feet and preying upon birds and mammals. The North American members of the family constitute the genera *Lichanura* and *Charina;* those in Madagascar are two species of *Boa* and one of *Corallus*, all three strangely removed from their nearest relatives, which are tropical American. Two peculiar genera, each with one species, are found on Round Island, near Mauritius, while all the African and Asiatic species belong to the genus *Eryx* and are sometimes called Sand-Snakes. A single species of *Eryx* extends just into Europe, occurring in Greece and the Ionian Islands.

PYTHONIDÆ (Pythons; 22 Species). **Plate 19, Map iv.**

With the exception of a single species, *Loxocemus bicolor*, which is a native of Southern Mexico, all the Pythons are restricted to the Old World. Australia possesses the greatest number (eight) of distinct species, and among these may be mentioned the beautiful "Carpet" Snake (*Python spilotes*). Four species occur in Africa, three of which belong to the typical genus *Python*. Three occur in the Oriental region, while in New Ireland is a peculiar Snake, known as *Nardoa boa*.

UROPELTIDÆ (Shield-Tails; 42 Species). **Plate 19, Map iv.**

The members of this family, which are restricted to Ceylon and the mountains of Southern India, owe their popular name to the peculiar nature of their tail. This is usually covered by a rough disc or shield which may be either naked or covered with keeled scales. The species are distributed among some seven genera, distinguished by technical characters. Shield-Tails are burrowing creatures and feed entirely on earth-worms.

ILYSIIDÆ (Cylinder-Snakes; 7 Species). **Plate 19, Map. iv.**

The typical genus *Ilysia* contains a single species known as the Coral Cylinder-Snake (*I. scytale*). It is confined to the Guianas and Upper Amazon, and is the only New World representative of the family. All the rest are natives of Ceylon and South-eastern Asia, and are, with one exception, members of the genus *Cylindrophis*.

GLAUCONIIDÆ (Blind-Snakes; 39 Species).
Plate 19, Map iv.

With one exception, all the Snakes of this family belong to a single genus (*Glauconia*). The majority of the species are found in the Ethiopian region, some 20 species being known from Africa and Arabia. South America and the West Indies together possess seven species; North and Central America only four. One species has recently been described from Algeria, one occurs in Scinde, North-west India, while two have been found in Persia since the Map was prepared. These curious little Snakes are lovers of warmth, and have, like the *Typhlopidæ*, subterranean habits.

TYPHLOPIDÆ (Typical Blind-Snakes; 137 Species).
Plate 19, Map iv.

Only three genera of *Typhlopidæ* are recognised. Of these *Helminthophis*, with eight species, and *Typhlophis*, with one, are confined to tropical America. The remaining species are referred to the wide-ranging and typical genus *Typhlops*. One species just enters Europe, occurring in Greece and its neighbouring islands, including Cyprus and Rhodes. The *Typhlopidæ* are curious little worm-like Snakes, possessing subterranean habits and feeding on millipedes and insects.

ORDER **LACERTILIA** (Lizards; 2560 Species).

CHAMÆLEONTIDÆ (Chamæleons; 98 Species).
Plate 19, Map v.

These interesting little creatures are so peculiar in structure that most authorities separate them from true Lizards and place them in a Sub-Order to themselves. They are distinguished principally by having a laterally compressed body, prehensile tail, and digits opposed so as to form an efficient clasping organ. About 40 species are confined to Madagascar, two species occur in the extreme south of the Palæarctic region, one is a native of India and Ceylon, while all the rest are purely Ethiopian in distribution. Only three genera are recognised, no fewer than 83 of the species belonging to the typical one (*Chamæleon*). The most remarkable feature of these creatures is their well-known power of changing the colour of the skin so as to assimilate to that of their surroundings, and there is no doubt but that they depend largely upon this method of escaping from their numerous enemies.

PYGOPODIDÆ (Scale-footed Lizards; 16 Species).
Plate 19, Map v.

These curious Snake-like Lizards owe their popular name to the fact that their limbs are entirely reduced to a pair of scaly flaps representing the hinder ones, while the fore-limbs have disappeared altogether. Eight genera are differentiated, but the family has a very restricted range, being confined indeed to Australia, Tasmania, and part of New Guinea.

AMPHISBÆNIDÆ (Amphisbænas; 98 Species). **Plate 19, Map v.**

These peculiar worm-like Lizards have a somewhat remarkable distribution, being found in the New World from Florida southwards to the Rio de la Plata, while in the Old World their occurrence is in detached areas in Africa, Europe, and Asia Minor. Eleven genera are distinguished, in only one of which are any traces of limbs. The latter, bearing the name of *Chirotes*, comprises a single species found in Mexico and California. *Blanus* is the genus which represents the family in the Mediterranean region, and its four species are found only in Spain, Portugal, Morocco, Algeria, and Asia Minor. The typical genus (*Amphisbæna*), containing 41 species, is found in tropical America and tropical Africa. All the members of the family possess burrowing habits, and their principal food consists of insects and worms.

ANIELLIDÆ (Aniella; 2 Species). **Plate 19, Map v.**

This family, sometimes spelled *Anniellidæ*, contains only two small worm-like species, both of which are found in California to the south of San Francisco. A third species is founded on a single specimen said to have been taken at El Paso, in Texas. Owing to this fact, we have not included it in our map, judging it better to await further evidence. The better-known species, *Aniella* (or *Anniella*) *pulchra* and *nigra* appear to be degraded forms of *Anguidæ* or Slow-Worms, which they closely resemble in appearance.

DIBAMIDÆ (Dibamus; 2 Species). **Plate 19, Map v.**

The members of this family are burrowing, worm-like Lizards, occurring in a few islands in the Malay Archipelago, and recorded also from the Malay Peninsula. Only a single genus is described.

ANELYTROPIDÆ (Anelytropsis, &c.; 10 Species). **Plate 19, Map vi.**

The few species constituting this family have a peculiar distribution. Four genera are described, the typical one (*Anelytropsis*) containing a single species found in a restricted area in Southern Mexico. All the other members of the family are Ethiopian, eight occurring in tropical and South Africa, and one in Madagascar. These Lizards are limbless, worm-like creatures, and may be regarded as degraded forms of Skinks (*Scincidæ*).

SCINCIDÆ (Skinks; 596 Species). **Plate 19, Map vi.**

This vast assemblage is of world-wide distribution, being only absent from the colder regions of the globe. Over 40 genera are recognised, the largest being *Lygosoma* with 291 species, or roughly half the known forms. The Old World species are much more numerous than those of the New World, and they are particularly well represented in the Oriental and Australian regions. Of the 37 species recorded from the New World, only four, belonging to the genus *Mabuia*, are found in South America, while seven occur in the West Indies, and one in the Bermudas. Perhaps the most interesting member of the family is the very peculiar Stump-tailed Lizard of Australia (*Trachysaurus rugosus*). This creature, which is about a foot in length, has a very broad depressed head, and a remarkably broad stumpy tail, while its body is covered with large, rough scales. Half a dozen species occur in Southern Europe, namely one *Ablepharus*, one *Ophiomorus*, and four belonging to the genus *Chalcides*. The *Ophiomorus* is a limbless, worm-like Lizard, found in Greece and Asia Minor.

GERRHOSAURIDÆ (Gerrhosaurus, &c.; 28 Species). Plate 19, Map vi.

This family is an entirely Ethiopian one, and intermediate in character between the *Scincidæ* and the *Lacertidæ*. Five genera are distinguished, and the two known as *Zonosaurus* and *Tracheloptychus* contain all the 13 species which are peculiar to the Malagasy sub-region. *Tetradactylus*, with four species, is confined to South Africa.

LACERTIDÆ (Typical Lizards; 142 Species). Plate 19, Map vi.

The Typical Lizards are purely Old World creatures, and, moreover, are absent from Madagascar and the whole of the Australian region. Eighteen genera have been differentiated, nine of which (with 23 species) are confined to Africa and Arabia, and one (with three species) to India. About 20 species are found in Europe, 12 of which are members of the typical genus (*Lacerta*). Two of these, the Common Lizard (*Lacerta vivipara*) and the Sand Lizard (*L. agilis*), are found in Britain, while two others, the Green Lizard (*L. viridis*), and the Wall Lizard (*L. menalis*), are included by some authors in the British fauna, simply on account of their occurrence in the Channel Islands. The Common or Viviparous Lizard occurs in many localities in England, Wales, Scotland, and Ireland, and is the only reptile found in the latter country. The Sand Lizard, on the other hand, appears to be confined to the south of England, rarely occurring outside the counties of Dorset, Hants, and Surrey.

TEJIDÆ (Greaved Lizards; 161 Species). Plate 20, Map i.

This New World family is an important one, and its members show considerable diversity of form. Forty-two genera are recognised, *Tupinambis* being one of the best known, since it contains a species known as the "Teju," a native of the greater part of South America and the West Indies. This is one of the largest Lizards in the family, attaining a length of a yard. It is a forest animal and carnivorous, feeding on a miscellaneous assortment of small animals. All the North American species (about 15 in number) belong to the genus *Cnemidophorus*.

XANTUSIIDÆ (Xantusia, &c.; 6 Species). Plate 20, Map i.

The few species of this family are distributed among five different genera. One species occurs in Panama, Guatemala, and South-western Mexico, another is confined to the island of Cuba, while the rest occur only in Southern California. Little is recorded of their habits.

VARANIDÆ (Monitors; 34 Species). Plate 20, Map i.

This group is a well-isolated one, zoologically speaking. All the species are placed in one genus (*Varanus*), and range over the southern portion of the Old World. The Australian region possesses about half the species, the Ethiopian only five, while at least two range into the Palæarctic, occurring in North Africa (Algeria and Egypt), Arabia, and Persia. Monitors are giants among the Lizards, some species attaining a length of nearly 7 feet. They are rapacious creatures, feeding upon whatever animals they can overcome.

LANTHANOTIDÆ (Lanthanotus; 1 Species). Plate 20, Map i.

This family has been formed for the reception of a single species of Lizard, of which only two specimens are known. They were found at Sarawak, in Borneo, and present undoubted affinities to the *Helodermatidæ*, or Poisonous Lizards. The teeth, however, are not grooved, and it is probable that there are no poison-glands.

HELODERMATIDÆ (Poisonous Lizards; 2 Species). Plate 20, Map i.

The two species of this family occur in Western Mexico and New Mexico, Arizona, and Nevada respectively. They are the only Lizards known which are actually poisonous, and they have been known in a few cases to cause the death of human beings. They feed on worms, frogs, and the eggs of large lizards. The "Gila Monster," under which name either of the species is known, is a remarkable example of what is known as "warning coloration," being marked with vivid patches of yellow or orange on a blackish-brown ground colour. Altogether the animal is a most repulsive-looking creature.

ANGUIDÆ (Blind or Slow-Worms and Glass-Snakes; 54 Species). Plate 20, Map ii.

Considering the small number of species, this family is somewhat widely distributed, having representatives in four of the zoögeographical regions. Many of the *Anguidæ* have rudimentary limbs, or these may be quite absent, as in the common British species (*Anguis fragilis*). Consequently, these creatures have a snake-like appearance, and are often regarded by the uninitiated person as belonging to the *Ophidia*, and hence to be handled with care. Only two species occur in Europe, namely, the Common Blind or Slow-Worm just mentioned, and the Scheltopusik or Glass-snake (*Ophisaurus apus*), which occurs in the Balkan Peninsula and South Russia, ranging also into Asia Minor and Morocco. Borneo and Fokien, in China, are each tenanted by a species of *Ophisaurus*, while another occurs in the Eastern Himalayas and Burma. All the other species are American.

ZONURIDÆ (Girdled Lizards; 22 Species). Plate 20, Map ii.

This Ethiopian family contains only four genera, with the majority of the species confined to South Africa. A single species of the typical genus (*Zonurus*) occurs in Madagascar, another in Gallaland, and a *Chamæsaura* in Uganda. All the Lizards of this family are carnivorous. One genus has rudimentary limbs, and consequently its representatives have a snake-like appearance.

XENOSAURIDÆ (Xenosaurus; 1 Species). Plate 20, Map ii.

The single representative of this family, *Xenosaurus grandis*, is a Lizard about a foot in length, with a depressed, granulated body, and a fold of skin along the sides. It is confined to Southern Mexico, and is regarded as a link between the *Iguanidæ* and the *Anguidæ*.

IGUANIDÆ (Iguanas, &c., 477 Species). Plate 20, Map ii.

With the exception of the members of the genera *Hoplurus* and *Chalarodon* (six in number), which occur only in Madagascar, and *Brachylophus* (one species), which is confined to the Fiji and Friendly Islands, the *Iguanidæ* are entirely New World creatures. Fifty-four genera have been established for the reception of the numerous species, which are for the most part insectivorous in habit, though a few of the more conspicuous forms are vegetarians. Their ways of life are varied, some being arboreal, others terrestrial, some burrowing, and some almost aquatic. The largest genus is *Anolis*, which contains some 172 species, ranging throughout tropical and sub-tropical America. They are beautiful creatures, slim of body and large-footed, possessing the power of changing their colour to an even greater extent than the better-known Chameleons. *Basiliscus* has four species, which are remarkable for their strange form. The Galapagos Islands possess several peculiar forms of *Iguanidæ*, the best-known belonging to the genus *Conolophus*, and being a creature of lazy and sluggish habits, dark brown in colour, and weighing as much as 15 lbs. The Horned Lizards of the genus *Phrynosoma*, of which 17 species are known, are remarkable for their spiny heads and bodies, and their stunted, frog-like appearance. They are found only in the western half of the United States and in Mexico.

AGAMIDÆ (Agamas, Flying Lizards, &c.; 293 Species). Plate 20, Map iii.

The members of this family, although very widely distributed in the Old World, are especially characteristic of the Oriental region, where about half the known species find their home. The Flying Lizards of the genus *Draco*, of which some 36 species are known, are of special interest through their peculiar powers of locomotion. They spend the greater part of their time in the crowns of the trees, and, being also scarce creatures, they are seldom seen. By means of the expansions of membrane with which the body and throat are furnished, these interesting and often extremely beautiful lizards are able to glide through the air with astonishing rapidity, generally in quest of some passing insect. The typical genus (*Agama*) contains 72 species spread over Africa, Southern Asia, and South-eastern Europe. Only two species, *A. stellio* and *caucasica*, are found in the latter continent, and these are restricted to the extreme south-eastern portion. One of the most remarkable members of the family is the Frilled Lizard (*Chlamydosaurus kingi*) of Australia, while another inhabitant of this country, bearing the name of *Moloch horridus*, is one of the most extraordinary-looking Lizards known.

UROPLATIDÆ (Uroplates; 4 Species). Plate 20, Map iii.

This small group contains only a few species of the genus *Uroplates*, and these are absolutely confined to Madagascar. They are only separated from the Geckos by certain structural differences in the nasal bones and sternum.

EUBLEPHARIDÆ (Eublepharis, &c.; 10 Species). Plate 20, Map iii.

This small group of Lizards is very closely allied to the *Geckonidæ*, and its few members may be distinguished by the possession of distinct movable eyelids. On this account they are sometimes spoken of as "Eyelid Geckos." Only five genera are differentiated. *Psilodactylus* and *Holodactylus* are the only African genera, with one species each, in West Africa and Somaliland respectively. *Coleonyx* and *Lepidoblepharis*, each likewise with a single species, are from Central America and Ecuador respectively. *Eublepharis* contains the remaining six species, of which three are Asiatic, two Central American, and one North American.

GECKONIDÆ (Geckos; 500 Species). Plate 20, Map iii.

The *Geckonidæ* are a vast assemblage, no fewer than 60 genera having been formed for the reception of the various species. They are of world-wide distribution, but more abundant in the warmer countries, especially in the Oriental and Australian regions. Over 60 species are enumerated from India, Ceylon and Burma. Europe possesses only about half a dozen species, which are restricted to the countries bordering on the Mediterranean. One of the best known of these is the Turkish Gecko (*Hemidactylus turcicus*). This species ranges along the whole coast of the Mediterranean, from Southern Portugal to the Grecian Archipelago, occurring on the African side as far south as Senegal, and also in Asia Minor and Persia.

ORDER **CROCODILIA (Crocodiles, &c.; 24 Species).**

CROCODILIDÆ (Crocodiles; 13 Species). Plate 20, Map iv.

Crocodiles have a fairly wide distribution, occurring in the greater part of Africa, Madagascar, Southern Asia, the extreme north of Australia, the Fiji Islands, and tropical America. Four species occur in the New World, three in Africa, two in Madagascar, two in Australia, and the rest in the Oriental Region and eastwards to the Fiji Islands. A small, short-nosed species found in West Africa is made the type of a distinct genus (*Osteolæmus*); all the rest are placed in the genus *Crocodilus*.

ALLIGATORIDÆ (Alligators and Caimans; 9 Species). Plate 20, Map iv.

The members of this family have an interesting and peculiar distribution. Only two genera are known, excluding the doubtful *Perosuchus*. The typical genus (*Alligator*) consists of three species, one of which occurs in the South-eastern United States, another in the Yang-tse-Kiang, and a third whose habitat is unknown. The Caimans (*Caiman*), distinguished by having bony armour on the lower surface of the body, are five in number, and are restricted to Central and South America. The presence of an Alligator in the Yang-tse-Kiang, so far removed from its relatives, is very remarkable, and it is still more curious that of the three species of the genus it is the one most closely allied to the Caimans.

GAVIALIDÆ (Gavials or Garials; 2 Species). Plate 20, Map iv.

These peculiar long-snouted Crocodilians are placed in two separate genera, *Gavialis gangeticus* being the well-known creature inhabiting the large Indian rivers, and *Tomistoma schlegelii* the other species occurring in the Malay Peninsula, Sumatra and Borneo. The Gavials, more properly called Garials, feed almost entirely on fish, and consequently are harmless to human beings.

ORDER **CHELONIA (Tortoises and Turtles; 269 Species).**

TRIONYCHIDÆ (Soft Tortoises; 30 Species). Plate 20, Map iv.

This family is distinguished from other Chelonians by the fact that the carapace is covered with soft leathery skin instead of horny shields, and the feet provided with distinct digits and three claws. Half a dozen genera are known, and their range of distribution includes the warmer parts of Asia, Africa and North America. The typical genus *Trionyx* contains 20 species which have a range as wide as that of the whole family. All the Soft Tortoises are of aquatic habits, most of them inhabiting rivers and feeding on fish, amphibians and molluscs.

CARETTOCHELYDIDÆ (Fly River Turtle; 1 Species). Plate 20, Map iv.

This family contains only a single peculiar Turtle (*Carettochelys insculpta*) which inhabits the Fly River, in New Guinea. Like the *Trionychidæ* this species has the shell covered with soft leathery skin, but its limbs are converted into paddles, and provided each with only two claws.

CHELYDIDÆ (Side-necked Tortoises; 31 Species). Plate 20, Map v.

This family is one of two for which we have adopted a common popular name. This bears allusion to the method of withdrawing the head by a horizontal bending of the neck. From the *Pelomedusidæ*, the other family so characterised, the present group is distinguished by the fact that when the head is withdrawn the neck still remains partly exposed. Nine genera are distinguished, five of which are South American, and four confined to Australia and New Guinea. The most remarkable species of the family is the Matamata Tortoise (*Chelys fimbriata*), a native of Guiana and Northern Brazil. Possessing a pointed and tube-like nose, a triangular head, and a neck covered with peculiar fringed processes, with a deeply corrugated shell, this Tortoise presents a most ungainly appearance.

PELOMEDUSIDÆ (Side-necked Tortoises; 17 Species). Plate 20, Map v.

This family, the second of the side-necked group of Tortoises, is distinguished by the fact that the head and neck can be completely withdrawn within the shell so as to be invisible. Only three genera are described, two of which (*Sternothærus* and *Pelomedusa*) are confined to tropical and South Africa and Madagascar, with eight and one species respectively. The third genus, *Podocnemis*, contains six South American species and one, strangely enough, confined to Madagascar.

CHELONIDÆ (Turtles; 11 Species). Plate 20, Map v.

Turtles are purely marine creatures, and in accordance with their aquatic habit their limbs are modified into paddles for swimming purposes, with one or two claws. Only two genera can be satisfactorily distinguished in recent forms, *Chelone* with two species, and *Thalassochelys* with nine. The well-known Green Turtle (*Chelone mydas*) furnishes the turtle soup so prized in banquets. This species has a wide distribution in tropical and subtropical seas, the principal collecting grounds for commercial purposes being off the island of Ascension, the West Indies, and the Mosquito Coast in Nicaragua. The second species of *Chelone* (*C. imbricata*) is an equally useful creature. It is known as the "Hawksbill Turtle," and is the source of the valuable "tortoise-shell" of commerce. Co-extensive in range with the Green Turtle, it differs from the latter in the fact that the horny shields covering the shell overlap like the tiles of a house-roof instead of meeting at their edges. Of the genus *Thalassochelys*, the best-known species is the so-called Loggerhead Turtle (*T. caretta*), a huge creature with a shell averaging $3\frac{1}{2}$ feet in length.

TESTUDINIDÆ (Land-Tortoises and Terrapins; 156 Species). Plate 20, Map v.

This is the typical, and at the same time much the largest, family of Chelonians, containing considerably more than half the known species. The species are found in all the zoögeographical regions except the Australian. Twenty-seven genera are recognised at the present day, *Testudo* being the principal one with over 50 species. These occur in all parts of the area covered by the family, while two species are well-known inhabitants of Southern Europe. In the Galapagos Islands, Mauritius, and neighbouring islands occur a number of giant forms which are probably the survivors of a once more extensive group. The Terrapins of the genus *Chrysemys* are a purely American group, as are also *Malacoclemmys* (with seven species) and the Box-Tortoises (*Cistudo*), of which four species are recognised. The Hinged-Tortoises (*Cinixys*, four species) and those of the genus *Homopus* (six species) are confined to Africa. The European Pond-Tortoise (*Emys orbicularis*) is interesting as being the species which ranges farthest north. In Europe it has occurred about as far north as St Petersburg.

PLATYSTERNIDÆ (The Big-headed Tortoise; 1 Species). Plate 20, Map vi.

This family includes only a remarkable-looking creature, known as the Big-headed Tortoise (*Platysternum megacephalum*), inhabiting chiefly Burma, Siam, Southern China, and the Philippine Islands. It is, however, so rare, that little or nothing is recorded of its habits. Besides its huge head, this curious Tortoise possesses an unusually flat shell and a tail of more than ordinary length.

CINOSTERNIDÆ (Mud-Terrapins; 14 Species). Plate 20, Map vi.

The *Cinosternidæ* are entirely confined to the New World, half the species occurring in the United States, five in Central America, and two in the northern part of South America. They are small creatures, never exceeding about 6 inches in length, inhabiting swamps and marshes, and feeding on small fishes, worms, and insects. In most of the species the lower portion of the shell is hinged in two places, so that the animal can retreat within and close the "box" both in front and behind.

DERMATEMYDIDÆ (Mud-Terrapins; 4 Species). Plate 20, Map vi.

The three genera constituting this family are closely related to the previous group of Mud-Terrapins, but have a much more restricted range, being, in fact, confined to a comparatively small area in Central America. The best-known species is *Dermatemys mawi*, sometimes known as Maw's Terrapin.

CHELYDRIDÆ (Snappers and Alligator-Terrapins; 3 Species). Plate 20, Map vi.

This again is an entirely New World family, ranging from Canada to Ecuador. Only two genera are recognised, the typical one *Chelydra* containing two species known as Alligator-Terrapins. Their popular name is said to be due, not to their habits, but to a supposed resemblance to an alligator provided with a shell. The better-known species has a curious distribution, since it occurs in the rivers of North America as far south as Mexico and also in a detached area in Ecuador. This peculiar gap in distribution appears to be partially filled by the second species, which occurs in Mexico and Guatemala. The second genus (*Macroclemmys*) contains a single species known as Temminck's Snapper (*M. temminckii*), a native of North America from Western Texas to Florida, and ranging northwards to Missouri. All the members of this family have ferocious and even dangerous habits, snapping viciously at anything within their reach, and sometimes inflicting severe wounds on human beings.

SPHARGIDÆ (The Leathery Turtle; 1 Species). Plate 20, Map vi.

The Leathery Turtle or Luth (*Sphargis* or *Dermochelys coriacea*) is the sole representative of its family, and by far the largest of all living Chelonians, full-grown specimens attaining a length of over 6 feet. This important creature has a wide distribution, occurring in all tropical seas and occasionally straying to more temperate waters. The main distinguishing features of the family are firstly, the vertebræ and ribs are not fused with the carapace or shell, as in all other Chelonians; secondly, the shell is covered with leathery skin; and thirdly, the limbs are modified into paddles and are without claws.

SUB-CLASS **PROSAURIA (1 Species).**

HATTERIIDÆ (The Tuatera; 1 Species). Plate 20, Map vi.

This family is formed for the reception of a Lizard-like creature which is confined to the small islands in the Bay of Plenty, New Zealand. Formerly the creature was common on the main islands, but it has rapidly diminished in numbers and is now apparently extinct except in the few small islands indicated. It is, perhaps, the most interesting animal in the whole of the New Zealand fauna, being the only living representative of a group which reached its zenith in Permian and Triassic times. In the words of Gadow, the *Prosauri*, the group in question, "seem to represent the central stem of the reptilian tree."

CLASS AMPHIBIA (Amphibians).

ORDER ANURA (Frogs and Toads; 1503 Species).

DENDROBATIDÆ (Solid-chested Tree-Frogs; 26 Species). Plate 21, Map i.

Were it not for important differences in their internal structure, these little arboreal frogs might very well be taken as Tree-Frogs of the family *Hylidæ*, which they much resemble in external appearance as well as in habits. Some four genera have been described, whose distribution is somewhat remarkable. The typical genus *Dendrobates* contains 14 species confined to tropical America, one occurring in the island of San Domingo. *Mantella*, with eight species, and *Stumpffia* with two, are confined to Madagascar; while *Cardioglossa*, recently described, has two species found in the Cameroons and the Gaboon.

RANIDÆ (Typical Frogs; 440 Species). Plate 21, Map i.

This vast assemblage of Frogs has a world-wide distribution, being absent only from Australia, New Zealand, and the greater part of South America. Over 40 genera have been differentiated, while the species are most numerous in the Oriental and Ethiopian regions. The typical genus *Rana* contains no fewer than 131 species, and eight of these occur in Europe. The Common Frog (*Rana temporaria*) is a familiar and abundant member of the British fauna, while the Edible Frog (*R. esculenta*) is still found in a few places in the eastern counties of England, where it was evidently introduced many years ago. The genus *Rhacophorus*, containing about 50 species, is interesting, containing as it does the so-called "Flying Frogs" of the Malay Archipelago. The feats performed by these frogs as they leap from the trees into the water have been much exaggerated; nevertheless the large webbed feet are undoubtedly used as parachutes, and are remarkable enough on this account alone.

CERATOBATRACHIDÆ (Ceratobatrachus; 1 Species). Plate 21, Map i.

This family has been formed for the reception of a single species (*Ceratobatrachus guentheri*) recently described from the Solomon Islands. It differs from typical *Ranidæ* in having teeth in the lower jaws.

GENYOPHRYNIDÆ (Genyophryne; 1 Species). Plate 21, Map i.

The only member of this family is a frog known as *Genyophryne thomsoni*, recently found in Sudest Island, between New Guinea and the Louisiade Archipelago. It is distinguished from its closest allies, the *Dyscophidæ* and *Engystomatidæ* by having very small teeth on the front portion of the lower jaw.

DYSCOPHIDÆ (Dyscophus, &c.; 22 Species). Plate 21, Map ii.

This small family, whose members are distinguished from the *Engystomatidæ* by the presence of teeth in the upper jaw, has a curious distribution. About a dozen genera have been differentiated, eight of which are confined to the island of Madagascar, one to Pegu and Burma, and one to Sarawak in Borneo. Red or pink is characteristic in the coloration of these frogs.

ENGYSTOMATIDÆ (Narrow-mouthed Toads; 141 Species). Plate 21, Map ii.

This is a large group of Frogs or Toads, containing no fewer than 43 genera, and distributed over the tropical regions of both Old and New Worlds. They are usually stout-bodied, those of the genus *Breviceps* (confined to Africa) excelling in this respect and assuming an almost globular shape.

DENDROPHRYNISCIDÆ (Dendrophryniscus and Batrachophrynus; 4 Species). Plate 21, Map ii.

This small group is entirely Neotropical. *Dendrophryniscus* contains a single species found in the neighbourhood of Rio de Janeiro, while the other genus, *Batrachophrynus*, has three species confined to the Andes of Peru. These frogs are entirely without teeth.

CYSTIGNATHIDÆ (Leptodactylus and Allies; 342 Species). Plate 21, Map ii.

Next to the *Ranidæ* this is the largest family of Frogs, although its distribution is somewhat restricted. It is practically confined to the Neotropical region and to Australia and Tasmania. Some 36 genera have been differentiated, 10 of which are Australian with about 30 species. *Ceratophrys* is probably the best-known genus, containing 16 species known as Horned Frogs or Toads. They have enormous mouths, and their habits are somewhat fierce. Important genera also are *Leptodactylus*, with 36 species called Piping Frogs, and *Hylodes*, with 107 species.

HEMIPHRACTIDÆ (Hemiphractus, &c.; 8 Species). Plate 21, Map iii.

This is a purely Neotropical family, with three genera. *Hemiphractus* contains two species which range from Colombia to Para; *Ceratohyla* has five, which live only in Ecuador; while *Amphodus* is represented by a single species which is found in the neighbourhood of Bahia. In these creatures both jaws are toothed.

HYLIDÆ (Typical Tree-Frogs; 291 Species). Plate 21, Map iii.

The distribution of this large and important family is remarkable, and the mere colouring of a map might be very misleading. Although found in all the zoögeographical regions except the Ethiopian, the great majority of the species are Neotropical. Only two occur in the Palæarctic region, one of which is confined to Corea while the other is found throughout the warmer parts of the region, and has a wider range than any other species. One species occurs in the extreme north-east of India, and one in Southern China and Formosa. About 60 are found in the Australian region and about 25 in North America. This leaves a balance of about 100 species for Central and South America (including half a dozen in the West Indies), where it is evident that the metropolis of the family lies. The Tree-Frogs, with their peculiar finger-discs, vivid and often protective coloration, and remarkable nursing habits, form altogether an unusually interesting family of Tailless Amphibians. Fourteen genera are recognised, but 221 species fall into the typical one, *Hyla*.

AMPHIGNATHODONTIDÆ (Amphignathodon and Grypiscus; 2 Species). Plate 21, Map iii.

The two species, one of each genus, which together constitute this family, are found in Ecuador and near Rio de Janeiro respectively. Both upper and lower jaws are toothed.

BUFONIDÆ (Toads; 174 Species). Plate 21, Map iii.

This, though not the most numerous in species, is by far the most widely distributed family among the Amphibians, having representatives in all parts of the world save Madagascar, New Zealand, New Guinea, and the greater part of Polynesia. Thirteen genera have been described, but 140 species belong to the typical one, *Bufo*. This genus is cosmopolitan, except that it is not represented in Australia, its place being apparently taken by *Pseudophryne*, with seven species, and two other peculiar genera. Three species of *Bufo* are found in Europe, namely *B. vulgaris* (the Common Toad), *B. viridis* and *B. calamita* (the Natterjack Toad). The first and last are found in Britain, the Common Toad throughout England and Scotland (but not in Ireland), and the Natterjack in many English counties, on the Moray Firth in Scotland, and in Ireland.

PELOBATIDÆ (Spade-footed Toad and Allies; 33 Species). Plate 21, Map iv.

The *Pelobatidæ* have an interesting distribution, occurring in three detached areas, viz., North America and Mexico; Europe, Asia Minor and Palestine; and the East Indies from Ceylon and the Eastern Himalayas to New Guinea. Nine genera have been described, the largest being *Leptobrachium*, with nine species occurring in the East Indies, the next *Scaphiopus* containing all the New World species, 10 in number. Three genera, each with a single species, are confined to New Guinea, while four species (two *Pelobates* and two *Pelodytes*) occur in Europe. The best-known species is the "Spade-footed Toad" (*Pelobates fuscus*) which occurs throughout the whole of Central Europe.

DISCOGLOSSIDÆ (Disc-tongued Frogs; 10 Species). Plate 21, Map iv.

This again is a family with a curious distribution. Five genera are described, three of which are Palæarctic, while the other two contain a single species each, confined to New Zealand (*Liopelma hochstetteri*) and Washington Territory, North America (*Ascaphus truei*) respectively. Five species occur in Europe. These are (1) *Discoglossus pictus*, found only in the South; (2) the Fire-bellied Toad (*Bombinator igneus*) occurring in Eastern Europe; (3) the Yellow-bellied Toad (*Bombinator pachypus*) of Southern and Western Europe; and (4 and 5) two species of "Midwife" Toad (*Alytes obstetricans* and *A. cisternasii*) found in the west.

PIPIDÆ (Surinam Toad, &c.; 2 Species). Plate 21, Map iv.

This family includes only two genera, each with a single species. The better known of these is the famous Surinam Toad (*Pipa americana*), which is a native of Northern Brazil and the Guianas. The chief peculiarities in structure, both in this and the second genus, are the total absence of both tongue and teeth. The Surinam Toad is a large and clumsy creature, chiefly remarkable for the singular way in which the eggs are taken care of during development. These are laid in the usual manner in the water and afterwards transferred by the male to the back of the female. Each egg then sinks into the skin and becomes afterwards covered by a flap or lid. Thus the mother toad carries her whole progeny on her back, each in a separate little compartment, until the time of hatching.

Hymenochirus, the other genus, contains a single species (*H. bœttgeri*) which has hitherto only been found in German East Africa and the French Congo.

DACTYLETHRIDÆ (Clawed Toads; 6 Species). Plate 21, Map iv.

The Clawed Toads, all belonging to a single genus (*Xenopus* or *Dactylethra*), are confined to tropical and South Africa. They are distinguished from their allies, the *Pipidæ*, by the possession of teeth in the upper jaw. *Xenopus lævis* is the best-known species, and ranges from the Cape to Abyssinia. All these Toads are entirely aquatic in habit, even feeding beneath the surface of the water.

ORDER **CAUDATA (152 Species).**

SIRENIDÆ (Mud-Eels; 2 Species). Plate 21, Map v.

This family includes only the curious degraded creatures known as *Siren lacertina* and *Pseudobranchus striatus*, the former of which occurs in the South-eastern United States, while the latter is confined to Georgia. In these interesting Amphibians, which are found burrowing in the mud of ponds and ditches, the body is Eel-like (hence the popular name), bearing three pairs of external gills which persist during the whole life of the animal. The fore limbs are present, with four fingers in *Siren* and three in *Pseudobranchus*; the hind limbs are altogether wanting.

PROTEIDÆ (Proteus or Gilled Salamander, &c.; 3 Species). Plate 21, Map v.

The *Proteidæ*, like the *Sirenidæ*, possess three pairs of persistent external gills, but have in addition a pair of hind limbs. Three genera have been described, each with a single species. *Proteus anguinus* is a curious, totally blind, eel-like creature living in the subterranean waters of caverns in the Alps of Carniola, Carinthia and Dalmatia. The fore limbs have three digits and the hind limbs only two. The American representative (*Necturus maculatus*) has four digits on both fore and hind limbs, while also possessing well-developed eyes and powers of vision. *Typhlomolge* is the third genus, with one species inhabiting Texas.

SALAMANDRIDÆ (Typical Salamanders; 32 Species). Plate 21, Map v.

The Salamanders and Newts, of which six genera are described, are practically confined to the Palæarctic and Nearctic regions, although one or two species range southwards in China to within the Oriental region. Only two species, belonging to the genus *Triton*, are found in the New World, but these have a fairly extensive range. One of the best-known species in the family is the Spotted Salamander (*Salamandra maculosa*) of Central and Southern Europe, Asia Minor, and North Africa. Being of a black colour, spotted with bright yellow, it is often regarded as one of the best-known examples of the so-called "warning" coloration, where a species enjoys protection through possessing some nauseous or poisonous quality, while its conspicuous markings serve to educate its enemies to the fact. Three species of Newt (*Triton*) are found in Britain.

AMBLYSTOMATIDÆ (Axolotls, &c.; 41 Species). Plate 21, Map v.

Although there is no general English name which can be accurately applied to these Amphibians, yet, as the larval forms of the typical genus have long been known as *Axolotls*, this word may be perhaps used for the members of the family as a whole. Ten genera have been differentiated, six of which are Asiatic and four North American. *Amblystoma*, the principal genus, includes 25 North American species and one which occurs, probably at high elevations, in Siam. The young or larvæ of this genus have been known since the time when the Spanish conquered Mexico, and until the year 1865 they were thought to be adult creatures allied to *Sirenidæ* or *Proteidæ*. It has, however, been proved by experiment that Axolotls may, under certain conditions, develop into mature *Amblystomas*.

PLETHODONTIDÆ (Spelerpes, &c.; 61 Species). Plate 21, Map vi.

This family, containing only five genera, has an interesting distribution. The great majority (no fewer than 54) of the species, including representatives of every genus, are North and Central American. Five occur in South America, one is confined to the island of San Domingo in the West Indies, while, strangely enough, one is found in Europe. This is *Spelerpes fuscus*, a native of the mountains of Southern France, Northern Italy, and Sardinia.

DESMOGNATHIDÆ (Desmognathus, &c.; 8 Species). Plate 21, Map vi.

This family contains five genera, three of which (with six species) are confined to the Eastern United States, one (*Thorius*) to Southern Mexico, and one (*Haptoglossa*) to Costa Rica.

AMPHIUMIDÆ (Fish-like Salamanders; 5 Species). Plate 21, Map vi.

This family, which includes three genera, is extremely limited in distribution, four of the species being found only in the Eastern United States, while the fifth is confined to China and Japan. The latter is, however, of much interest, as it is much the largest species of living Amphibian. It is known as the Giant Salamander (*Megalobatrachus maximus*), and the largest specimen known is over five feet in length! This Amphibian giant inhabits clear, cold, and swiftly-flowing streams in the mountainous parts of Japan and a portion of China. It has four front and five hind toes and is without an external gill-opening.

ORDER **APODA (53 Species).**

CŒCILIIDÆ (Cœcilia, &c.; 53 Species). Plate 21, Map vi.

The members of this group are so distinct in their characters that they are usually placed in an Order to themselves, under the name of **Apoda**. This name bears allusion to the total absence of limbs, which is one of their most evident characters. The tail also is rudimentary or absent, and the eyes are either wanting altogether or buried deeply beneath the skin and absolutely useless. These creatures are hence blind and worm-like, while they possess burrowing habits and exhibit great uniformity of structure and external appearance. They are pretty widely distributed in tropical regions, possessing representatives in the Ethiopian, Oriental, and Neotropical regions. Seventeen genera have been described, seven of which (with 28 species) are confined to tropical America, five to tropical Africa, and three to the Oriental region.

CLASS PISCES (Fishes).

Sub-Class **DIPNEUSTI (Dipnoi).**

LEPIDOSIRENIDÆ (Mud-Fishes). Plate 22, Map i.

Of these interesting fishes two genera are known. The typical one, *Lepidosiren*, contains a single species (*L. paradoxa*), which inhabits the great Amazon River and its affluents, and also the swamps and marshes which form the tributaries of the Paraguay River. It is a curious eel-like creature, of sluggish habits, feeding principally on molluscs of the genus *Ampullaria*, but also devouring quantities of algæ. The second genus, *Protopterus*, is purely African, and contains three species. They are particularly abundant in the Gambia River, and are remarkable for their habit of burrowing into the mud and remaining in a torpid condition during the rainless season, when the marshes become dried up.

CERATODONTIDÆ (Lung-Fish). Plate 22, Map i.

The single known species representing this family is confined to the Burnett and Mary Rivers in Queensland. It is known scientifically as *Neoceratodus forsteri*, while its native name is "barramundi," and its popular English name the Australian Lung-Fish. It frequents pools which are comparatively stagnant in the rivers mentioned, is sluggish in its movements, and feeds on crustaceans, molluscs, and various other aquatic creatures, which it is reputed to obtain among the submerged plants which form their home.

ORDER **TELEOSTEI (Bony Fishes).**

MOLIDÆ (Sun-Fishes). Plate 22, Map i.

Of this family two genera may be recognised, and several species, of which the best-known is the Common Sun-fish (*Mola mola*). This fish, which attains a length of about eight feet, inhabits the North Atlantic and the Mediterranean, occasionally occurring also off the British coasts. Other species range over the greater part of the oceans in tropical and temperate zones.

DIODONTIDÆ (Porcupine-Fishes). Plate 22, Map i.

These remarkable fishes, of which two genera and about 15 species are known, owe their popular name to their covering of spines, which in some forms are immovable, while in others they are erectile. They are found in most seas, but chiefly within the Tropics. A well-known American representative of the family is the Rabbit-fish (*Chilomycterus schœpfi*) of the Atlantic coast.

TETRODONTIDÆ (Globe-Fishes). Plate 22, Map i.

Globe-fishes, of which about 60 species are known, are chiefly inhabitants of tropical and warm seas; but a few species occur in fresh water, notably in the large rivers of Brazil, West Africa and the East Indies. These fishes have the power of inflating their bodies with air, and on this account are sometimes called "Puffers." Pennant's Globe-Fish (*Tetrodon lagocephalus*) has occurred on the coasts of Britain, but it is always rare in European seas.

BALISTIDÆ (File-Fishes, &c.). Plate 22, Map ii.

The members of this family are chiefly inhabitants of tropical and sub-tropical seas. About 100 species have been described, two of which are recorded as British. These are (1) the so-called Pig-faced Trigger-Fish (*Balistes carolinensis*), which has occurred on our coasts on several occasions; and (2) the "Ocean Turbot" (*Canthidermis maculatus*), a very rare species, whose claim to be regarded as British is a matter of some doubt. Certain members of the family are reported to be very destructive to pearl-fisheries.

LOPHIIDÆ (Angler-Fish, &c.). Plate 22, Map ii.

This is a small family (containing about a dozen species) of curious-looking fishes with sluggish habits, inhabiting the sea-floor in all parts of the world; while some forms attach themselves to floating sea-weed, and are thus carried about in various directions. They owe their popular name to the curious appendage on the snout, which often assumes a curious appearance and acts as a lure for catching prey. The Common Angler or "Sea-Devil" (*Lophius piscatorius*), is found commonly all round the British coasts. Allied to the *Lophiidæ* are a number of interesting deep-sea forms, which are usually placed in distinct families. If such a course be followed, then the whole of these related families may be considered as a sub-order, under the name of Pediculati.

MASTACEMBELIDÆ. Plate 22, Map ii.

This is a small group inhabiting fresh and brackish waters in Tropical Africa and Southern Asia. Only two genera are differentiated to contain the 30 odd species. They are somewhat eel-shaped in appearance, and little is known of their habits beyond the fact that they are carnivorous.

LOPHOTIDÆ (Unicorn-Fishes). Plate 22, Map ii.

Only three or four species of this family are known, and all belong to a single genus (*Lophotes*). They have been recorded from the Mediterranean, the Atlantic off Madeira, the Cape of Good Hope, the Sea of Japan and New Zealand. They have a much elongated body, somewhat like the Ribbon-Fishes of the next family (Trachypteridæ), but differ from them in the possession of an anal fin. The head is armed with a curious recurved spine, whence the popular name is derived. The Unicorn-Fishes inhabit the deep sea, but not to such a great depth as the Ribbon-Fishes.

TRACHYPTERIDÆ (Ribbon-Fishes). Plate 22, Map ii.

The Ribbon-Fishes, of which two genera and about 15 species are differentiated, are inhabitants of the deep sea, and are chiefly known through specimens which have been stranded on the coasts of Britain, Norway, India, New Zealand, and other countries. Their whole organisation is of much interest, adapted as it is to withstand the enormous pressure which exists in the abysses of the ocean. One of the best-known forms is the so-called Oar-Fish, or "King of the Herrings" (*Regalecus glesne*), a creature attaining a length of over 20 feet, and remarkable for the curious appendages on the head and the long filaments which represent the pelvic fins. Over 20 specimens of this extraordinary creature are known to have been stranded on the British coasts, and about a dozen on that of Norway. Another singular species is the Deal-Fish (*Trachypterus arcticus*), of which a few examples have been stranded on our shores.

OPHIDIIDÆ (Snake-Fishes, &c.). Plate 22, Map iii.

The Ophidiidæ, of which about 25 species are known, have a wide distribution in the Atlantic, Pacific, and Indian Oceans. Three genera are recognised, of which the typical one (*Ophidium*), contains the smallest members of the family, among which one occurs in Southern Europe and rarely on the south coast of England. *Genypterus* is of more importance, comprising several species which occur in southern seas. The best-known of these are the "klipvisch" (*G. capensis*) of the Cape of Good Hope, and the "Cloudy Bay Cod" (*G. australis*) of New Zealand. Both are important as food-fishes, attaining a length of 5 feet.

ZOARCIDÆ (Viviparous Blennies, &c.). Plate 22, Map iii.

This is a large and widely distributed family, containing about 130 species and a large number of genera. Many of the species are denizens of the deep sea, while two are inhabitants of fresh water in Cuban caves, and are interesting from the fact that they are blind. The typical genus *Zoarces* is represented in British waters by the so-called Viviparous Blenny (*Z. viviparus*), a small fish which is common along the whole of the northern coasts of Europe. An allied species, called the American Eel-Pout or Mutton-Fish (*Z. anguillaris*), is common on the western side of the Atlantic to the northwards of Cape Cod. *Lycodes* is abundant in northern seas, furnishing food for the Esquimaux and other northern races.

BATRACHIDÆ (Frog-Fishes). Plate 22, Map iii.

Five genera and about a score of species are referable to this family, and these are natives of warm and tropical seas. One species, the European Toad-Fish (*Batrachus didactylus*) occurs in the Mediterranean. *Opsanus tau* is a well-known form inhabiting rocky places on the Atlantic coast of North America; while *Thalassophryne* is an interesting genus from the fact that its members possess a well-developed poison apparatus in connection with the gill-cover and dorsal spines. The well-armed fishes of the latter genus are found along both the Atlantic and the Pacific coasts of Central America.

BLENNIIDÆ (Blennies, &c.). Plate 22, Map iii.

This is a large and important family, with numerous genera and about 350 species, which are found in nearly all seas and a few in fresh waters. Several species belonging to the typical genus (*Blennius*) are found off the British coasts, but the most important, as well as the largest, of our native representatives is the so-called "Wolf-Fish" or "Cat-Fish" (*Anarrhichas lupus*). This species attains a length of 5 or 6 feet, and is highly esteemed as food. More often, however, it is discarded on account of its repulsive appearance.

GOBIESOCIDÆ (Sucker-Fishes). Plate 22, Map iv.

These curious fishes, sometimes called "Cling-Fishes," have a wide distribution and occur in all latitudes from Scandinavia to New Zealand. About 50 species are known, and three (belonging to the genus *Lepadogaster*) are more or less frequent off the British coasts. *Gobiesox* is confined to the West Indies and the Pacific coast of South America; while certain other genera (*e.g.*, *Trachelochismus*) are natives of southern seas. All the fishes of this family are characterised by the possession of an adhesive disc on the under surface of the body. This peculiar structure at one time led to some confusion between the *Gobiesocidæ* and the Lumpsuckers (*Cyclopteridæ*), with which, however, they have little in common.

TRICHONOTIDÆ (Hairy-Backs). Plate 22, Map iv.

The Trichonotidæ are small fishes, confined to the Indian Ocean and the seas around New Zealand. Only five species, placed in three genera, are known. They are closely allied to the Dragonets (Callionymidæ).

TRACHINIDÆ (Weavers, &c.). Plate 22, Map iv.

The Trachinidæ and their allies occur in all seas, and have been considered by the most recent authorities as representing at least five distinct families. The true Weavers belong to a single genus (*Trachinus*), and are found on the coasts of Europe and West Africa, with two species (*T. draco* and *T. vipera*), occurring commonly in British seas. These fishes are sometimes used as food, but require careful handling, since they are able to inflict dangerous wounds with their sharp dorsal and opercular spines, at the base of which are developed small poison glands. The Leptoscopidæ are a group of deep-sea forms (about 25 known species), which occur from the Tropics to the Antarctic Circle, while the Nototheniidæ comprise about 40 species from southern seas. The Uranoscopidæ, sometimes called "Star-gazers," have a wide distribution, chiefly within the Tropics, but occurring from the Mediterranean and Japan to New Zealand.

DACTYLOPTERIDÆ (Flying-Gurnards). Plate 22, Map iv.

Of this family only four species are known, belonging to a single genus (*Dactylopterus*). They occur chiefly in the warmer regions of the Atlantic and Indo-Pacific Oceans, and are remarkable for their power of leaping out of the water and through the air like the true Flying-Fishes of the genus *Exocœtus* (family Scombresocidæ). *Dactylopterus volitans* is common in the Mediterranean.

TRIGLIDÆ (Gurnards). Plate 22, Map v.

About 50 species are referred to this family, and many of them are remarkable for their brilliant colours. They occur in all temperate and tropical seas, and Britain claims at least six species, which are all members of the typical genus (*Trigla*). The fishes of this group are remarkable for the peculiar appendages of their large pectoral fins, which are used as feelers when the fish creeps along the bottom of the sea. They are not unimportant as food-fishes.

AGONIDÆ (Armed Bullhead, &c.). Plate 22, Map v.

This family comprises about 40 species, which are known in America as "Sea-Poachers" or "Alligator-Fishes." They are mainly inhabitants of the Northern Atlantic and Pacific, but representatives occur off Chili and Patagonia. Some of the members of this family have a fantastic appearance, owing to their armoured bodies and greatly developed fins. The "Pogge" or Armed Bullhead (*Agonus cataphractus*) is the only representative in British waters, and is a small, littoral fish, occurring on many of our coasts.

CYCLOPTERIDÆ (Lumpsuckers). Plate 22, Map v.

The Lumpsuckers are clumsy-looking fishes, inhabiting chiefly the northern oceans, but occurring also in the Antarctic. They are carnivorous in habit, and voracious feeders, though sluggish in their movements. About 50 species are known, three of which are British. These are the Common Lumpsucker (*Cyclopterus lumpus*), and two species of "Sea-Snail" belonging to the genus *Liparis*. Many of the Cyclopteridæ live at great depths in the ocean, some descending to 1800 fathoms. They possess a ventral disc which enables them to attach themselves firmly to rocks, hence their popular name.

COTTIDÆ (Bullheads, &c.). Plate 22, Map v.

The Cottidæ are chiefly inhabitants of northern seas, but a few forms are found as far south as South Georgia on the fringe of the Antarctic Ocean. Most of the 200 odd species are marine, but a few occur in fresh waters, as shown on the Map. Four species occur in Britain, one of which (*Cottus gobio*) is a fresh-water species called popularly the River Bullhead, occurring in clear streams throughout England. The three marine British forms are all likewise members of the genus *Cottus*, and are chiefly inhabitants of the littoral zone.

HEXAGRAMMIDÆ (Hexagrammus, &c.). Plate 22, Map vi.

These fishes, of which six genera and 12 species are known, are confined to the Northern Pacific, occurring on rocky coasts from California to Northern China. Many of the species are highly esteemed as food.

SCORPÆNIDÆ (Scorpænoids). Plate 22, Map vi.

This is an extensive family, of world-wide distribution, comprising about 250 species and many deep-sea forms. Numerous genera have been described, while the external form of these fishes presents much variety. *Sebastes norvegicus* and *Scorpæna dactyloptera* are the only known British representatives, the former being known as the "Bergylt" or "Norway Haddock."

ECHENEIDIDÆ (Sucking-Fishes). Plate 22, Map vi.

These fishes are remarkable from the fact that the spinous portion of the dorsal fin is modified to form a powerful sucking disc, by means of which they attach themselves to boats, sharks, whales and other large dead or living objects. Three genera and about 10 species are known, which are found in the warmer portions of all seas. One species has occurred a few times in British waters.

GOBIIDÆ (Gobies, &c.). Plate 22, Map vi.

This is an extensive and widely-distributed family, comprising about 600 species, occurring in all temperate and tropical seas, and having fresh-water representatives almost in all parts of the world. One species, known as *Mistichthys luzonensis*, a native of the Philippine Islands, is of special interest, as it is believed to be the smallest known vertebrate animal. Full-

grown examples of this tiny fish do not exceed half an inch in length! Another very interesting genus is *Periophthalmus*, the members of which are known as Walking-Fishes or Mud-Skippers. These extraordinary creatures use their pectoral fins for progressing through the mud, or even for climbing trees. They inhabit the mud-flats at the mouths of various tropical rivers of the Old World. Several species of Goby occur in British waters, all of which are marine and of small size.

KURTIDÆ (Kurtus, &c.). Plate 23, Map i.

In the distribution shown on the Map, this group has been taken to comprise the true Kurtidæ, of which *Kurtus indicus* is the only known representative, and about a dozen species belonging to the genus *Pempheris* and its allies, which are sometimes regarded as a distinct family. *Kurtus indicus* is a small fish occurring in the Indian and Pacific Oceans; the other species occur, in addition, in the Atlantic; while one genus (*Bathyclupea*), is a deep-sea form which has been taken in the Indian and Caribbean Seas.

PLEURONECTIDÆ (Flat-Fishes). Plate 23, Map i.

This family contains some 500 species, among which are some of the most familiar and important food-fishes. They have a world-wide distribution, and a few fresh-water forms occur in South America and the Malay Archipelago. More than 20 species occur in British seas, including such valuable food-fishes as the Halibut (*Hippoglossus limandoides*); the Plaice (*Pleuronectes platessa*); the Flounder (*P. flesus*), which ascends rivers to far beyond the influence of the tide; the Turbot (*Psetta maxima*); the Sole (*Solea vulgaris*); and others.

ZEIDÆ (Dories). Plate 23, Map i.

About a dozen species are referred to this family, some of which are highly valued as articles of diet. The so-called "John Dories" of the genus *Zeus* are found in the Mediterranean, part of the Atlantic, the Australian, the Japanese, and one locally in British seas; *Cyttus*, an allied genus, occurs off Madeira, South Australia and New Zealand. Other members of the family occur in the Pacific Ocean.

BRAMIDÆ (Brama, &c.). Plate 23, Map i.

The Bramidæ occur in nearly all tropical and temperate seas. They have broad bodies, covered with small, firm scales. The species known as Ray's Bream (*Brama raii*) has been taken several times off the British coast; indeed, the species was first made known from a Yorkshire specimen. About a dozen species of the family are known.

CORYPHÆNIDÆ ("Dolphin"). Plate 23, Map i.

Only two species constitute the present family. They are large, somewhat clumsy-looking fishes, occurring in all tropical and subtropical seas. Popularly called "Dolphins," their flesh is much esteemed as food.

XIPHIIDÆ (Sword-Fishes). Plate 23, Map ii.

Half a dozen species of this pelagic family are known, which have a singularly wide range, and are remarkable for having their upper jaw prolonged to form a powerful weapon of offence. The best-known form is the Common Sword-fish (*Xiphias gladius*), which is not uncommon off certain sections of the British coast, besides having an extremely wide distribution elsewhere. The members of the genera *Histiophorus* and *Tetrapturus* are known as Sail-Fishes, and occur in tropical and subtropical seas.

TRICHIURIDÆ (Scabbard-Fishes, &c.). Plate 23, Map ii.

The Scabbard-Fishes and their allies are widely distributed, and while some are surface-fishes living near the coast, others occur at considerable depths. Some 25 species are known, two of which (*Trichiurus lepturus* and *Lepidopus caudatus*) have occurred as stragglers off the British coasts. The former of these is known popularly as the Hair-tail.

SCOMBRIDÆ (Mackerels, &c.). Plate 23, Map ii.

The members of this family, well-known as food-fishes, have a remarkably wide distribution. About 50 species are known, which belong to seven genera. The genus *Scomber* includes the true mackerels, of which one species (*Scomber scombrus*) is too well-known to require more than an allusion. The Tunny (*Thunnus thynnus*) is an important representative, attaining a length of ten feet, and being the largest member of the family. It is abundant in the Mediterranean, and occasionally occurs off the south coast of England, and less frequently elsewhere in British seas. Other uncommon British species are the Bonito (*Gymnosarda pelamis*), and the Belted Bonito (*Sarda sarda*).

CARANGIDÆ (Horse-Mackerels, &c.). Plate 23, Map ii.

This is a large family, containing about 150 species, which occur in all temperate and tropical seas. About 14 genera are recognised, and three species may be regarded as members of the British fauna. These are the Scad or Horse-Mackerel (*Trachurus trachurus*), the Pilot-Fish (*Naucrates ductor*), and the Derbio (*Lichia glauca*), the two latter being casual visitors. Many of the Carangidæ are useful as food.

LABRIDÆ (Wrasses, &c.). Plate 23, Map iii.

Over 500 species have been referred to this family, which is of universal distribution. Most of the species are noteworthy on account of their brilliant coloration. Seven forms are recorded as British, the chief of which are the Ballan Wrasse (*Labrus maculatus*), and the Striped Wrasse (*Labrus mixtus*). The so-called "Parrot-Wrasses" are sometimes regarded as a distinct family, under the name of Scaridæ. They are mostly tropical, but one species (*Scarus cretensis*) occurs in the Mediterranean. Of the Wrasses as a whole, some species serve as food while others have the reputation of being poisonous: all the British species are unmarketable.

POMACENTRIDÆ (Coral-Fishes). Plate 23, Map iii.

These are a family of beautifully-coloured fishes which, as their popular name implies, inhabit chiefly the neighbourhood of coral-reefs. About 150 species have been described, which are most numerous in the tropical parts of the Pacific and Atlantic Oceans.

CICHLIDÆ (Chromides). Plate 23, Map iii.

The members of this family which, for want of a better name, are sometimes called "Chromides," are purely inhabitants of fresh and brackish water. Some 293 species are known, of which 150 are natives of Africa, Syria and Madagascar, 140 American, and three Indian. In Lake Tanganyika we find a great development of this family; indeed, the Cichlidæ constitute almost the entire fish-fauna of this interesting lake.

EMBIOTOCIDÆ (Surf-Fishes). Plate 23, Map iii.

The members of this small family inhabit principally the surf along sandy beaches, whence arises their popular name of "Surf-Fishes." They inhabit the western coast of North America and the shores of Japan. Twenty-four species are known, only two of which are Japanese. One species lives in fresh water in the lowlands of the Sacramento Basin.

OSPHROMENIDÆ (Paradise-Fish, &c.). Plate 23, Map iii.

This is a purely fresh-water family, comprising 22 species, which are restricted to a few comparatively small areas in the Old World. Only one species occurs in Africa, inhabiting the Ogowé River. The best-known and largest member of the family is the so-called Gourami (*Osphromenus olfax*), a native of the Malay Archipelago, which attains a length of two feet and has a great reputation as a food-fish.

TEUTHIDIDÆ (Teuthis). Plate 23, Map iv.

These fishes are confined to the Indian and Pacific Oceans. About 30 species have been described, all placed in a single genus (*Teuthis*). They are mostly brilliantly coloured, and some forms are reputed to be poisonous.

ACANTHURIDÆ (Surgeon-Fishes). Plate 23, Map iv.

The Surgeon-Fishes are a group of about 80 species, mostly confined to tropical seas. They are brightly-coloured fishes, remarkable for having the tail armed on each side with a peculiar lancet-shaped spine. With this weapon they can inflict dangerous wounds, yet in spite of this fact, they are caught and esteemed as food.

CHÆTODONTIDÆ (Butterfly-Fishes). Plate 23, Map iv.

The members of this family owe their popular name to their brilliant and beautiful coloration. They are confined to tropical and subtropical seas, and are most numerous in the neighbourhood of coral reefs. About 200 species are known, most of which are found in Polynesia and the East Indian Archipelago.

CAPROIDÆ (Boar-Fish, &c.) Plate. 23, Map iv.

Only two species have been referred to this family. The better-known of these is the Boar-Fish (*Capros aper*), which is a native of the Atlantic and the Mediterranean, and is not unfrequently taken off the British coast. The second species, belonging to the genus *Antigonius*, has occurred at Madeira, Barbadoes and other scattered localities.

MULLIDÆ (Red Mullets). Plate 23, Map v.

The members of this family inhabit tropical and temperate seas, and many species also enter brackish water. About 50 species have been described, two of which (*Mullus barbatus* and *M. surmuletus*) are British. The former is much valued as food, but does not attain a large size. It is celebrated in history, since it was esteemed above all other fishes by the Romans, and is mentioned in many classical writings. These fishes are remarkable for their beautiful red colour.

SPARIDÆ (Sea-Breams, &c.). Plate 23, Map v.

The Sparidæ are a large group, comprising over 200 species, which have a world-wide distribution. They are inhabitants of the shores, and many of them are much esteemed as food. Nine species occur off the British coasts, the best-known of which are the Black Sea-Bream or "Old Wife" (*Cantharus lineatus*) and the Common Sea-Bream (*Pagellus centrodontus*). The so-called "Sheep's-Head" of North America is esteemed for the excellent quality of its flesh, while in Australia the "Schnapper" (*Sparus unicolor*) has a similar reputation.

SCIÆNIDÆ (Croakers, &c.). Plate 23, Map v.

The species of this family, about 150 in number, are shore-fishes, found principally in the Atlantic and Indian Oceans, especially near the mouths of large rivers which they habitually enter. They are not found in the Red Sea, while in the Pacific they are of great rarity, a fact which is accounted for by the absence of large rivers on its coasts. Nevertheless certain species occur, and some are useful as food. The only British representative of this family is the Maigre (*Sciæna aquila*), a species which is somewhat rare on our coasts, and ranges even to the Cape of Good Hope and Australia.

HOPLOGNATHIDÆ (Knife-Jawed Fishes). Plate 23, Map v.

This group contains only a single genus (*Hoplognathus*) with four species. These occur on the coasts of Australia, Japan and Peru.

CEPOLIDÆ (Band-Fishes). Plate 23, Map vi.

This family is a small one, containing only 10 species, which are found in scattered localities in various seas. Only two genera are recognised, the typical one (*Cepola*) containing the only British representative of the family, viz., the Red Band-Fish (*C. rubescens*). This species ranges from British coasts, where it is only casual, to the Mediterranean, where it is quite common.

SERRANIDÆ (Sea Perches, &c.). Plate 23, Map vi.

The Serranidæ are an extensive group, comprising a large number of genera and between 500 and 600 species. They have a world-wide distribution, and most of the species are marine. Britain claims four different forms, the best-known and most abundant of which is that known as the Bass (*Morone labrax*). The Stone-Bass (*Polyprion cernium*) is another, but somewhat uncommon, British species, well known for its excellent qualities as food. Many of the exotic species of Serranidæ are highly valued in various countries for the same reason.

PERCIDÆ (Fresh-Water Perches). Plate 23, Map vi.

The species of this family, about 90 in number, are entirely confined to the fresh waters of the Nearctic and Palæarctic regions. The so-called Pike-Perches (*Lucioperca*) are among the larger and more important fishes included here. They inhabit the lakes and rivers of Eastern Europe, Western Asia, and Eastern-north America, and are much esteemed as food. Two species of Percidæ occur in Britain, viz., the Common Perch (*Perca fluviatilis*), and the Ruffe or Pope (*Acerina cernua*).

NANDIDÆ (Nandus, &c.). Plate 23, Map vi.

This is a purely fresh-water family, containing six genera and 14 species. Two genera occur widely in South America, three in South-eastern Asia, and one in a restricted area at the mouth of the River Niger, in West Africa. All the members of this family possess carnivorous habits.

CENTRARCHIDÆ (Black Bass, &c.). Plate 24, Map i.

This family, which contains about 30 species, is specially characteristic of the United States of America, where some of the forms are particularly abundant. They are essentially fresh-water fishes, but a few are found in brackish water. In America they are collectively known as "Sun-Fishes," but must not be confounded with the members of the family Molidæ, which bear the same popular name. The fishes known as Black Bass (*Micropterus*) are excellent eating, and have been introduced into the streams of Europe. The family is also represented in South Africa, Madagascar, the East Indies, Australia and Polynesia.

BERYCIDÆ (Slime-Heads). Plate 24, Map i.

Over 70 species belonging to this family have been described, and these occur all over the world, principally in deep water. They owe their somewhat repellent popular name to the fact that the head is furnished with a number of cavities, filled with mucus and covered over with skin. Members of the typical genus *Beryx* have been taken from a depth of over 300 fathoms; some of them are valued as food. A species of this family (*Trachichthys trachichthys*) has recently been discovered in deep water off the west coast of Ireland.

GADIDÆ (Codfishes). Plate 24, Map i.

This is a large family, of much importance from an economic point of view. About 120 species are known, and these inhabit chiefly the seas of the Northern Hemisphere, while a few forms live exclusively in fresh water. The British fauna comprises about 20 species, some of which are among the most valuable of fishes for the table. The Cod, Haddock, Whiting, Pollack, and Coal-Fish are all members of the typical genus *Gadus*, and more or less abundant off our coasts; while the Hake (*Merluccius vulgaris*), Ling (*Molva molva*), and five species of Rockling (*Motella*), are well-known British representatives. The best-known fresh-water member of the family is the Burbot or Eel-Pout (*Lota lota*), which occurs locally in England, in Northern and Central Europe and Siberia, and in North America.

MACRURIDÆ (Long-Tails). Plate 24, Map i.

This family is closely allied to the Gadidæ, and contains about the same number of species (120). They are essentially fishes of the deep sea, occurring to a depth of 2650 fathoms. The various forms are found in all seas, and are remarkable for the shape of the tail, which is long and pointed (whence the popular name) and devoid of an expanded fin. One species has occasionally occurred in British seas.

ANABANTIDÆ (Climbing Perches). Plate 24, Map ii.

These remarkable fishes inhabit fresh waters and estuaries in the Ethiopian and Oriental regions, and include about 15 species, 11 of which are confined to Africa. They owe their English name to their wonderful power of ascending trees, sometimes to a height of several feet. The ascent is accomplished by means of the spines on the gill-covers and ventral fins.

OPHIOCEPHALIDÆ (Serpent-Heads). Plate 24, Map ii.

The distribution of this family is very similar to that of the previous one, although ranging further north in Asia, and being more restricted in Africa. They are all fresh-water forms, and of carnivorous habits. Over 30 species have been described, of which only three occur in Africa.

STROMATEIDÆ (Butter-Fishes). Plate 24, Map ii.

These fishes have a wide distribution, occurring in all tropical and temperate seas. Between 40 and 50 species have been described, the best-known of which are the so-called Black Fish (*Centrolophus niger*) and the Rudder-Fish (*Lirus perciformis*), both of which are occasionally caught off the British coast. A Mediterranean species, *Stromateus fiatola*, called the "fiatola" by Italian fishermen, is much esteemed for its qualities as food.

SPHYRÆNIDÆ (Barracudas). Plate 24, Map ii.

About 20 species, belonging to a single genus (*Sphyræna*) are referred to this family. They inhabit nearly all tropical and temperate seas, and are often found also in estuaries. Attaining a large size (sometimes eight feet) they are justly feared by the bather, for they are reported to be of pugnacious habits, and more dangerous than many sharks. They are sometimes eaten, but at certain seasons are said to be poisonous.

POLYNEMIDÆ (Threadfins). Plate 24, Map ii.

These fishes, which are remarkable for the curious tactile appendages forming part of the pectoral fin, are inhabitants of the shores of all tropical and subtropical seas, sometimes ascending the mouths of rivers. Three genera have been described, with about 25 species. Certain East-Indian species yield a sort of isinglass, while their flesh is much esteemed.

MUGILIDÆ (Grey Mullets). Plate 24, Map iii.

This family contains about 100 species, most of which have a high value as food. They occur on the coasts of all temperate and tropical regions, and many species inhabit fresh water. Three species occur in British seas, the best-known of which is the Common Grey Mullet (*Mugil capito*). This species has a remarkably wide distribution, ranging from the Cape of Good Hope northwards to Scandinavia.

ATHERINIDÆ (Sand-Smelts, &c.). Plate 24, Map iii.

The fishes of this family are mostly small creatures, yet in spite of this fact are much valued for food. They occur on the coasts of nearly all temperate and tropical regions, two species being inhabitants of British waters. Some forms are found in fresh water, and all are of carnivorous habits. About 65 species have been described, which have been relegated to about a dozen different genera.

AMMODYTIDÆ (Sand-Eels). Plate 24, Map iii.

This is a small family, containing only two genera and nine species. They are confined to the coasts of the Northern Hemisphere, and are very common on the sandy shores of Europe and North America. Two species, the Greater Sand-Eel (*Ammodytes lanceolatus*) and the Lesser Sand-Eel (*A. tobianus*) are common on British coasts.

SCOMBRESOCIDÆ (Gar-Pike, Flying-Fish, &c.). Plate 24, Map iii.

The Scombresocidæ are an extensive group, comprising over 200 species, and occurring in all temperate and tropical seas. Three or four species are found in British waters, the best-known of which is the so-called Gar-Pike or Gar-Fish (*Belone vulgaris*), a common inhabitant of our coasts. The most interesting members of the family are, however, the Flying-Fishes of the genus *Exocœtus*. These remarkable fishes are well-known to every ocean-traveller, and some 40 or 50 species have been described. *Exocœtus volitans* is a small form, and has occasionally occurred as a straggler off the British coast.

PEGASIDÆ (Dragon-Fishes). Plate 24, Map iii.

The Dragon-Fishes, of which some half-dozen species are known, are curious little creatures inhabiting the seas of India, China, Japan, the Malay Archipelago, and Australia. They are small fishes, and little appears to be known of their habits. *Pegasus volans* is probably the most familiar member of the family.

SYNGNATHIDÆ (Pipe-Fishes, &c.). Plate 24, Map iv.

The curious elongated fishes of this family are found in the seas of practically the whole world. About 175 species have been described, some of which are remarkable for their extraordinary appearance. Seven species are recorded from British coasts, including three forms of Pipe-Fish (genera *Siphonostoma* and *Syngnathus*) and the interesting little Sea-Horse (*Hippocampus hippocampus*), the latter, however, being a rare wanderer from more southern seas. The members of the Australian genus *Phyllopteryx* are remarkable for the possession of a number of dermal appendages, which resemble very closely the seaweeds among which these fishes live, and hence serve as an effectual means of concealment.

CENTRISCIDÆ (Trumpet-Fishes, &c.). Plate 24, Map iv.

This family consists of eight or nine species which occur pretty widely in the Atlantic, Indian and Pacific Oceans. The Common Snipe-Fish (*Centriscus scolopax*) occasionally wanders as far as the south coast of Britain, occurring also in the Mediterranean. The Needle-Fishes of the genus *Amphisile*, which occur in the Indian and Pacific Oceans, are sometimes placed in a separate family.

FISTULARIIDÆ (Flute-Mouths). Plate 24, Map iv.

The members of this family, seven or eight of which are known, are sometimes described as "gigantic marine Sticklebacks." They are found in most tropical and subtropical seas, generally near the shore. *Fistularia tabaccaria* grows to a length of six feet. The genus *Aulostoma* is sometimes referred to a separate family, as are also *Aulorhynchus* and *Auliscus*.

GASTROSTEIDÆ (Sticklebacks). Plate 24, Map iv.

These well-known little fishes are found in both fresh and salt water, and are entirely restricted to the Northern Hemisphere. They are remarkable for their nest-building habits, the male undertaking this duty and also that of guarding the eggs until hatched. Five species are found in British waters, the Three-spined and Ten-spined Sticklebacks (*Gastrosteus aculeatus* and *pungitius*) being among the most familiar of our native fishes. Almost identical forms inhabit Europe and North America, rendering an exact estimate of the number of species a difficult matter; probably, however, about a dozen may be regarded as distinct.

LAMPRIDIDÆ (The Opah or King-Fish). Plate 24, Map v.

The sole representative of this family is a handsome and bulky fish, known as the Opah or King-Fish (*Lampris luna*). It occurs in the North Atlantic, the Mediterranean, and certain parts of the Pacific, and is not very uncommon off the British coasts. It attains a length of about four feet, and is said to be excellent eating.

FIERASFERIDÆ (Pearl-Fishes). Plate 24, Map v.

About 10 species of this family are known; all are small eel-shaped fishes belonging to a single genus, *Fierasfer*. They are remarkable for the fact that they spend the whole of their lives as commensals within the bodies of Holothurians (Sea Cucumbers), starfishes, or bivalved molluscs. They are found near the coasts of nearly all tropical and subtropical seas, and one species (*F. dentatus*) has occurred off the coasts of Ireland.

NOTACANTHIDÆ (Thornbacks). Plate 24, Map v.

The Notacanthidæ are elongated deep-sea fishes found in the Mediterranean Sea and the Atlantic and Pacific Oceans, occurring at depths of 400 to 1875 fathoms. Nine species have been described, belonging to the two genera *Notacanthus* and *Polyacanthonotus*.

PERCOPSIDÆ (Trout-Perches). Plate 24, Map v.

Only two species, each belonging to a distinct genus, are referred to this purely North-American family. The first of these (*Percopsis guttata*) abounds in the great lakes and their tributaries, occurring also in various rivers of Canada and the United States. The other species (*Columbia transmontana*) is much rarer, occurring only in lagoons in the lower basin of the Columbia River in the Western States. Both these fishes are remarkable for the possession of the so-called adipose fin, so characteristic of the Salmon and its allies.

AMBLYOPSIDÆ (Blind-Fishes). Plate 24, Map vi.

This family includes three genera and six species, which occur only in ditches, streams, and subterranean waters within a restricted area in the Eastern United States. The best-known representative is the famous Blind-Fish (*Amblyopsis spelæa*), inhabiting the Kentucky and other caves east of the Mississippi. This species, and two others found in similar situations, have only rudimentary eyes, and appear to depend largely for their safety on the sense of touch, which is highly developed.

CYPRINODONTIDÆ (Killifishes). Plate 24, Map vi.

The Cyprinodontidæ inhabit fresh or brackish waters in the warmer portions of both hemispheres, but of the 200 known species about 170 are natives of America. One of the most interesting genera of the family is *Anableps*, which contains three species inhabiting Tropical America, and known as Double-eyes or Four-eyed Fishes. In these curious fishes the eyes are divided into two portions, an upper and a lower, so that the creature when swimming near the surface can see into the air and into deep water at the same time.

KNERIIDÆ (Kneria). Plate 24, Map vi.

This small family contains only two species, placed in a single genus (*Kneria*), and is confined to fresh waters in Angola and East Africa respectively. They are small fishes, from two to four inches in length, with a somewhat Loach-like general appearance.

SCOPELIDÆ (Lantern-Fishes, &c.). Plate 24, Map vi.

The Scopelidæ are a large and universally distributed family, containing over 100 species, many of which are deep-sea forms of much interest. In correlation with their life at great depths, they are often provided with phosphorescent spots on the head and body, while in one genus (*Ipnops*) the eye is modified from a light-perceiving to a light-producing organ. *Bathypterois* is an interesting genus, discovered by the "*Challenger*" expedition, and remarkable for the extraordinarily elongated pectoral rays which act as organs of touch; one species, *B. dubius*, has recently been found in deep water off the S.-W. coast of Ireland. The four known species occurred at a depth varying from 520 to 2650 fathoms. *Scopelus engraulis*, one of the best-known representatives of the family, is sometimes called the "Phosphorescent Sardine."

ESOCIDÆ (Pikes). Plate 25, Map i.

This group includes six or seven species of carnivorous and voracious fresh-water fishes, which are exclusively confined to the temperate and subarctic portions of the Northern Hemisphere. *Esox*, the typical genus, contains four or five species, including *Esox lucius*, the only representative of the family in Britain, occurring also in Northern Asia and North America. The second genus, *Umbra*, contains two species, one occurring in Austro-Hungary, and the other in Canada and the United States.

HAPLOCHITONIDÆ (Southern Salmon). Plate 25, Map i.

Only four species of this family are known, one belonging to the typical genus *Haplochiton* and three to *Prototroctes*. The first-named occurs in the extreme south of South America and in the Falkland Islands, while the other three are natives of New Zealand, South Australia and Queensland respectively. They are all Trout-like in appearance, and are exclusively confined to fresh water.

GALAXIIDÆ (Pikelets). Plate 25, Map i.

About 30 species are referred to this family, and they are chiefly confined to fresh waters in the Southern Hemisphere, although one species occurs also in the sea. The peculiar distribution of these fishes, as shown on the map, added to the fact that one or two species at least are partially marine, furnishes a strong argument in favour of the theory that there formerly existed a huge Antarctic continent, connecting the remote areas inhabited by the Galaxiidæ, now so remote from one another.

MURÆNIDÆ (Murænoid Eels, &c.). Plate 25, Map i.

This family is a large one, containing about 150 species of universal distribution. They are most abundant in warm seas, especially in the neighbourhood of coral reefs. The Murry (*Muræna helena*) is much esteemed as food in the countries surrounding the Mediterranean, and was a great favourite with the ancient Romans. It has occurred, though very rarely, off the coast of England. Several remarkable deep-sea forms belong to this family, and these are often placed in separate families. *Saccopharynx* and its allies are among the most extraordinary-looking fishes known, possessing a pharynx and stomach so dilatable that the fish is able to swallow another one much larger than itself. These and other interesting forms occur down to a depth of 2000 fathoms.

ANGUILLIDÆ (Typical Eels). Plate 25, Map ii.

The Typical Eels, of which about 150 species are known, occur in all temperate and tropical seas, while a few species also inhabit fresh water. Many are deep-sea forms and occur down to 2500 fathoms. Two species occur in British waters, namely, the Common Eel (*Anguilla vulgaris*) and the Conger (*Conger vulgaris*), both of which are abundant and widely-distributed within the British area. The Common Eel has also a wide range in the Northern Hemisphere and descends to the sea to spawn; while the Conger is almost cosmopolitan in its distribution. Many species of Anguillidæ are important articles of food.

SYMBRANCHIDÆ (Single-Slit Eels). Plate 25, Map ii.

Half a dozen species only are referred to this family, three of which occur in India, the Malay Archipelago, China and Japan; two in Australia and Tasmania, and one in Central and South America. The Australian forms are marine, but all the rest inhabit fresh or brackish waters.

LORICARIIDÆ (Mailed Cat-Fishes). Plate 25, Map ii.

This is an interesting family, containing some 200 species, which are confined to the Neotropical Region, and are exclusively inhabitants of fresh waters. Fourteen genera have been recognised, which are grouped into two sub-families. In one, the *Arginæ*, the body is naked; while in the other, the typical one, *Loricariinæ*, the body is protected by bony plates.

SILURIDÆ (Cat-Fishes). Plate 25, Map ii.

This is one of the most important families of fishes, containing over a thousand species. These are, with a few exceptions, confined to fresh waters, and occur in nearly all the temperate and tropical portions of the world. In North America they do not occur west of the Rocky Mountains. At least 120 genera are differentiated by our modern authorities, and these are arranged in no fewer than eight sub-families. Although occurring in Central Europe, they are entirely absent from the western portion of the continent, including Britain. Madagascar possesses representatives, but New Zealand has none.

CYPRINIDÆ (Carps, &c.). Plate 25, Map iii.

The Carp family is an extensive one, containing about 1300 species. They are exclusively fresh-water fishes, and occur in all parts of the world, except South America, Madagascar and the Australian region. In Europe, Asia and North America they outnumber all other fresh-water fishes, but in Africa they are comparatively feebly represented, only about 100 species occurring in that continent. Sixteen species occur in Britain, including the Barbel (*Barbus vulgaris*); Gudgeon (*Gobio fluviatilis*); Roach, Chub, Dace, Rudd and Minnow (*Leuciscus* spp.); Tench (*Tinca vulgaris*); Bream (*Abramis brama*); and Loach (*Nemachilus barbatulus*).

GYMNOTIDÆ (Electric Eels). Plate 25, Map iii.

The Gymnotidæ are a group of about 30 species of fishes, entirely confined to the fresh waters of Central and South America. Although somewhat like Eels in external appearance, these fishes are not related to them structurally, but are nearly allied to the Characinidæ, which are dealt with

below. The best-known member of the present family is the interesting Electric Eel (*Gymnotus electricus*) of Brazil and Guiana. This creature grows to a length of six or eight feet, and, since the shocks produced by its electric organ are capable of disabling the horses and cattle of travellers who ford the waters which form its home, it is not a little dreaded, or, at least, detested, by them.

CHARACINIDÆ. Plate 25, Map iii.

This is an extensive family, for which it is difficult to employ a common English name. Some 500 odd species are known, which are distributed only in the fresh waters of Africa, south of the Sahara, and Tropical and Sub-tropical America. They are very varied in structure, and equally diverse in habits. Among the carnivorous species the so-called "Dogs of the Water" of the genus *Hydrocyon* and the Cariba (genus *Serrasalmo*) are probably the most formidable, being armed with powerful teeth, which are capable of inflicting dangerous wounds. The former inhabit the Nile and other rivers and lakes in Tropical Africa; the latter, many rivers of Tropical America.

GONORHYNCHIDÆ (The Beaked Salmon). Plate 25, Map iii.

The single species constituting this family is a much elongated fish, which has a wide distribution, occurring off the coasts of the Cape of Good Hope, Australia, New Zealand and Japan; while examples have been recorded from intermediate seas. In New Zealand it is esteemed as food, and takes the name of "Sand-eel" from its occurrence in sandy bays.

STOMIATIDÆ. Plate 25, Map iii.

The Stomiatidæ and their allies are a group of about 60 species, found in all seas, and mostly at great depths. Some of the forms included here have an extraordinary appearance, and the majority have a formidable array of teeth. They have been dredged at a depth of 2500 fathoms.

ALEPOCEPHALIDÆ (Smooth-Heads). Plate 25, Map iv.

Like the Stomiatidæ, these fishes are found at great depths, and have an almost cosmopolitan distribution. About 35 species have been described, whose structure is said to be similar to that of the Salmon and the Herring tribes.

SALMONIDÆ (Salmon, Trout, &c.). Plate 25, Map iv.

This is one of the most important families of fishes from an economic point of view, including as it does some of the most familiar and valuable food fishes. Excluding a few deep-sea forms occurring in the Antarctic Ocean (not shown in the map), the Salmonidæ are almost entirely confined to the fresh waters and seas of the Northern Hemisphere. One genus, however, is peculiar to New Zealand. About 80 species are referred to this family, several being natives of Britain. According to some authors, the British list numbers at least 25 different forms, but about half of them must be regarded as mere varieties or local races, especially when it is borne in mind that in many cases they occur only in a single lake. The best-known members of the family are the Salmon (*Salmo salar*); the Trout (*S. fario*); the Smelt (*Osmerus eperlanus*); the Powan, Vendace and Pollan (*Coregonus* spp.); and the Grayling (*Thymallus vulgaris*).

CLUPEIDÆ (Herrings, &c.). Plate 25, Map iv.

This is an almost cosmopolitan family, comprising some 200 different species. Many forms are useful as food, for although small, they occur in immense shoals, and for the fishermen afford a rich harvest. About half a dozen species occur in British seas. The best-known of these are the Herring (*Clupea harengus*); the Sprat (*C. sprattus*); the Pilchard (*C. pilchardus*); and the Anchovy (*Engraulis encrasicholus*).

CHIROCENTRIDÆ (The Dorab). Plate 25, Map iv.

The formidable fish known in the East as the "Dorab" (*Chirocentrus dorab*) is the only representative of this family. It occurs in the Indian Ocean, the Red Sea, and the coasts of the Western Pacific, from Japan to Australia. It attains a length of three feet, but is comparatively useless as food.

PANTODONTIDÆ (The Chisel-Jaw). Plate 25, Map iv.

The only member of this family is a small fish discovered comparatively recently in the rivers of certain parts of West Africa. Its scientific name is *Pantodon buchholzi*, while its popular one of "Chisel-Jaw" bears reference to the strong teeth with which the jaws are furnished.

OSTEOGLOSSIDÆ (Arapaimas). Plate 25, Map v.

The five known species of this family have an interesting distribution, while that known as the true Arapaima (*Arapaima gigas*) is worthy of special mention, since it is the largest known fresh-water fish. This huge creature grows to a length of at least 15 feet, and often weighs over 400 lbs. It is confined to the larger rivers of Brazil and Guiana, and its flesh is much esteemed, both fresh and salted. Of the four remaining species one, belonging to the typical genus (*Osteoglossum*) is South American; one is confined to Tropical Africa; one is found only in Sumatra, Borneo, and Banka; while the fourth inhabits Northern Australia. All the members of the family are confined to fresh waters.

NOTOPTERIDÆ (Feather-Backs). Plate 25, Map v.

This is a group comprising four species, which inhabit fresh and brackish lakes and marshes in Western Tropical Africa and certain parts of the Oriental Region. They are carnivorous fishes, the largest growing to a length of four feet.

HYODONTIDÆ (Moon-Eyes). Plate 25, Map v.

This family is entirely restricted to the fresh waters of that portion of North America which lies to the east of the Rocky Mountains. They are handsome fishes, attaining a length of about 18 inches, but their flesh is said to be rather insipid.

MORMYRIDÆ (African Beaked Fishes). Plate 25, Map v.

About 100 species of this family are known, which are entirely confined to the fresh waters of Africa, principally between the Tropics. Ten genera have been described, which are grouped into two sub-families. One species, at least, was known to the ancient Egyptians, and is frequently represented on hieroglyphics and frescoes. Although such a large group, very little is known of their habits.

ELOPIDÆ (The Tarpon, &c.). Plate 25, Map v.

Only four species, placed in two genera, are referred to this family. *Elops*, the typical genus, contains two species, one of which occurs throughout warm and tropical seas, while the other appears to be confined to the west coast of Africa, where it ascends the rivers to some distance. *Megalops*, the second genus, contains two species of much larger fishes, the better known of which is the Tarpon (*M. atlanticus*) of the eastern coasts of America, including the Gulf coast of Florida. This fish affords exciting sport to the angler, attains a length of six feet, and is much esteemed for the table.

ORDER **HOLOSTEI.**

LEPIDOSTEIDÆ (Bony Pike, &c.). Plate 25, Map vi.

This family comprises some four or five species, which all belong to a single genus, and are confined to the fresh waters of the south-eastern portion of North America, Central America and Cuba. The best-known species is probably that known as the Long-nosed Gar-Pike (*Lepidosteus osseus*), which is fairly abundant in the rivers and lakes of the United States, attaining a length of five feet.

AMIIDÆ (The Bow-Fin). Plate 25, Map vi.

The sole representative of this family is the archaic-looking fish known as the Bow-Fin (*Amia calva*). It is confined to the fresh waters of the eastern half of the United States, and attains a length of about 2½ feet. Although not much used as food, it is yet a favourite with the angler, on account of its sporting qualities.

ORDER **CHONDROSTEI.**

ACIPENSERIDÆ (Sturgeons). Plate 25, Map vi.

The members of this family are found in both seas and fresh waters, and are entirely confined to the temperate and subarctic regions of the Northern hemisphere. Only two genera are known, with about 20 species. Many of these are abundant in certain inland seas, such as the Black Sea and the Caspian, while they inhabit also many of the larger rivers. One species, known as the Common Sturgeon (*Acipenser sturio*) occurs on British coasts and enters rivers, but is of somewhat uncertain occurrence. From a commercial point of view this family is of much importance, since certain species furnish the delicacy known as "caviare," while from the air-bladder is prepared the important commodity so familiar under the name of isinglass.

POLYODONTIDÆ (Toothed Sturgeons). Plate 25, Map vi.

This family is represented by two species, each belonging to a separate genus. The typical genus *Polyodon* contains the curious Paddle-Fish (*P. folium*) which is confined to the Mississippi and its tributaries. *Psephurus gladius*, the second species, occurs only in China, where it inhabits the Yang-tse and Hoang-ho rivers.

ORDER **CROSSOPTERYGII.**

POLYPTERIDÆ (The Bichir, &c.). Plate 26, Map i.

The ten species which form this family are the sole living representatives of the order. They are entirely confined to the fresh waters of Western Tropical Africa, six species being restricted to the Congo and its tributaries. Two genera are differentiated, the best-known species being the so-called Bichir (*Polypterus bichir*). *Calamichthys*, the second genus, contains a single species only (*C. calabaricus*).

ORDER **HOLOCEPHALI.**

CHIMÆRIDÆ (Chimæras). Plate 26, Map i.

The Chimæridæ have a wide distribution, the half-dozen known species occurring practically in all seas. The typical genus, *Chimæra*, contains three species, one of which ranges from Europe to Japan and the Cape of Good Hope, while many examples have been captured in British seas, and as far north as the Orkneys. A second genus, *Callorhynchus*, contains a single species confined to the South Pacific and the Antarctic Basin.

ORDER PLAGIOSTOMI.

MYLIOBATIDÆ (Eagle-Rays). Plate 26, Map i.

The Eagle Rays are represented by about 30 species, which occur principally in tropical and subtropical seas. The best-known species is *Myliobatis aquila*, which has been taken on many parts of the British coasts, while beyond our seas it has an almost cosmopolitan distribution.

TRYGONIDÆ (Sting-Rays). Plate 26, Map i.

The Sting-Rays owe their popular name to the strong caudal spines, with which they are capable of inflicting severe and dangerous wounds. About 50 species are known, which have a wide range in tropical and temperate seas. A single species, *Trygon pastinaca*, occurs not infrequently in British waters, while it ranges also over both sides of the Atlantic, the Mediterranean, and even as far east as China and Japan. A few species live in fresh waters, and these are mainly found in the northern portion of South America.

TORPEDINIDÆ (Electric Rays). Plate 26, Map ii.

The Electric Rays, so called from the presence of electric organs between the head and the pectoral fins, are found chiefly in warm seas, although one species (*Torpedo hebetans*) has frequently been taken off the British coasts. Seven genera and about 15 species have been described.

RAIIDÆ (Rays or Skates). Plate 26, Map ii.

The species of this family, some 30 or 40 in number, are found in all the cooler waters of the globe, and are more abundant in the Northern than in the Southern Hemisphere. The great majority of the species belong to the typical genus *Raia*, as do all the British representatives of the family. The latter are nine in number, the best-known of which are the Common Skate (*R. batis*) and the Thornback Ray (*R. clavata*). Most of the Rays are eaten as food.

RHINOBATIDÆ (Beaked Rays). Plate 26, Map ii.

The Rhinobatidæ inhabit warmer regions than the True Rays (*Raiidæ*), and are found in nearly all tropical and subtropical seas. About 20 species have been described, belonging to five different genera. The peculiar shape of the body in these Rays has led to their being sometimes called guitar-fishes or fiddler-fishes.

PRISTIDÆ (True Saw-Fishes). Plate 26, Map iii.

This is a small group, containing only a single genus and four or five species. They are formidable fishes, attaining a length of over 20 feet, and are found in all the warmer seas. Carnivorous in habit, these creatures, with their serrated beak, cause much havoc among their defenceless neighbours.

PRISTIOPHORIDÆ (Side-gilled Saw-Fishes). Plate 26, Map iii.

As their popular name indicates, these fishes may be distinguished from the true Saw-Fishes forming the previous family by the position of their gill-openings, which are lateral instead of ventral. In general appearance, however, they resemble the Pristidæ. About four species, belonging to a single genus, *Pristiophorus*, are known, and these are confined to the seas of Australia and Japan.

RHINIDÆ (Angel-Fishes). Plate 26, Map iii.

The members of this family are all very closely allied to one another, and it is doubtful whether more than a single species should be recognised. Angel-Fishes have an almost cosmopolitan distribution, occurring in practically all the tropical and temperate seas. They attain a length of about five feet. *Rhina squatina*, the typical species, is not uncommon in British waters, especially off the Scottish coasts.

SPINACIDÆ (Spiny Dog-Fishes). Plate 26, Map iii.

About 20 species of this family are known, belonging to eight genera. They have a world-wide distribution, but are most abundant in temperate seas. The best-known member of the group is the Picked or Piked Dog-Fish (*Acanthias vulgaris*), a creature growing to a length of three or four feet, and abundant on the British coasts. The Greenland Shark (*Læmargus borealis*) is an occasional visitor to British seas, but inhabits principally the Arctic regions. The Spinous Shark (*Echinorhinus spinosus*) is another well-known member of the family, wandering on rare occasions to Britain.

RHINODONTIDÆ (Whale-Sharks). Plate 26, Map iv.

The Rhinodontidæ have a wide distribution, but are only rarely seen. One, or perhaps two, species may be recognised, belonging to a single genus *Rhinodon*. These creatures are the largest known Sharks, growing to a length of over 50 feet. Little is recorded of their habits, but the size of their teeth suggests that their food consists of small fishes. They are, at any rate, reported to be quite harmless to man.

CETORHINIDÆ (The Basking Shark). Plate 26, Map iv.

The Basking Shark (*Cetorhinus maximus*) is the sole representative of this family. It inhabits Arctic seas, but wanders as far south as the Mediterranean and California. It is a huge creature, attaining a length of 40 feet, but is harmless to man, by whom it is regularly hunted for the sake of the oil obtained from its liver. The popular name of this Shark, which occurs fairly commonly in British seas, is due to its habit of lying motionless on the surface of the water.

LAMNIDÆ (The Porbeagle, &c.). Plate 26, Map iv.

About seven species are usually referred to this family, belonging to five or six different genera. They are widely distributed, occurring in nearly all seas. The best-known species is the Common Porbeagle (*Lamna cornubica*), a fierce animal inhabiting the Northern Atlantic and Pacific Oceans, and common in British waters. Another species, *Carcharodon rondeletii*, is regarded as the most formidable and voracious of all sharks, attaining a length of 40 feet, and found in all tropical and subtropical seas, ranging from the Mediterranean to New Zealand. The curious, long-tailed Fox Shark or Thresher (*Alopecias vulpes*) is not uncommon on British coasts.

SPHYRNIDÆ (Hammer-Head Sharks). Plate 26, Map iv.

A single genus (*Sphyrna*, formerly called *Zygæna*) of this family is recognised, with five species. They are widely distributed in all the warmer seas, while one species (*Sphyrna zygæna*), is occasionally taken off the British coasts. These sharks are remarkable for the curious lateral extensions of the head, which bear an eye at each extremity, and give these fishes an extraordinary hammer-like appearance, whence their popular name.

CARCHARIIDÆ (The Blue Shark, &c.). Plate 26, Map v.

This family is a comparatively large one, comprising about 60 species These have a world-wide distribution, ranging from Iceland to New Zealand, and occurring in all seas. Numerous genera have been formed for the reception of the various forms, the typical one (*Carcharias*) containing about half of them. The best-known members of this important family are the so-called Blue Shark (*Carcharias glaucus*), the Topes of the genus *Galeus*, and the "Hounds" or species of *Mustelus*. The Blue Shark is frequently captured in British waters; *Galeus canis*, the Common Tope, is also common off our coasts; while *Mustelus vulgaris* and *M. lævis* are both well-known inhabitants of British seas.

SCYLLIIDÆ (Dog-Fishes, &c.). Plate 26, Map v.

About 20 species of Dog-Fishes constitute the present family, and these are found in the seas of the whole world. The members of the typical genus *Scyllium* are of small size, and are sometimes used as food. Two species, called respectively the Small-spotted and Large-spotted Dog-Fish (*S. canicula* and *catulus*) are common off the British coasts; while *Pristiurus melanostomus*, known as the Black-mouthed Dog-Fish, is a European species which has several times been captured in British waters. The Tiger- or Zebra-Shark (*Stegostoma tigrinum*) is a common inhabitant of the Indian Ocean, owing its popular name to the handsome coloration of its body, which is of a brownish-yellow, striped with dark brown or black.

HETERODONTIDÆ (Bullhead Sharks). Plate 26, Map v.

The species of this family, four in number, are confined to the Pacific Ocean, where, however, they have a wide range. The best-known species is that called popularly the Port Jackson Shark (*Heterodon philippi*), a somewhat repulsive-looking creature inhabiting the seas of Australia. Little is known of the habits of these Sharks, but they appear to feed chiefly on Molluscs. None of them exceeds five feet in length.

NOTIDANIDÆ (Comb-toothed Sharks). Plate 26, Map v.

This family comprises about half a dozen species of moderate-sized Sharks, which are found in nearly all tropical and temperate seas. *Notidanus griseus*, inhabiting the Atlantic and the Mediterranean, is an occasional visitant to British waters.

CYCLOSTOMATA.

PETROMYZONTIDÆ (Lampreys). Plate 26, Map vi.

The lowly-organised fishes known as Lampreys are found on the coasts and in the fresh waters of a great part of the globe, but most of the records, perhaps naturally enough, have been made in the Northern Hemisphere. Three species are recorded as British, namely, the Sea-Lamprey (*Petromyzon marinus*), not uncommon off our coasts; the Lampern or River-Lamprey (*P. fluviatilis*), generally distributed in rivers, and the Pride, Sandpiper, or Small Lamprey (*P. branchialis*), found throughout the rivers and streams of the British Isles. *Geotria* is a southern genus, occurring in the rivers of Chili, South Australia and New Zealand; while *Mordacia* has an equally interesting distribution, being confined, so far as at present known, to the coasts of Chili and Tasmania.

BDELLOSTOMATIDÆ (Hag-Fishes). Plate 26, Map vi.

The members of this family are confined to the coasts of the Pacific, being recorded principally from California, Chili, Patagonia, Japan and New Zealand; and the South Atlantic, where they occur at the Cape of Good Hope. In general appearance and habits they resemble the Hag-Fishes of the next family, differing in structure principally in possessing six to fourteen pairs of gill-openings, whereas in the Myxinidæ the six pairs of gill-sacs open to the exterior by a common orifice on each side.

MYXINIDÆ (Hag-Fishes). Plate 26, Map vi.

The principal character which distinguishes these Hag-Fishes from the Bdellostomatidæ has been pointed out in the preceding paragraph. A single genus (*Myxine*) is here included, with at least half a dozen species. They are widely distributed, but chiefly in temperate seas, and one species, the so-called Glutinous Hag or Borer (*M. glutinosa*), is abundant on the British coasts. It is eel-like in appearance, and enters the bodies of other fishes, especially cod fishes, to feed upon their flesh.

CEPHALOCHORDATA.

BRANCHIOSTOMATIDÆ (Lancelets). Plate 26, Map vi.

The fish-like and primitive vertebrates known as Lancelets are of so peculiar a structure as to constitute a separate class to themselves of an importance, from a morphological point of view, equal to that of the whole of the fishes. They are marine animals, and the 16 known species are found on the coasts of all parts of the world. Most of the records, however, are tropical and subtropical, referring to localities between 40° N. and 40° S. *Branchiostoma lanceolatum* has been recorded from many parts of the British coast.

CLASS MOLLUSCA (Molluscs).

ORDER CEPHALOPODA

OCTOPODIDÆ (Octopus, &c.). Plate 27, Map i.

The *Octopodidæ* occur off the coasts of nearly all temperate and tropical regions. About 100 species have been described, and two at least occur in British waters. They are solitary animals, inhabiting rocky shores, and the adults attain a huge size, some having been seen over 9 feet in length. Their food consists principally of bivalved molluscs. In the South of Europe they are sold as food, and are said to be excellent eating.

ARGONAUTIDÆ (the Paper-Nautili). Plate 27, Map i.

The members of this family are all placed within a single genus (*Argonauta*). They inhabit the warmer portions of all seas, and are reported to be more active in the night. The shell of these creatures is a very beautiful object, and was at one time supposed to be made by some other mollusc, the Paper-Nautilus merely using it as a convenient dwelling-place. It is now known, however, to be secreted by the animal itself. The male is without a shell, and is a much smaller creature than the female.

LOLIGINIDÆ (Squids). Plate 27, Map i.

The Squids or Calamaries, of which about 60 species are known, occur in all seas. Three species are found in British seas, including the Common Squid (*Loligo vulgaris*). The Cuttle-fishes of this family sometimes grow to an enormous size. Specimens have been captured which, when measured, were found to possess a body at least 7 feet long, with arms that stretched a distance of from 24 to 30 feet.

SEPIIDÆ (True Cuttle-Fishes). Plate 27, Map i.

Over 30 species of this family are known, which are found in the seas of all the world. They are, in general, much smaller than the members of the preceding family, seldom exceeding a foot in length. Three species of *Sepia* find a place on the British list, the best-known of which is usually called the Common Cuttle-fish (*S. officinalis*). They are chiefly shore animals, feeding on fish and crustaceans. In Italy they are much esteemed as food.

SPIRULIDÆ (Spirula). Plate 27, Map ii.

Three species of this interesting family are known, all belonging to a single genus (*Spirula*). The shells of these animals are well-known, since they are washed ashore in all parts of the world. The living animal is, however, very rarely seen, and very few good specimens have been obtained. The best-known form is *S. peronii*, which is reported from British waters.

NAUTILIDÆ (Nautili). Plate 27, Map ii.

The six living species of this family are confined to tropical seas, and little is known of their habits. In many of the Polynesian Islands these molluscs are used as food, while their elegant shells are in India made into drinking-cups. The Nautili are the sole existing representatives of a group which is known as Tetrabranchiate, and which includes many thousands of species only known in a fossil state. The well-known Ammonites of the fossil collector are referred by many authors to this group.

CLASS GASTROPODA.

ORDER PULMONATA.

TESTACELLIDÆ (Shelled Slugs). Plate 27, Map ii.

This family of terrestrial molluscs possesses representatives in all the zoögeographical regions, including two species which are on the British list, though probably introduced. These belong to the typical genus (*Testacella*), which contains besides a few species found in the South of Europe and North Africa. *Streptostylus* is confined to tropical America, with about 50 species; *Glandina*, with about 150 species, is likewise chiefly American; *Gibbus*, with over 40 species, is confined to Madagascar, Seychelles, and the neighbouring islands; while *Paryphanta* and *Rhytida* are confined to the Australian region.

LIMACIDÆ (True Slugs). Plate 27, Map ii.

This is an extensive group, containing representatives in all parts of the world. Some of the slugs belonging to this family are devoid of an external shell, possessing only a small internal plate; others again possess a complete spiral shell within which the animal can wholly withdraw. The most important genera are *Urocyclus*, confined to tropical Africa; *Parmarion*, which is entirely Oriental; *Helicarion*, with about 100 species found principally in the Oriental and Australian Regions; *Ariophanta*, with over 500 species of universal distribution; *Parmacella*, occurring chiefly in the Mediterranean countries; *Limax*, with over 100 species of world-wide distribution; *Vitrina*, with about 100 species inhabiting chiefly the Northern Hemisphere; and *Zonites*, confined to Europe and America. The British forms of this family include nine species of *Limax*, one of *Vitrina*, and eleven of *Zonites*.

HELICIDÆ (Typical Land-Snails). Plate 27, Map iii.

The typical Land-Snails occur in every part of the globe, and include an enormous number of species. The slugs of the genus *Arion* are included here, although sometimes placed in a separate family. Britain possesses three species, with numerous varieties of this genus, which is characterised by the absence of a shell. Curiously enough, these slugs, so abundant with us, are unknown in America. The typical genus *Helix* is an enormous one, with about 4000 species. Of universal distribution, this genus has been divided into innumerable sub-genera. Britain claims at least 25 species, each of which has several named varieties. Lastly, *Bulimus*, with over 300 species, is mainly South American.

BULIMULIDÆ (Bulimulus, &c.). Plate 27, Map iii.

This family, as at present constituted, is confined to the New World, the Oriental Region, and the Australian Region. It contains several species which were formerly placed in the genus *Bulimus* (Helicidæ), but which, owing to certain characters formerly overlooked, are more properly removed from that position. The great majority of the members of the family belong to the typical genus *Bulimulus*.

UROCOPTIDÆ (Urocoptis, &c.). Plate 27, Map iii.

This family, formerly bearing the name *Cylindrellidæ*, is entirely confined to tropical America. Their shells are very long, with many whorls, and often beautifully sculptured. About 250 species have been described, *Urocoptis* (or *Cylindrella*) containing about 200, and *Macroceramus* most of the remainder.

PUPIDÆ (Pupa, &c.). Plate 27, Map iii.

This group is a very extensive and somewhat heterogeneous one, containing representatives in all parts of the world. The typical genus, *Pupa*, contains about 400 species found universally, but more characteristic of temperate regions. Several species occur in Britain. *Vertigo* has an equally extensive distribution, with about 100 species; while *Clausilia* contains at least 700 species, which are mainly inhabitants of Europe and Asia, with five in Britain. Of other genera, *Anostoma*, *Odontostomus*, *Megaspira* and *Strophia* are American; *Buliminus* belongs to the Old World; *Balea* is European; while *Cœliaxis* is confined to the Solomon Islands and Australia.

STENOGYRIDÆ (Agate-Snails, &c.). Plate 27, Map iv.

Over 500 species of this family are known, and these have a world-wide distribution. The genus *Achatina* is probably the most important, containing about 80 species, which are confined to the Ethiopian region, and known as Agate-Snails. Their shells are handsomely marked, and among them are the largest land-shells known. *Stenogyra*, the typical genus, contains 250 species of universal distribution; while *Ferussacia* is an interesting genus, confined principally to the Mediterranean region, the Canary Islands, Madeira, and the Malay Archipelago.

SUCCINEIDÆ (Amber-Snails, &c.). Plate 27, Map iv.

The *Succineidæ* are found all over the world, and contain over 200 species, the great majority of which constitute the typical genus, *Succinea*. Half a dozen species of this genus occur in Britain. The molluscs of this family may be called subaquatic, since they live in damp places, on aquatic plants, or in marshes. The genus *Homalonyx*, with about half a dozen species, is confined to the West Indies and Brazil; while *Hyalimax* has a still more limited distribution, occurring only in Mauritius and the Nicobar Islands.

LIMNÆIDÆ (Fresh-water Limpets, &c.). Plate 27, Map iv.

The molluscs of this family are inhabitants of fresh-water, but at the same time are air-breathers, and hence come to the surface at intervals to renew their supply of free oxygen. The family, as a whole, has a universal distribution, as have also the principal genera *Ancylus* (Fresh-water Limpets), *Planorbis* and *Limnæa* (Pond-Snails). Of these three genera Britain possesses two, twelve, and eight species respectively. *Gundlachia* (five species) is found in the United States, Cuba, and Tasmania; *Latia* (two species) is confined to New Zealand; *Pompholyx* is Californian; while *Choanomphalus* is only found in Lake Baikal, occurring in that lake at a depth of over 1000 feet.

PHYSIDÆ (Physa, &c.). Plate 27, Map iv.

Although a comparatively small group, the Pond-Snails of this family have an almost universal distribution. The two principal genera are *Physa*, with about 100 species, and *Aplecta*, with about 25. In Britain the two species, *Physa fontinalis* and *Aplecta hypnorum*, alone represent the family, the latter being abundant and widely distributed in slow rivers, canals and ditches.

ORDER PROSOBRANCHIATA

CONIDÆ (Cones). Plate 27, Map v.

The Conidæ are an extensive group of marine molluscs, at least 1500 species having been described. They are of universal distribution, and are a favourite group with collectors, owing to the number of handsome species contained therein. The typical genus, *Conus*, comprises over 500 species, the great majority of which are found in eastern seas. A single species occurs in the Mediterranean. The genus *Pleurotoma* and its allies have a wider distribution, ranging into temperate and arctic seas. They are sometimes regarded as a separate family (*Pleurotomidæ*). About a dozen species of *Pleurotoma* and half that number of *Mangilia* are recorded from British waters, but the more typical *Conus* is absent.

OLIVIDÆ (Olives). Plate 27, Map v.

The Olividæ, of which about 150 species have been described, are molluscs with beautiful shells of a more or less cylindrical shape and a highly-polished surface. They are chiefly natives of tropical seas, but a few species have been recorded from cooler regions, such as Japan and Patagonia. They are not known from British waters. The principal genera are *Oliva*, with about 60 species, and *Ancilla*, with about 45.

VOLUTIDÆ (Volutes). Plate 27, Map v.

Over 100 species are referred to this family, which contains many handsome and, to collectors, valuable molluscs. They have a world-wide distribution, but some of the genera have a restricted range. Thus *Provocator* is confined to the island of Kerguelen, *Wyvillea* to the Marion and Crozet Islands, and *Volutolyria* to the Antilles. *Volutomitra* is purely arctic and antarctic, while the typical genus *Voluta* occurs in all the warmer seas, and is especially well represented in those of Australia.

BUCCINIDÆ (Whelks, &c.). Plate 27, Map v.

Over 300 species, and numerous genera, of this family have been described, which are found in all seas. The typical genus *Buccinum*, however, has a purely northern distribution, with over 20 species. Two of these occur in British waters, and the better-known (*B. undatum*) is brought to London and other markets in large quantities, forming a favourite food in many parts of the country. In the antarctic region this genus appears to be represented by *Neobuccinum*, which occurs at Kerguelen. The genus *Cominella* contains 20 species, occurring at the Cape of Good Hope, also in New Zealand and Australian seas.

MURICIDÆ (Murex, &c.). Plate 27, Map vi.

This family is of world-wide distribution, and contains about 500 species, many of which possess extremely handsome shells. The typical genus, *Murex*, contains about 300 species whose shells are furnished with numerous rows of variously shaped spines or tubercles. These molluscs occur chiefly in tropical and subtropical seas. Another important genus, *Trophon*, on the other hand, is typically arctic and antarctic, containing about 40 species. *Purpura* is an important genus, widely distributed, and sometimes placed with its allies in a distinct sub-family. About a score of species of Muricidæ inhabit British waters.

CASSIDIDÆ (Helmet-Shells). Plate 27, Map vi.

The molluscs of this family possess large, handsome shells which are extensively used by the cameo-cutter, owing to the fact that they are made up of differently coloured layers. They are mostly inhabitants of warm seas, but three species occur in the Mediterranean and one off the Atlantic coast of France, while one has been dredged from deep water off the south-west of Ireland. The tenants of these fine shells are active, carnivorous molluscs, whose food is principally bivalved members of the same great class.

CYPRÆIDÆ (Cowries). Plate 27, Map vi.

This family comprises about 300 species of molluscs, which are mainly inhabitants of tropical and subtropical seas. Three species, however, are on the British list, and a few others occur in the Mediterranean and off the European coasts. The typical genus (*Cypræa*) contains about half the species, whose shells are remarkable for their high polish. One of the best-known forms is the Money-Cowry (*Cypræa moneta*), so extensively used for currency in India and Africa. *Ovula* is another important genus, containing about 75 species.

STROMBIDÆ (Wing-Shells). Plate 28, Map i.

About 90 species of this family have been described, some of which are of very large size and curiously shaped. They owe their popular name to the wing-like expansion of the outer lip found in some species. The typical genus *Strombus* contains about 70 species, which are widely distributed in warm seas. The so-called "fountain-shell" of the West Indies (*S. gigas*) is a beautiful pink species whose shell is ground to powder and used in the manufacture of fine porcelain, while it is also cut into cameos. *Aporrhais pespelecani*, the "pelican's-foot shell," is a common species round our coasts, and one of two which alone represent the family in British waters.

MELANIIDÆ (Melania, &c.). Plate 28, Map i.

The Melaniidæ are a group of over 500 species of fresh-water molluscs with a wide distribution in the Old World and a much more restricted range in America. The typical genus *Melania* contains about 400 species, which are widely distributed, but mainly tropical. *Paludomus* is restricted to India, Ceylon, and Sumatra, with 25 species; while *Typhobia* is a remarkable form confined to Lake Tanganyika, in Central Africa.

HYDROBIIDÆ (Hydrobia, &c.). Plate 28, Map i.

The members of this interesting family are extremely widely distributed, the various species inhabiting fresh and brackish waters in almost all parts of the world. Five species are regarded as British, viz., three belonging to the typical genus *Hydrobia* and two to *Bithinia*. The distribution of some of the exotic genera is of much interest. Thus *Baicalia* is confined to Lake Baikal; *Tanganyicia* to Lake Tanganyika; *Jullienia* to Cambodia; *Potamopyrgus* to New Zealand; *Littorinida* to South America; *Amnicola* and *Fluminicola* to North America. By some authors the Hydrobiidæ are regarded as merely a sub-family of the Rissoidæ, which are marine; for this sole reason, however, it is perhaps advisable to keep them apart.

PALUDINIDÆ (Viviparous Pond-Snails). Plate 28, Map i.

The members of this family are mainly found in the fresh waters of the Northern Hemisphere, but a few species are found in the tropics and in southern regions. Over 100 species have been described, the majority of which belong to the typical genus (*Paludina*). Of this genus two species are found widely distributed in Britain, the better-known being *Paludina vivipara*, called in popular parlance the viviparous Pond-Snail. The genus *Lioplax* contains a few species which are confined to North America. The family appears to be absent from New Zealand and Polynesia.

VALVATIDÆ (Valvata, &c.). Plate 28, Map ii.

The Valvatidæ are small fresh-water molluscs occurring for the most part in Europe and North America. Only a single genus (*Valvata*) is recognised, but, like most of the genera of Mollusca, this has been subdivided into a number of sub-genera. Curiously enough, the section *Lyogyrus* is represented in New Caledonia, far away from all other members of the family. Two species of *Valvata* (*V. piscinalis* and *V. cristata*) are universally distributed in Britain.

AMPULLARIIDÆ (Ampullaria, &c.). Plate 28, Map ii.

The molluscs of this family are amphibious, and live in ponds and marshes principally within the tropics. They are somewhat larger than the Pond-Snails of the previous families, and are known among dealers as "apple shells." About 200 species have been described, most of which belong to the genus *Ampullaria*. In the New World these molluscs range as far north as Mexico and Georgia. *Asolene*, sometimes regarded as a separate genus, is confined to South America; while *Lanistes* belongs solely to Africa and Madagascar.

CYCLOPHORIDÆ (Cyclophorus, &c.). Plate 28, Map ii.

This is an extensive family, containing about 800 species and numerous genera, which are widely distributed in both hemispheres. They are terrestrial molluscs, and at one time were regarded as members of the great group *Pulmonata*. The presence of an operculum closing the mouth of the shell is, however, a character which marks them off clearly from the true land-snails and slugs. The most important genera are: *Pomatias*, found in Southern Europe and North Africa; *Diplommatina*, of the Oriental and Australian Regions; *Cyclophorus*, with 200 tropical species widely distributed; and *Aperostoma*, confined to Central and South America.

CYCLOSTOMATIDÆ (Cyclostoma, &c.). Plate 28, Map ii.

Like the Cyclophoridæ the members of the present family are terrestrial, and their shells are provided with an operculum. About 250 species have been described, half of which belong to the typical genus *Cyclostoma*. A single species (*Cyclostoma elegans*) occurs in Britain, where it is found under stones, &c., in many parts of the country. *Choanopoma*, with 55 species, is restricted to the West Indies; while *Cistula*, with 42, is found both in the latter islands and in Central America. *Omphalotropis* has 25 species, occurring in Mauritius, the Philippine Islands, and Polynesia; and lastly, the two genera, *Hainesia* and *Acroptychia*, are peculiar to Madagascar.

ACICULIDÆ (Acicula). Plate 28, Map iii.

This is a limited group of operculated land molluscs, containing a single genus (*Acicula*) and about a score of species, which are confined to Europe, Asia Minor, and North Africa. One species (*Acicula lineata*) is found in Britain, occurring over a wide area and met with under stones or among decayed leaves in wooded districts. The present family is sometimes united with the Cyclostomatidæ.

PROSERPINIDÆ (Proserpina). Plate 28, Map iii.

This family of molluscs is, like the three previous ones, terrestrial, but the shells have no operculum. A single genus (*Proserpina*) is known, divided into a few sub-genera. The distribution of the few species is limited, for they are confined to the Neotropical region, and occur only in Cuba, Jamaica, and a few limited areas in Central, and the northern portion of South America.

HELICINIDÆ (Helicina, &c.). Plate 28, Map iii.

The molluscs of this family are, in general appearance, like the well-known snails of the genus *Helix*, but differ from them in the possession of an operculum. They are an extensive group, comprising over 600 species, which are found in the tropical and subtropical portions of America, Japan, South-eastern Asia, and the Australian Region. *Stoastoma* is a genus containing 82 species, of which 80 are found only in Jamaica.

TROCHIDÆ (Trochus, &c.). Plate 28, Map iii.

The species of this family are about 300 in number, and are found in all seas, ranging from the arctic to the antarctic regions. Most of the typical forms have a shell, which is remarkably like an inverted spinning-top, and hence they are sometimes called "top-shells." About 16 species, belonging to the typical genus *Trochus*, are found in British waters. *Margarita* is an essentially northern genus, with about 20 species. A few species of the family have been dredged at enormous depths.

HALIOTIDÆ (Ormers). Plate 28, Map iv.

The Haliotidæ are interesting molluscs, found in all warm and temperate seas. In Europe one species (*Haliotis tuberculata*) occurs as far north as the Channel Islands, and on the strength of this it is claimed by some conchologists as a British species. The 75 species of the family are all placed in a single genus. The shells, on account of their beautiful pearly lustre, are much used in inlaying, and hence have some commercial value. In some countries these molluscs are used as food.

PATELLIDÆ (Limpets). Plate 28, Map iv.

This important family contains about 200 species, which are strictly littoral in habit, occurring on rocks between tide-marks all the world over. The single genus usually recognised (*Patella*) may be divided into numerous sub-genera. *Patella vulgata* is an abundant and universal inhabitant of the British shores, and furnishes in this and other countries an important part of the diet of people living near the coast.

ORDER **POLYPLACOPHORA**

CHITONIDÆ (Chitons). Plate 28, Map iv.

The Chitonidæ are a group of molluscs of so remarkable a structure as to form an Order to themselves. They possess a shell, which consists of a series of eight separate pieces arranged in a row over the back, and are thus, by their external appearance alone, easily recognised. About 300 species are known at the present day, and these occur principally in shallow water in all parts of the globe. A few forms, however, have been dredged from great depths, even from as much as 2300 fathoms. About a dozen species claim a place on the British list.

CLASS PELECYPODA

OSTREIDÆ (Oysters). Plate 28, Map iv.

These are probably the best-known of all molluscs, since they furnish a favourite part of the diet of almost all countries, and have been used from the remotest periods of history. The artificial cultivation of Oysters is an important industry in many countries, while their natural distribution is practically cosmopolitan. About a hundred distinct species have been described, which are all regarded as belonging to a single genus. *Ostrea edulis* is the only representative of the family in British waters.

PECTINIDÆ (Scallop-Shells). Plate 28, Map v.

The members of this family are among the most beautiful of bivalved molluscs, their shells being often prettily coloured and elegantly ribbed. Over 200 species are known, most of which belong to the typical genus (*Pecten*). Ten species are found in British seas; the rest are found in all parts of the world, and at various depths.

AVICULIDÆ (Pearl Oysters). Plate 28, Map v.

From a purely monetary point of view this family of molluscs is the most important of all, since certain of its species are the principal source of the valuable concretions known as "pearls." The distribution of the true Pearl-Oysters (*Meleagrina*) is shown separately on the map. From this it will be seen that they occur off Madagascar, Ceylon, West Australia, Central America, in the Red Sea and Persian Gulf, and in certain parts of Polynesia. One of the most important pearl-fisheries is that of Ceylon, but fine specimens are obtained in the Persian Gulf and other places. About 25 species are known in the family as a whole, two of which (*Avicula hirundo* and *Pinna rudis*) occur in British water.

MYTILIDÆ (Mussels). Plate 28, Map v.

Of this family, which is of great importance from an economic point of view, about 200 species are known, the great majority of which are marine and found in all seas. The principal genera are *Mytilus*, with 70 species of wide distribution but most abundant in the colder zones; *Modiola*, also with about 70 species of universal distribution, and a few Asiatic forms living in fresh water; *Lithodomus*, with 25 species, sometimes called "date-shells"; *Dreissensia*, with about 20 species confined to rivers in various parts of the Old World; and *Mytilopsis*, also a fresh-water genus, with a few species found in a few small areas in the New World. A dozen species of Mytilidæ have a place on the British list. The most important of these is the common Edible Mussel (*Mytilus edulis*), of which enormous quantities are used as food, and also for bait, especially in deep-sea fishing.

UNIONIDÆ (Fresh-water Mussels). Plate 28, Map vi.

The Fresh-water Mussels are found in ponds and streams in almost all parts of the world, but they appear to be absent from Madagascar and the Polynesian Islands. The family is an enormous one, more than 1200 species having been described. Of these more than half are natives of the rivers of the United States. The principal genera are *Unio*, of which three species are found in Britain; and *Anodonta*, with two British species. *Unio margaritifer*, occurring both in Europe and North America, produces valuable pearls which, however, are not so fine in quality as those derived from the Pearl Oysters (family Aviculidæ).

ÆTHERIIDÆ (Fresh-water Oysters). Plate 28, Map vi.

This family includes only a few species, placed in three genera, which are confined to rivers and lakes in tropical Africa and the northern portion of South America. The typical genus *Ætheria* contains all the African forms (only four in number); *Mulleria* and *Bartlettia* are South American.

CARDIIDÆ (Cockles). Plate 28, Map vi.

About 150 species of this family are known, which live in shallow water off the coasts of all parts of the world. *Cardium* is the principal genus, with about 100 species, of which ten are found in British waters. The Common Cockle (*C. edule*) is a familiar and widely-distributed edible species. It ranges from Britain to the Baltic, and occurs also in the Black and Caspian Seas. *Adacna* is a genus of special interest, inasmuch as its eight known species are peculiar to the Caspian, Black, Azof and Aral Seas.

CYRENIDÆ (Cyrena, &c.). Plate 28, Map vi.

These molluscs inhabit fresh and brackish waters in nearly all parts of the world. About 400 species are known at the present day, of which 100 are placed in the typical genus *Cyrena*, 120 in *Corbicula*, 75 in *Sphærium*, and 60 in *Pisidium*. Britain possesses four species of *Sphærium*, three of which are widely distributed in lakes, canals and ponds; also five species of *Pisidium*, which occur in slow-running or stagnant water in all parts of the kingdom.

CLASS INSECTA (Insects).

ORDER **LEPIDOPTERA (Butterflies and Moths).**

SECTION RHOPALOCERA (Butterflies).

PAPILIONIDÆ (Swallow-Tails, &c.). Plate 29, Maps i and ii.

The Papilionidæ (Map i) are a group of over 700 species, of world-wide distribution (but absent from New Zealand), and containing some of the handsomest known Butterflies. Some 14 genera are usually recognised, but the majority of the species belong to the typical genus *Papilio*. The geographical distribution of this genus corresponds roughly with that of the family as a whole (*see* Map i). In the Neotropical Region, however, there are probably as many species as in all the other regions put together. The Common Swallow-Tail (*P. machaon*) is a native of Britain, occurring in the fen districts of Norfolk and Cambridgeshire.

The genus *Ornithoptera* (Map i) comprises about 20 species of remarkably handsome appearance, some of them, indeed, being entitled to rank as the finest of known Butterflies, and rivalled only by the magnificent Morphos of the Neotropical Region. *Ornithoptera* is an essentially Oriental genus, but is represented also in North-eastern Australia and most of the Papuan Islands.

Thais (Map ii) is a genus peculiar to the Palæarctic Region. It comprises three species which occur in Southern Europe, Asia Minor and North Africa, with a fourth doubtful form described some years ago from the Amur Region.

Parnassius (Map ii) is a group of about 30 species, with numerous varieties, which are confined to the Palæarctic and Nearctic Regions. Only four of these occur in the latter, and these are confined to the west of the Rocky Mountains.

Of other important genera in this family *Druryia* is confined to West Africa, *Teinopalpus* to the Himalayas, and *Eurycus* to Australia.

PIERIDÆ (Whites, Clouded Yellows, &c.). Plate 29, Maps ii-v.

This is an enormous family, comprising at least 1000 species, and occurring in all parts of the world except New Zealand. The great majority of the forms are of a prevailing white or yellow coloration, a feature which is responsible for the popular names bestowed on them. Fully 50 genera are differentiated for the reception of the various forms, or even more, according to the views of various authors.

Dismorphia (Map iii) is a Neotropical genus, containing over 80 species. Many of these are remarkable from the fact that they mimic closely the distasteful Butterflies of other families, such as Neotropidæ and Acræidæ.

Pieris (Map iii) contains about 200 species, which, according to some authors, form a number of distinct genera. The distribution of the genus (considered in the broad sense) is cosmopolitan, and four species occur in Britain.

Delias (Map iii) is a genus of often brilliantly-coloured Butterflies, occurring in South-eastern Asia and the Australian Region. About 50 species have been described, eight of which are found on the Australian Continent.

The members of the genus *Terias* (Map iv) are small, mostly yellow in coloration, and very difficult to distinguish from each other. About 150 species are known, which occur in nearly all tropical and subtropical regions. Although ranging in Asia as far north as Japan, they do not occur in North Africa, while in the New World two species occur even northwards to New York.

Catopsilia (Map iv), a genus of large white or yellow Butterflies, contains about 50 species, which have a wide range in both Old and New Worlds. The New World forms are sometimes regarded as a distinct genus, under the name of *Callidryas*. They are most abundant in the Tropics, where they sometimes assemble in enormous numbers by the side of streams.

Gonopteryx (Map iv) is a small group of handsome Butterflies, found chiefly in the Palæarctic Region, but with one or two Neotropical forms. A single species, the Brimstone Butterfly (*G. rhamni*), occurs in England and Ireland.

Colias (Map v) is an important genus, with an interesting distribution, Over 50 species have been described, the great majority of which are natives of the Palæarctic Region. They are able to withstand great degrees of cold, and hence have been often found in high arctic latitudes. In the regions which lie between the tropics they are confined to hilly country such as the slopes of the Andes or the high peaks in Equatorial Africa. Two species occur in Britain, in some years being particularly abundant and in others scarce.

DANAIDÆ. Plate 29, Maps v and vi.

This family is essentially a tropical one, although a few species range into temperate regions. About 250 species have been described and 7 well-marked genera. Only four species range into the Palæarctic Region, and these belong to the typical genus (*Danais*). *Danais chrysippus* occurs in Greece and is the only European representative of the family. North America is little better favoured, possessing only two species, which are also forms of *Danais*.

The Danaidæ are mostly distasteful to Birds, and enjoy from this cause considerable immunity from attack. They are largely copied in coloration by Butterflies of other families, and both models and mimics furnish interesting material for the study of that fascinating subject, "Protective Mimicry."

Euplœa (Map v) is an essentially Oriental genus, comprising over 150 species. Three are found, however, in Madagascar and the neighbouring islands, and 16 in Australia. They are beautiful creatures, often of a dark brown colour shot with brilliant purplish-blue.

Amauris (Map vi) is a group of about a dozen handsome black and white Butterflies, whose range is confined to the southern portion of Africa and the Mascarene Islands.

NEOTROPIDÆ. Plate 29, Map vi.

The members of this family were at one time regarded as a sub-family of the Danaidæ, but they were separated under their present name about 20 years ago. Fully 500 species have been described, all of which, with the exception of about half a dozen belonging to the genus *Hamadryas*, are confined to the Neotropical Region and that part of North America immediately adjoining. The species of *Hamadryas* inhabit the extreme north of Australia, the Papuan Islands, the Solomon Islands and perhaps New Zealand. The New Zealand records, however, are somewhat doubtful. At least 20 genera may be recognised in the family, some of which are divided into numerous sub-genera.

ACRÆIDÆ. Plate 29, Map vi.

This is essentially an Ethiopian group, for, of the 200 or more species, the great majority are natives of Africa and Madagascar. A few are found in South America, and these all belong to the genus *Actinote*. The Old-World members of the family are sometimes included in a single genus *Acræa*, and, taking the genus in this broad sense, its distribution is shown separately on the map. Only one or two species occur in the Oriental Region, and a single one in Australia; all the rest are Ethiopian. The Butterflies of this family are in general small, of a prevailing reddish-brown tint, and with a series of irregularly arranged spots of black. They are often mimicked in appearance by Butterflies of other families.

HELICONIDÆ. Plate 30, Map i.

This family, containing about 200 species, mostly of very elegant appearance, is practically confined to the Neotropical Region, only a single species ranging into Florida. Two genera are recognised, *Heliconius* and *Eueides*, the latter containing only about 30 species. These Butterflies are protected by the possession of nauseous fluids within the body, and their gay colours are hence to be regarded as examples of the so-called "warning coloration."

NYMPHALIDÆ (Fritillaries, Tortoise-Shells, &c.). Plate 30, Maps i-v.

The Nymphalidæ (Map i) form one of the most important families of Butterflies, containing more than 150 genera and over 2000 species. They are cosmopolitan in distribution, and include some of the most familiar of known Butterflies. Eighteen species are found in Britain, the best-known of which are members of the genus *Vanessa*, which is considered below.

The genus *Argynnis* (Map ii) is a group of about 75 species, which are characteristic of the Northern Hemisphere. They are about equally divided between the Palæarctic and Nearctic Regions, and six species occur in Britain. Together with the members of the genus *Melitæa*, they are known as Fritillaries, and have a prevailing reddish-tawny coloration, with black spots on the upper and silvered ones on the under surface of the wings. Certain species (few in number) occur in elevated regions in warmer parts of the world, far removed from their allies.

Phyciodes (Map ii) is a large assemblage of small Butterflies, somewhat resembling Fritillaries in appearance. Fully 150 species are known, all confined to America.

Vanessa (Map ii) is one of the most important genera of Butterflies, and of cosmopolitan distribution. *Vanessa* (or *Pyrameis*) *cardui*, the so-called Painted Lady, is the most ubiquitous Butterfly known. There is no country which cannot claim it as a native, and it has even been seen hundreds of miles out at sea. As a British species it is of irregular appearance, in some years being almost, if not quite, absent, while in others it may appear quite suddenly in large numbers. Other well-known British members of this genus are the Common Tortoise-shell (*V. urticæ*), the Peacock (*V. io*), and the Red Admiral (*V. atalanta*).

Precis and *Junonia* have here been considered (Map iii) as a single genus, including over 50 species, which are found in the tropical and subtropical regions of the whole world. Only one species occurs in North America, while in Europe there is no representative whatever.

Kallima (Map iii) is one of the most interesting genera of Butterflies, on account of the remarkable resemblance which certain of the species bear to a withered leaf, especially when the insect is at rest with its wings elevated and placed together above its back, so as to hide the upper surface. About half a dozen species are known, which are confined to the Oriental and Ethiopian Regions.

Hypolimnas (Map iii) is a genus of handsome Butterflies, whose sexes often show an interesting diversity in coloration, the females sometimes mimicking in an extraordinary fashion the distasteful (and consequently protected) Butterflies of other families. Over 30 distinct species have been described, with innumerable local forms or races. They are practically confined to the warmer regions of the Old World, while one species has occurred in New Zealand, and another occurs rarely in Florida, the Antilles and a limited area in the north-eastern portion of South America.

Neptis (Map iv), comprising over 100 species of small or medium-sized Butterflies of a black and white or black and yellow coloration, is a genus entirely confined to the Old World. Two species occur in Central and South-eastern Europe.

Limenitis (Map iv) contains about 30 species, which range over the Palæarctic, Nearctic and Oriental Regions. Three species occur in Europe, one of which is also found in the South of England, and eight in North America.

Euphædra (Map iv) is confined to Tropical Africa. Fully 50 species have been described, which are mostly large, and of a peculiar style of coloration, in which green figures largely. The western portion of the continent appears to be *par excellence* the home of this genus.

Euthalia (Map v) is, on the other hand, almost entirely Oriental, although represented in the Papuan Islands and in China. Over 60 species are known, of diverse coloration.

Apatura (Map v) is widely distributed, and contains about 50 species. Although occurring over a large area in both Old and New Worlds, they are entirely absent from the Ethiopian and Australian Regions (with the exception of Celebes). Two species occur in Europe, one of which, the Purple Emperor (*A. iris*), is found in the South of England.

Charaxes (Map v) is an important Old-World genus, containing about 100 species, which are especially characteristic of Africa, fully two-thirds of the described forms inhabiting that continent. One species is found in the south of Europe, one in Eastern Australia, and about 20 in British India.

MORPHIDÆ. Plate 30, Map vi.

This family consists of large and brilliantly-coloured Butterflies, which are confined to tropical and subtropical regions in both Old and New Worlds. They are, however, entirely absent from the Ethiopian Region. The genus *Morpho* is confined to the New World, as shown by the Map. It contains about half the known species of the family, most of which are remarkable for their great size and the brilliant metallic blue coloration of their wings. About a dozen genera are recognised for the reception of the Old World members of the family.

BRASSOLIDÆ. Plate 30, Map vi.

The Brassolidæ are a purely Neotropical group, containing some eight genera and about 80 species. They are not so brilliantly coloured as the Morphidæ, but they rival them in size, while the lines and shades of colour on the under surface of the wings are of a wonderfully intricate and harmonious character.

SATYRIDÆ (Ringlet Group). Plate 31, Maps i-iv.

This family is an extensive one, and of cosmopolitan distribution. Over 1000 species are known, for the reception of which at least 70 genera have been differentiated. Nearly 100 species are found within the limits of Europe (11 of which are British) and about 60 in North America. They are for the most part soberly-coloured insects, and on this account not generally attractive.

Pararge (Map i) is a group of about 20 species, practically confined to the Palæarctic Region, although represented also in Somaliland. Two species occur in Britain, namely, the Speckled Wood (*P. ægeria*) and the Wall Butterfly (*P. megæra*).

Melanitis (Map ii) includes about 20 species of large, dull-coloured butterflies confined to the Old World and occurring chiefly within the Tropics. Many of the species are remarkable for the variation in colour shown on the under-surface of the wings, these variations being often associated with the dry and wet seasons.

Mycalesis (Map i) is a larger group, with much the same distribution. Over 100 species have been described, about two-thirds of which are Oriental and one-third Ethiopian. Half a dozen occur in North-eastern Australia.

Euptychia (Map ii) is a purely American genus, comprising over 200 species. Only seven of these, sometimes regarded as a distinct genus, occur in North America, so that *Euptychia* may be considered a typically Neotropical group.

Cœnonympha (Map ii) is confined to the Northern Hemisphere, with about 24 Palæarctic and 7 or 8 Nearctic species. They are small Butter-

flies, with rounded wings. Two species are found in Britain, namely, the Large Heath (*C. tiphon*), and the Small Heath (*C. pamphilus*).

Erebia (Map iii) is also a genus principally found in the Northern Hemisphere, but possessing representatives in mountainous regions in the temperate portion of South America, in South Africa, Madagascar, and New Zealand. Over 70 species have been described, the great majority of which are Palæarctic, while two are found in Britain.

Satyrus (Map iii) is a group of over 60 species, with a distribution similar to that of *Cœnonympha*, but occurring also, like *Erebia*, in South America. Europe possesses 17 species, one of which, known as the Grayling (*S. semele*), is common locally in Britain.

Xenica (Map iii) is confined to the Australian Region, the majority of the species, of which about a dozen have been described, being natives of Southern Australia and Tasmania.

Oeneis (Map iv) is an interesting genus, containing about 24 species, the great majority of which are confined to the Arctic and Sub-arctic Regions of both hemispheres. Five species occur within the limits of Europe, one of which occupies an isolated area in the Alps of Switzerland and the Tyrol, always on the verge of the snow-line. Two species are recorded from the extreme south of South America, but according to some authors these belong to a separate genus.

Pedaliodes (Map iv) contains over 80 species, all of which are confined to the Neotropical Region.

ELYMNIIDÆ. Plate 31, Map iv.

This family, sometimes regarded as belonging to the Satyridæ, comprises about 50 rather handsome species, which are characteristic of the Oriental Region. Two or three, however, are found in Western Tropical Africa, and a few in the Papuan Islands. Some of the forms are close mimics of Butterflies belonging to other families, while there is often considerable difference in coloration between the sexes.

LIBYTHEIDÆ. Plate 31, Map v.

The Libytheidæ are a group of small Butterflies all comprised within the limits of a single genus (*Libythea*). About 20 species are known, which have a wide but very discontinuous distribution. A single species (*L. celtis*) occurs in the South of Europe and Asia Minor, while North America claims two.

NEMEOBIIDÆ. Plate 31, Map v.

The Nemeobiidæ are a group of about 50 small species of Butterflies entirely confined to the Old World. About nine genera are differentiated, six of which are Oriental. Only one genus (*Abisara*) occurs in the Ethiopian Region, and one (*Nemeobius*), with a single species (*N. lucina*), in Europe. The latter is a native of Britain, occurring in large woods mainly in the southern half of England. It is known popularly as the "Duke of Burgundy Fritillary."

EUSELASIIDÆ. Plate 31, Map v.

This family is almost entirely confined to the Neotropical Region. It comprises over 100 species, most of which belong to the typical genus *Euselasia*. These Butterflies are small, with brightly coloured wings, and much variety in pattern. Five genera are usually recognised.

LEMONIIDÆ. Plate 31, Map vi.

The Lemoniidæ are a wonderfully varied assemblage, comprising over 1000 species, mostly of small size. They are entirely restricted to the New World, and since only about a dozen species occur in North America, they may be regarded as an essentially Neotropical group. Over 80 genera have been described for the reception of the prettily-coloured Butterflies of this family.

LYCÆNIDÆ (Blues and Coppers). Plate 31, Map vi.

The "Blues" and their relatives are an immense assemblage of mostly small Butterflies, in which the colours indicated by their popular names predominate. Considerably more than 2000 species have already been described, and the number is being constantly increased by the discovery of new forms. They are truly cosmopolitan in distribution, and are familiar insects in all countries. Over 70 species occur within European limits, including 17 which are natives of Britain. The Hairstreaks (genus *Thecla*), the Blues (genus *Lycæna*), and the Coppers (genus *Polyommatus*), may be taken as typical representatives of the family.

HESPERIIDÆ (Skippers). Plate 31, Map vi.

This extensive group, comprising over 2000 species and more than 200 genera, is generally regarded as the most distinct of the families of Butterflies. Indeed, it is proposed by some authors to place them in a separate Sub-order, between the Butterflies and the Moths, under the name of **Grypocera**. They have a world-wide range, though not apparently found so far north as the Lycænidæ. In Europe some 30 species are native, and in Britain 7. North America, on the other hand, possesses about 200 species, while Tropical America claims considerably more than half the known members of the family.

SECTION HETEROCERA (MOTHS).

CASTNIIDÆ. Plate 32, Map i.

The members of this family are day-flying Moths, often adorned with bright colours, and forming a sort of link between Moths and Butterflies. Over 100 species have been described, the great majority of which belong to the typical genus *Castnia*, and are found in Tropical America. *Synemon* is a genus peculiar to Australia, and containing about 20 species.

SATURNIIDÆ (Emperor Moths, &c.). Plate 32, Map i.

This family is of some economic importance, since certain of its member are silk-producers. The silk is usually somewhat coarse, and is known in commerce as Tusser or Tussore silk, under which name it is largely used in the manufacture of dress materials. About 500 species, placed in about 70 genera, are referred to the Saturniidæ, and these have an almost universal distribution. New Zealand and the Pacific Islands are, however, entirely without representatives. About 30 species are found in North America, and half a dozen in Europe. The Emperor Moth (*Saturnia pavonia*) is common in Britain, and is our only native representative of the family.

BOMBYCIDÆ (Silk Moths). Plate 32, Map i.

The true Silk Moths, although somewhat small and unattractive in appearance, are of immense importance from an economic point of view. The silkworm proper (*Bombyx mori*) has been so long domesticated that there is some doubt as to its original home. At the present day it is widely cultivated in many parts of the globe, but not in Northern Europe or in Britain. About 100 species, divided among some 20 or 25 genera, are now referred to the family. The only one occurring in Europe is the so-called Kentish Glory (*Endromis versicolor*), which is found locally in Britain. This Moth is sometimes regarded as the type of a separate family, and if so, the range of distribution as shown on the Map must be considerably reduced. The only species occurring in North America is *Thauma ribis*, which is reported from Vancouver Island.

SPHINGIDÆ (Hawk Moths). Plate 32, Map ii.

This is a large and important family, comprising about 800 species, mostly of large and striking appearance. Although found in practically all parts of the world, they are essentially tropical insects, since in each of the three tropical zoögeographical regions there are between 200 and 250 species, while the Palæarctic and Nearctic Regions each possess only 75. In Europe, 31 species are native, and in Britain 16. Some of these are very striking insects, *e.g.*, the Death's-Head Moth (*Acherontia atropos*), the Convolvulus Hawk-Moth (*Sphinx convolvuli*), and the Elephant Hawk-Moth (*Chœrocampa elpenor*). The Caterpillars of the Hawk-Moths are remarkable for their form and coloration. Adorned as they often are with vivid stripes or spots, and furnished with a peculiar horn-like appendage on one of the hinder segments of the body, they form conspicuous objects, and are of much popular interest.

NOTODONTIDÆ (Prominents, &c.). Plate 32, Map ii.

About 700 species and 200 genera of this family are known, which have a world-wide distribution and include some well-known and interesting forms. New Zealand and Polynesia are without representatives, while Australia possesses few species. Europe claims about 40 species, of which 25 are British. Among the best-known of the latter may be mentioned the Buff Tip (*Phalera bucephala*), the Puss Moth (*Dicranura vinula*) and the Lobster Moth (*Stauropus fagi*). About 80 species represent the family in North America.

SESIIDÆ (Clear-Wings). Plate 32, Map ii.

The *Sesiidæ* are a comparatively small family, while the size of the Moths themselves is insignificant. As their popular name indicates, the wings in this group are frequently devoid of scales, either wholly or in part, thus appearing more or less transparent, like those of a bee or fly. They are of wide distribution, and over 100 species are found in the Palæarctic Region, about 60 of which occur in Europe and 14 in Britain. North America likewise possesses 100 species.

SYNTOMIDÆ. Plate 32, Map iii.

This family includes about 1200 species of Moth, mostly of small size, but often adorned with remarkably brilliant colours, and sometimes with transparent wings, as in the members of the previous family. They are most abundant in tropical regions, but yet have a wide distribution. Only four species occur in Europe, and the family is totally unrepresented in Britain. In North America some 21 species are recorded, most of which, however, are confined to the Southern States.

ZYGÆNIDÆ (Burnet-Moths). Plate 32, Map iii.

Over 1100 species of this family have been described, grouped under nearly 200 genera and 9 sub-families. The limits of the group vary considerably, however, owing to differences of opinion as to its classification. The distribution of these Moths is almost universal, but they do not occur in New Zealand. Many of the species are brightly coloured and diurnal in habit. About 50 species occur in Europe, and of these 10 are British. The best-known of the latter are the Six-spotted Burnet (*Zygæna filipendulæ*) and the "Foresters" of the genus *Ino*.

COSSIDÆ (Goat-Moth Group). Plate 32, Map iii.

This family comprises over 200 species and about 40 genera of large or moderate sized Moths, with a distribution approximately like that of the previous family. Some 21 species occur in North America, about 90 in the Palæarctic Region, and a dozen in Europe. Only three are British, namely, the Goat Moth (*Cossus cossus*), the Reed Moth (*Phragmatœcia castaneæ*) and the Leopard Moth (*Zeuzera pyrina*). The last-named is sometimes referred to a separate family, which bears the name of *Zeuzeridæ*.

HEPIALIDÆ (Ghost-Moths, &c). Plate 32, Map iv.

About 175 species, placed in a score or so of genera, are referred to this family. They are of very varied size and appearance, some of the largest

measuring 6 or 7 inches across the wings. They are of world-wide distribution, but nine of the genera are confined to Australia, Tasmania, and New Zealand. Thirteen species occur in North America, 22 in the Palæarctic Region and 9 in Europe, all the latter being members of the typical genus *Hepialus*. Five species, often called Swift Moths, are British. One of the largest and handsomest members of the family is *Leto venus*, a native of South Africa. Its fore wings are covered with blotches of silver, giving the insect a striking appearance.

LASIOCAMPIDÆ (Lappet-Moths, Eggars, &c.). Plate 32, Map iv.

About 150 genera and 750 species belong to this family, which has representatives in all parts of the world, except New Zealand and Polynesia. About 60 species occur in the Palæarctic Region, and of these fully half are found in Europe and 11 in Britain. The best-known of the latter are the Fox Moth (*Macrothylacia rubi*), the Oak Eggar (*Lasiocampa quercus*), the Drinker (*Cosmotriche potatoria*) and the Lappet-Moth (*Gastropacha quercifolia*). Twenty-four species occur in North America.

LYMANTRIIDÆ (Tussock-Moths, &c.) Plate 32, Map iv.

This family is of universal distribution, with representatives in the extreme north, examples having been met with on several of the Arctic expeditions (*e.g.*, *Dasychira rossii*). Over 800 species, placed in nearly 200 different genera, have been described. About 70 species occur in the Palæarctic Region, of which 23 are European and 10 British. The Brown Tail (*Euproctis chrysorrhœa*), Gold Tail (*Porthesia similis*), Satin Moth (*Stilpnotia salicis*) and Gipsy Moth (*Lymantria dispar*) are well-known British representatives of the family. Fifteen species occur in North America.

HYPSIDÆ or AGANAIDÆ. Plate 32, Map v.

This is a small and essentially tropical family, comprising about 120 species and about 24 genera. Less than 20 species occur in the Ethiopian Region, and only one in the Neotropical. It is hence specially characteristic of the Oriental and Australian Regions, while at the same time absent from New Zealand. These Moths are peculiarly coloured, with buff and grey tints prevailing.

ARCTIIDÆ (Tiger-Moths, &c.). Plate 32, Map v.

The *Arctiidæ* are a large and important group, containing over 2000 species, for the reception of which over 400 genera have been characterised. These Moths, often brightly-coloured and attractive in appearance, occur in all parts of the world and are well represented in Britain, fully 30 species being recognised as native. Among these the best-known are the Common Tiger Moth (*Arctia caia*), the Cinnabar Moth (*Euchelia jacobææ*), the Ermines of the genus *Spilosoma* and the so-called "Footmen" of the genus *Lithosia*. At least 160 species occur in the Palæarctic Region, 71 in Europe, and 120 in North America.

AGARISTIDÆ. Plate 32, Map v.

In this family about 250 species are known, placed in over 50 genera. Many of these Moths possess brightly-coloured wings, and are diurnal in habit. In general appearance they have some resemblance to the members of the previous family. They are mainly confined to the tropical portions of both Old and New Worlds, only 15 species occurring in North America (and mainly in the Southern States) and 2 in the Palæarctic Region (Corea, Japan and China).

GEOMETRIDÆ (Loopers). Plate 32, Map vi.

This is an enormous group of Moths, comprising thousands of species and distributed over every part of the globe. In the Palæarctic Region alone there are about 1200 species, while Europe and North America each possess at least 800. In Britain about 270 species occur, of which the Currant or Magpie Moth (*Abraxas grossulariata*) may be taken as an abundant and very familiar example. The Moths of this family are in great part of dull colours, with slender, fragile bodies. The popular name of "Looper" arises from the peculiar gait of the caterpillar, whose body during progression is thrown into a large loop. The scientific name of the family is derived from the same peculiarity.

NOCTUIDÆ (Noctuid Moths). Plate 32, Map vi.

At least 10,000 species of usually sombre-coloured Moths belong to this family, whose distribution is universal. Nearly all the members of the group are nocturnal in habit, from which circumstance their name is taken. About 1800 species occur in the Palæarctic Region, over 1000 in Europe, and about 330 in Britain. At least 2000 species are recorded from North America, while over 70 are found in New Zealand, and about 250 in Madagascar. Several sub-families have been formed for the reception of the enormous number of genera contained in the family, but the classification of these genera is a matter of considerable difficulty.

URANIIDÆ. Plate 32, Map vi.

This family comprises about 70 species of Moths somewhat resembling the *Geometridæ* in general appearance, but often adorned with brilliant colours. The species are confined to the Tropics, and attain their chief development in the Neotropical and Oriental Regions. The typical genus *Urania* contains eight species, which range from Mexico and the Greater Antilles to Brazil, and are of brilliant coloration. The handsomest member of the family, however, is the wonderfully brilliant *Chrysiridia madagascariensis*, confined to Madagascar and originally described as a Butterfly! Other important genera are *Alcidis* and *Nyctalemon*, confined to the Oriental and Australian Regions, and *Coronidia*, which is purely Neotropical.

ORDER **COLEOPTERA (Beetles).**

SECTION LAMELLICORNIA.

PASSALIDÆ. Plate 33, Map i.

Of this family between 400 and 500 species have been described. Their range extends throughout the tropical and subtropical regions of both hemispheres. Only a single species occurs in North America, while the family is entirely absent from the Palæarctic Region. These Beetles are usually of a large size and of a shining black colour. They occur chiefly in decaying wood.

LUCANIDÆ (Stag-Beetles, &c.). Plate 33, Map i.

This is an important and widely distributed group, containing about 750 species and 80 genera. Of this number only about a dozen occur in Europe (three of which are British), and 14 or 15 in North America, the metropolis of the family apparently being the Indo-Malayan and Austro-Malayan Sub-regions.

Three genera, viz., *Lucanus*, *Lamprima*, and *Odontolabis*, have been selected for illustration. *Lucanus*, the typical one, contains 26 species, and is especially characteristic of the Nearctic and Palæarctic Regions, to which nearly all its species are confined. One species, the Common Stag-Beetle (*Lucanus cervus*) occurs in England, but only south of the Midlands. *Lamprima* is a group of about 15 beetles, often of a brilliant metallic green coloration, confined to Australia, Tasmania, and New Guinea. *Odontolabis* comprises 50 species, mostly of large size, and ranging from Southern India to China and the Malay Archipelago. The male beetles in this genus are remarkable for their great variation in size.

SCARABÆIDÆ (Dung-Beetles, Chafers, &c.). Plate 33, Maps ii and iii.

This is an enormous and very heterogeneous family, comprising at least 13,000 species. They occur in all parts of the world, and in order to accommodate this vast assemblage of forms, five sub-families are usually adopted. The first (*Coprides*) contains about 5000 species, and includes such forms as the Egyptian Sacred Beetle (*Scarabæus sacer*) and its allies. The second sub-family (*Melolonthides*) includes the Cockchafers and their allies, about 4000 species in all; the third (*Dynastides*) contains about 1000 species of huge size and mostly tropical. The fourth sub-family (*Rutelides*) includes 1500 species, and the fifth (*Cetoniides*) about 1600, mostly found in warm regions. Over 80 species of the family as a whole are found in Britain.

Scarabæus (Map ii) is confined to Southern Europe, Africa, Madagascar, and the southern portion of the Asiatic mainland. About 70 species are known. *Phanæus* (Map ii) affords a good example of a genus characteristic of (though not confined to) the Neotropical Region. Over 80 species have been described, many of which are of a beautiful metallic green colour. *Trox* (Map iii) is a widely distributed genus, comprising at least 100 species. About a dozen species occur in Europe, and two in Britain. *Serica* (Map iii) contains about 660 species, distributed as follows: Palæarctic Region, 80; Oriental Region, 400; Ethiopian Region, 150; Nearctic Region, 30; Neotropical Region, 5. One (*S. brunnea*) occurs and is widely distributed in Britain. *Melolontha* (Map iii) includes about 20 species of Cockchafer, two of which occur in Britain. The remainder are confined to Europe and Asia, extending as far east as Borneo and the Philippines. *Gymnetis* (Map iii) is confined to the New World, with about 90 species.

SECTION ADEPHAGA.

CARABIDÆ (Carnivorous Ground-Beetles). Plate 33, Map iv.

This important family comprises about 13,000 species. Representatives are found in all parts of the globe, and many handsome and singular forms are to be found among them. The genus *Mormolyce*, containing four species inhabiting the Malay Archipelago and Peninsula, is one of the most remarkable.

North America possesses about 1200 species of this family; Europe about 1400, and of the latter over 300 occur in Britain.

Carabus (*see* Map) is the typical genus, and contains over 300 species, which are mostly confined to the Palæarctic Region. Representatives are found, however, widely spread in the Nearctic Region, while a few forms occur in Chili and even on Mt. Kilimanjaro in East Africa. *Graphipterus*, also shown on the Map, is purely African (and Arabian), comprising about 60 species. *Anthia* (*see* Map) is a group of about 70 handsome species, which range over the whole of Africa, Arabia, and the southern part of the Asiatic mainland.

CICINDELIDÆ (Tiger-Beetles). Plate 33, Map v.

The Tiger-Beetles are active and often handsome insects, fierce and carnivorous in their habits. They are universally distributed, and number about 1500 species. The number of genera and species increases steadily towards the Equator. About 70 occur in North America and about 40 in Europe. Britain only possesses 5, all belonging to the typical genus *Cicindela*. The best-known, and the prettiest, of these is *C. campestris*, which occurs commonly in sandy places throughout the kingdom.

DYTISCIDÆ (Carnivorous Water-Beetles). Plate 33, Map v.

The Water-Beetles belonging to this family are universally distributed, occurring even in remote oceanic islands. At least 1800 species have been described, of which about 300 are natives of North America, and about 220 in Europe. Over 100 species occur in Britain, one of which, *Dytiscus marginalis*, is a well-known inhabitant of our ponds, and may be taken as a typical representative of the family.

SECTION POLYMORPHA.

STAPHYLINIDÆ (Rove-Beetles). Plate 33, Map v.

The Rove-Beetles are mostly of small size, and are easily known by the short elytra, or wing-cases, which leave a great part of the abdomen exposed. About 9000 species are known at the present day, and these occur in every part of the world. Even the remotest oceanic islands, such as Kerguelen and Tristan da Cunha, have their representatives. Over 1000 species occur in North America and about 1400 in Europe. Britain possesses nearly 800 different forms, of which the so-called "Devil's Coach-Horse" (*Ocypus olens*), is one of the largest and most familiar.

SILPHIDÆ (Burying-Beetles, &c). Plate 33, Map vi.

Although this family is widely distributed, the species are more numerous in the cooler parts of the earth than in the Tropics. Some 900 species have been described, of which about 100 occur in North America, and about 200 in Europe, while temperate Australia and New Zealand also possess a considerable number of representatives. They appear to be absent from the greater part of tropical Africa and Polynesia. Over 100 species occur in Britain.

COCCINELLIDÆ (Lady-Birds). Plate 33, Map vi.

This family is of no little importance from an economic point of view, for the larvæ of various species destroy and keep in check such injurious insects as plant-lice and scale insects, as well as destructive mites. At least 2000 species are known, many of them of extremely pretty appearance, and some presenting a remarkable variation in coloration. They are of universal distribution, about 150 species occurring in North America and about 120 in Europe. Of the latter, some 40 odd are British, and although of small size they are fairly familiar insects.

ELATERIDÆ (Click-Beetles). Plate 33, Map vi.

This is a large and important family, whose members have a tolerably uniform aspect, and consequently are easy to recognise. About 7000 different species are known, some of the exotic representatives being of large size. They occur in all parts of the globe, fully 350 species being found in North America and about 270 in Europe. In Britain about 70 species are native, some of which in the larval state (then known as "wire-worms") are destructive to many kinds of cultivated plants.

BUPRESTIDÆ. Plate 34, Maps i and ii.

The members of this family are beetles often of a large size and adorned with brilliant, usually metallic, colours. Although occurring in all parts of the world, the species are much more numerous in the Tropics, and are lovers of hot sunshine. Of the 5000 known species over 200 occur in North America and a like number in Europe. Only 10 species are British, and these are comparatively small and unattractive. With the exception of a single species occurring in the Solway district, they do not range north of Yorkshire.

Julodis (Map i) is a genus of about 100 species, which range over the whole of Africa and Madagascar, while a few forms occur in South-western Asia, and about eight in the extreme south and south-east of Europe. They are easily recognised by the peculiar tufts of pale hair which are arranged in various patterns on the elytra.

Chrysochroa (Map i) contains about 50 species of large beetles characteristic of the Oriental Region, but also occurring in Africa and Madagascar.

Psiloptera (Map ii) is a group of nearly 400 species, which are found chiefly in the Neotropical and Ethiopian Regions, but also sparsely represented in the Oriental. Three species occur in Europe.

Buprestis (Map ii) is the typical genus, with about 50 species, practically confined to the Northern Hemisphere. Eight species are found in Europe.

Stigmodera (Map ii) is a peculiarly Australian genus, comprising over 300 species, which are practically confined to that country. A few representatives, however, occur in Tasmania and New Guinea.

SECTION HETEROMERA.

TENEBRIONIDÆ (Meal-Worm Group). Plate 34, Maps iii and iv.

This is an enormous family, comprising fully 10,000 species, and occurring over the whole of the earth. Over 400 species occur in North America and 700 in Europe. Thirty species are found in Britain, and these include two forms of *Blaps*, or Cellar-Beetle, and two of *Tenebrio*, or Meal-Worm.

Blaps (Map iii) is a genus of over 170 species, which are practically confined to the Palæarctic Region; *Helops* (Map iii) on the other hand, occurs also in the Nearctic Region, and contains about 200 species, with a few representatives in other and isolated parts of the world. *Zophosis* (Map iv) is a group of about 160 species, found for the most part in the Ethiopian Region, but ranging also into Southern Europe, Asia Minor and the Transcaspian Region. *Asida* (Map iv) is a genus of somewhat peculiar distribution. Nearly 300 species have been described, the great majority of which occur in the countries surrounding the Mediterranean Sea and North America from Oregon and Louisiana to Mexico. Since the map was prepared, a few species have been described from South Africa (Namaqualand and Mozambique to the Cape), while a species from Chili has also been referred to the genus. Lastly, *Hopatrum* (Map iv) is confined to the Old World, at least 180 species having been described. Of these, over 50 occur in Europe and one in Britain, which, however, is confined to the southern and south-eastern coasts of England.

SECTION PHYTOPHAGA.

PRIONIDÆ (Longicorns). Plate 34, Map v.

The present and the two succeeding families are often regarded as one, to which the general name of *Cerambycidæ* is given. If this course be adopted, the groups shown on the map may be considered as sub-families only. The differences between them are of a technical character, and consist of certain peculiarities in the articulation of the front pair of legs. All these beetles are characterised by the great length of their antennæ, and hence the general term "Longicorn" usually applied to them. In the *Prionidæ*, which is the smallest of the three sections, some 600 species have been described, which have a world-wide distribution, though not occurring so far north as other Longicorns. Only eight species are found in Europe and one in Britain, namely *Prionus coriarius*. This is a local insect, occurring only in the southern half of England and Wales.

CERAMBYCIDÆ (Longicorns). Plate 34, Map v.

This group of Longicorns includes at least 5000 species, which as a whole are universally distributed. About 230 species are found in Europe, and of these only 37 are British. Though not on the average so large as the *Prionidæ*, yet in general they are adorned with brighter colours, and hence have a more attractive appearance.

LAMIIDÆ (Longicorns). Plate 34, Map v.

This, the largest family of Longicorns, comprises about 6000 species, which are found in all parts of the world. Europe possesses 230 species and Britain 17. Of the latter, perhaps the most interesting is *Acanthocinus ædilis*, which is a conspicuous insect on account of its extraordinarily long antennæ. In the male these appendages are about four times the length of the body. This beetle is often introduced in pine and fir logs, otherwise it is a local insect and its appearance is always regarded with interest.

CHRYSOMELIDÆ (Phytophagous Beetles). Plate 34, Map vi.

This is an enormous family, comprising fully 18,000 species, and one of much economic importance, inasmuch as certain members cause wholesale destruction of various crops in North America, Europe, and elsewhere. Probably the best known of these is the so-called "Colorado beetle," or "potato beetle" (*Doryphora decemlineata*), which attained much notoriety some years ago, owing to its destructiveness in the United States. The *Chrysomelidæ* are found in every part of the world. North America possesses over 600 species, Europe over 1000 and the British Isles about 540.

SECTION RHYNCHOPHORA.

CURCULIONIDÆ (Weevils). Plate 34, Map vi.

At least 20,000 species of Weevil have been described, and this vast assemblage is represented in every part of the globe. The chief character by which a member of this family may be recognised is the rostrum or beak in front of the head. This curious organ is always present, but varies enormously in development. From an economic point of view the family is even more important than the *Chrysomelidæ*, for the larvæ are extremely destructive, and there is hardly a species of plant or part of a plant which is totally exempt from their attacks. Over 600 species are found in North America and over 1800 in Europe. Of the latter about 450 are British, nearly 80 of which belong to the genus *Apion*.

ORDER HYMENOPTERA

APIDÆ (Bees). Plate 35, Map i.

About 1500 species of Bees are known at the present day, and these range over the whole world. They are remarkable for the extreme hairiness of their bodies, and from all other Hymenoptera they may be known by the fact that some of the hairs are branched or plumose. Just over 200 species are found in Britain, and these range in size from the tiny members of the genus *Prosopis* to the huge and clumsy Humble-Bees of the genus *Bombus*.

VESPIDÆ (Social Wasps). Plate 35, Map i.

These formidable insects (numbering about 530 species) are found in practically all parts of the world, but do not range so far north as Bees, and apparently are not found in New Zealand although occurring in many of the Polynesian Islands. In Europe 12 species are found, of which Britain possesses 7, all belonging to the typical genus *Vespa*. The largest and most formidable species is the Hornet (*V. crabro*), which is only found in England from Yorkshire southwards. The most important exotic genera are *Polistes*, *Icaria* and *Polybia*. As their popular name indicates, these insects live in communities, and their nests, usually built of a papery material, are of much interest and of great variety.

FORMICIDÆ (Ants). Plate 35, Map i.

Using this family name in a broad sense, about 3000 species of Ants may be here included, which have a world-wide distribution. Six sub-families are sometimes adopted to accommodate this large assemblage, the majority of which are lovers of tropical regions. About 200 species occur in North America and nearly 150 in Europe. Britain possesses 20 which are truly native, while at least half-a-dozen others are found in greenhouses, &c., as introductions.

ORDER **DIPTERA**.

CULICIDÆ (Gnats or Mosquitoes). Plate 35, Map ii.

Since the remarkable discovery was made that certain insects of this family play an important *rôle* in the dissemination of certain tropical diseases, such as malaria, yellow fever, &c., much attention has been bestowed upon them. From this increased activity, a much better knowledge of their distribution has been obtained, while the number of described species has been augmented to a remarkable degree. At the present day fully 500 species are known, distributed among about 70 genera. They are found in every part of the world, Europe possessing about 50 species and North America about 40. In Britain 26 species have been recorded, and some of them are found in all parts of our islands. *Anopheles*, whose distribution is shown separately on the Map, is a genus comprising about 17 species, at least two of which (*A. maculipennis* and *bifurcatus*) are known to be carriers of the parasite which causes malaria. *Stegomyia* (also shown on the Map) is likewise an important genus. About 20 species are known, one of which (*S. fasciata*) is the sole agent in the dissemination of that scourge of the Tropics, yellow fever.

TABANIDÆ (Horse-Flies, Clegs, &c.). Plate 35, Map iii.

This family is composed of about 1600 species, some of which are among the bulkiest of known Diptera or Two-winged Flies. They are found in all parts of the world, and are all more or less addicted to blood-sucking, but this habit is confined to the members of the female sex. About 200 species inhabit the Palæarctic Region, about the same number the Nearctic Region, and about 300 the Ethiopian. Britain possesses 25, which are placed in the five genera *Hæmatopota*, *Therioplectes*, *Atylotus*, *Tabanus* and *Chrysops*.

SYRPHIDÆ (Hoverer Flies). Plate 35, Map iii.

The flies of this family are among the most attractive in appearance of all the Diptera, their bodies being often elegantly adorned with bands and spots of yellow, or covered with brightly coloured hair. Their popular name is due to their interesting habit of hovering in the air apparently quite motionless, while if disturbed they dart off with lightning-like rapidity, and after a short time return again to hover hawk-like at the same spot. Fully 2500 species are known, and these are found in every part of the globe. Over 300 occur in North America, about 600 in Europe, and 200 in Britain.

GLOSSINA (Tsetse Flies). Plate 35, Map iii.

This genus of flies, belonging to the family *Muscidæ*, has of recent years sprung into much prominence, owing to the fact that at least one of its species (*Glossina palpalis*) has been proved to convey the parasite which causes the dreadful African disease known as "sleeping sickness," while another (*G. morsitans*) is the carrier of the parasite which produces "Nagana" or "fly-disease," so destructive to horses, cattle and other domestic animals. Fortunately for the rest of the world this genus is practically confined to tropical Africa. Ten species have been described, but only the two mentioned have been proved to assist in the dissemination of disease.

ORDER **HEMIPTERA**.

COCCIDÆ (Scale Insects). Plate 35, Map iv.

In this important family about 1500 distinct species have been described. They are of universal distribution, and in some countries are of the greatest importance from the economic point of view, inasmuch as they are probably more destructive to the various fruit and other crops cultivated by man than any other group of insects. Nearly 400 species are found in North America, one of the best-known being the notorious "San José Scale," which is a most destructive pest in California and other parts of the United States. On the other hand, certain members of this family produce wax and other materials of much use to man. Lac, cochineal, and axin, the latter a substance used externally in medicine, are examples.

ORDER **NEUROPTERA**.

MYRMELEONTIDÆ (Ant-Lions). Plate 35, Map iv.

About 300 species of Ant-Lions are known at the present day. These range over the greater part of the world, but are more abundant in the warmer regions. Although entirely absent from Britain, yet they occur on the continent of Europe, practically as far north as the Arctic Circle. Some of the forms inhabiting the Ethiopian and other regions are quite handsome insects, with an expansion of wing of four inches or more.

TERMITIDÆ (Termites or White-Ants). Plate 35, Map iv.

These insects are of much interest, both on account of their remarkable nests and also because of the wonderful details which have been ascertained respecting their social life. Their habitations, built of earth, wood, or other material, sometimes reach a height of 15 to 20 feet, and in such cases form conspicuous objects in the landscape. About 350 species have been described, but this number is probably only a small proportion of those which actually exist. From their habit of eating wood they become in some countries exceedingly destructive to furniture and even whole buildings. These insects are very widely distributed, being mainly found in the warmer regions of the globe. Few species occur in North America or in Europe, while they are quite absent from Britain.

ODONATA (Dragon-Flies). Plate 35, Map v.

These handsome and attractive insects are universally distributed, but attain their greatest variety in the warmer regions of the earth. About 2000 species are known at the present day, and these are arranged in two principal divisions according to the relative size of the fore and hind wings, while about seven smaller groups or sub-families may be recognised. About 300 species occur in North America, and just over 100 in Europe. Britain possesses 40 which are truly native, and some of these are fairly familiar objects, attracting attention either by their beautiful and vivid colours, or by their large size and rapid and powerful flight.

ORDER **TRICHOPTERA**.

TRICHOPTERA (Caddis-Flies). Plate 35, Map v.

The Caddis-flies in their adult state are moth-like insects, usually seen in the neighbourhood of streams and lakes. Their larvæ are well known and of much interest, from the wonderful nature of their habitations, which are in the form of more or less cylindrical, and sometimes spiral cases, built of tiny stones, grains of sand, fragments of weed, or other materials. About 1300 species have been described up to the present day, and these are grouped into 13 distinct families. Some 150 occur in North America, 500 in Europe, and 150 in Britain, but all these numbers will probably be much augmented when the group receives more attention.

ORDER **ORTHOPTERA**.

LOCUSTIDÆ (Green Grasshoppers, &c.). Plate 35, Map v.

The *Locustidæ*, sometimes called *Phasgonuridæ*, are distinguished from their relatives, the *Acrididæ*, chiefly by the length and delicacy of their antennæ, which are composed of a large number (always more than 30) joints. They are of universal distribution, but most abundant in warm countries. In the most recent catalogue the names of about 3200 species are given, and these are distributed among no fewer than 694 genera, and 24 sub-families. Only nine or ten species occur in Britain, and the majority of these are confined to the extreme south of England.

ACRIDIDÆ (Locusts). Plate 35, Map vi.

A strange confusion exists between the popular and scientific names of this and the preceding family. Thus, the true Locusts are not *Locustidæ*, but *Acrididæ*, while the term Grasshopper is equally unsatisfactory. The members of the present family may, however, be conveniently known as "Short-horned Grasshoppers," in accordance with their most prominent characteristic, namely, their relatively short antennæ, consisting of less than 30 joints. Like the *Locustidæ* these insects are universally distributed, but the species are more numerous, over 4250 having been described. For the reception of this multitude of forms, about 840 genera have been founded, arranged in 12 sub-families. Only 11 species are found in Britain, but those of the genera *Stenobothrus* and *Gomphocerus* are tolerably common.

PHASMIDÆ (Stick and Leaf Insects). Plate 35, Map vi.

The *Phasmidæ* are, in general, the most extraordinary-looking of all insects, resembling twigs, green or withered leaves, or other parts of plants. They are widely spread over the globe, but are more abundant in the tropical portion. About 950 species are known, which are arranged in about 200 genera and 16 sub-families. About a dozen species are found in North America, and four or five in Europe, where they are mostly confined to the south. They are entirely absent from the British Isles, and appear to reach their zenith in Australia. One of the most extraordinary species known is *Eurycantha horrida*, a creature inhabiting New Guinea and some of the neighbouring islands.

MANTIDÆ (Praying Insects). Plate 35, Map vi.

Like the members of the preceding family, the so-called "Praying Insects" are creatures of extraordinary appearance, and many of them closely resemble leaves and even flowers. They are easily recognised by their powerful spined front pair of legs, which are used for seizing their prey. The name "praying insect" bears allusion to their habit of resting with their front legs held out in a peculiar manner, which is supposed to simulate an attitude of prayer. The distribution of *Mantidæ* is practically the same as that of the *Phasmidæ*. About 830 species have been described, belonging to just over 200 distinct genera, and constituting eight sub-families. Some 20 species occur in North America, but only in the southern portion, while in Europe only about a dozen occur, likewise in the south. The best-known European species, *Mantis religiosa*, is a frequent inhabitant of southern and central France, but no member of the family occurs in Britain.

VERTICAL AND LATITUDINAL DISTRIBUTION. Plate 36.

This Plate is an adaptation of one prepared by W. Marshall, which forms No. 60 of Berghaus' Physikalischer Atlas (Abteilung VI, Atlas der Tierverbreitung). No revision of details has been attempted, but a slightly different arrangement has been made of the groups of animals concerned, merely for the sake of clearness. The distribution of marine life, as shown by Marshall, has been omitted for the same reason, but three insets are given to show the bathymetrical range of a few selected families of Fishes and Molluscs. These are based principally upon information given in the *Challenger* Reports.

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ZOOGEOGRAPHICAL REGIONS.

Canadian Sub-Region
NEARCTIC REGION
Rocky Mountain Sub-Region
Alleghany Sub-Region
Antillean Sub-Region
Mexican Sub-Region
Brazilian Sub-Region
NEOTROPICAL REGION
Chilian Sub-Region
European Sub-Region
PALÆARCTIC REGION
Siberian Sub-Region
Mediterranean Sub-Region
Indian Sub-Region
ORIENTAL REGION
Indo-Chinese Sub-Region
Indo-Malayan Sub-Region
Ethiopian Sub-Region
African REGION
Malagasy Sub-Region
South African Sub-Region
Austro-Malayan Sub-Region
Polynesian Sub-Region
AUSTRALIAN REGION
Australian Sub-Region
New Zealand Sub-Region

NOTE TO ZOOGEOGRAPHICAL REGIONS

According to A. Russel Wallace

- PALÆARCTIC REGION
- ETHIOPIAN REGION
- ORIENTAL REGION
- AUSTRALIAN REGION
- NEARCTIC REGION
- NEOTROPICAL REGION

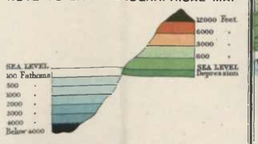
NOTE TO VEGETATION MAP

- Tropical Forests (Wet Jungles)
- Savannas & Grassland with Mixed Woods
- Forests chiefly of Conifers
- Grassy Steppes
- Steppes
- Deserts
- Tundra
- Mountain Flora (Alpine)
- Glacial Zone (Fields)

Warm Currents — Cold Currents

In Northern Summer the Monsoons are from S.W. and S.E.

NOTE TO BATHY-OROGRAPHICAL MAP



PREVAILING VEGETATION AND OCEAN CURRENTS

BATHY-OROGRAPHICAL CONFIGURATION

J.G. Bartholomew

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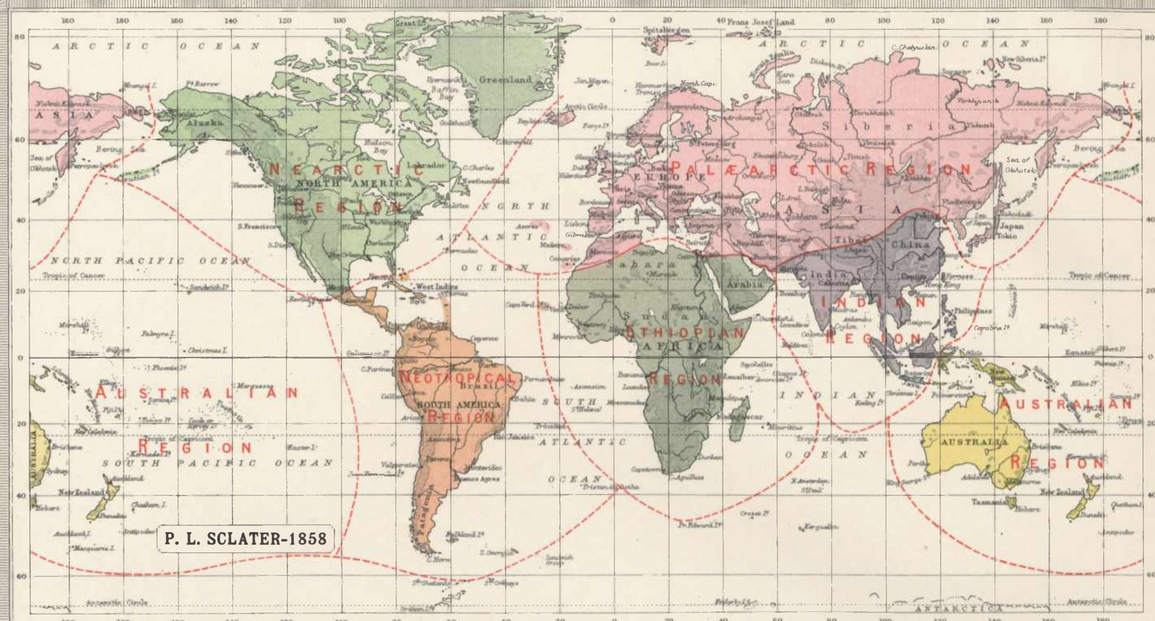
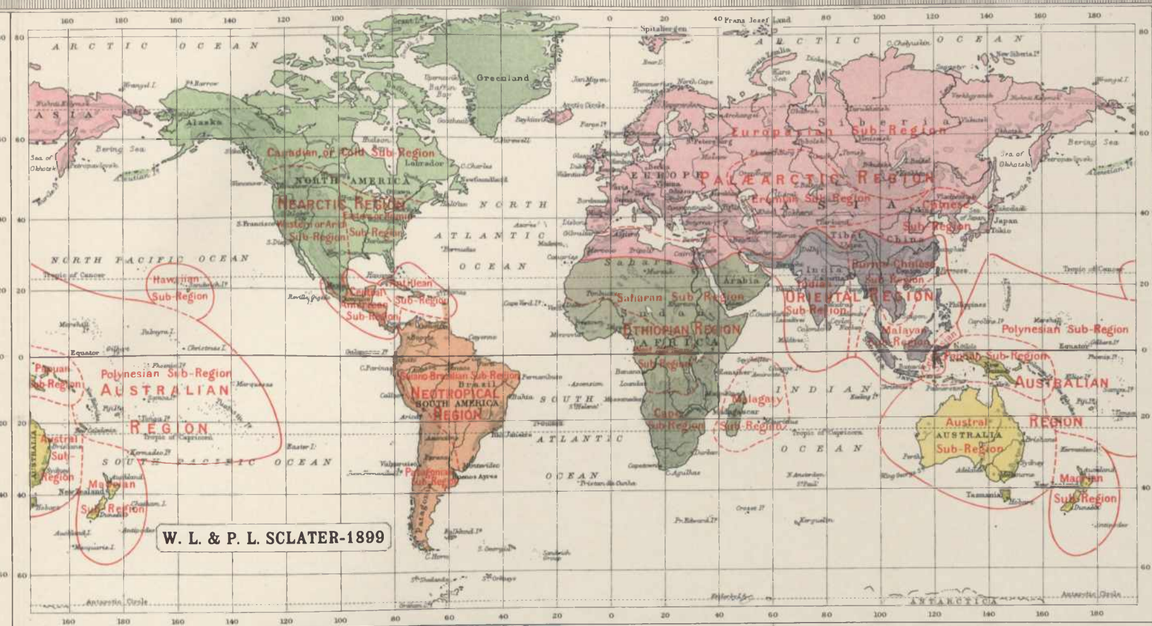
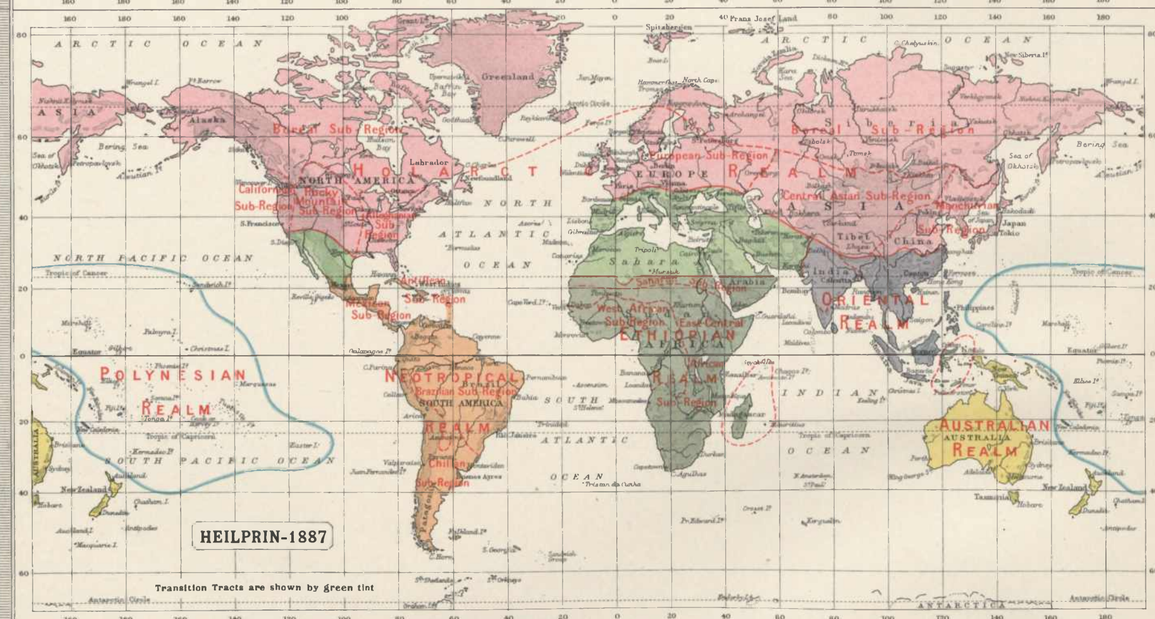
ZOOGEOGRAPHICAL REGIONS.



P. L. SCLATER-1858

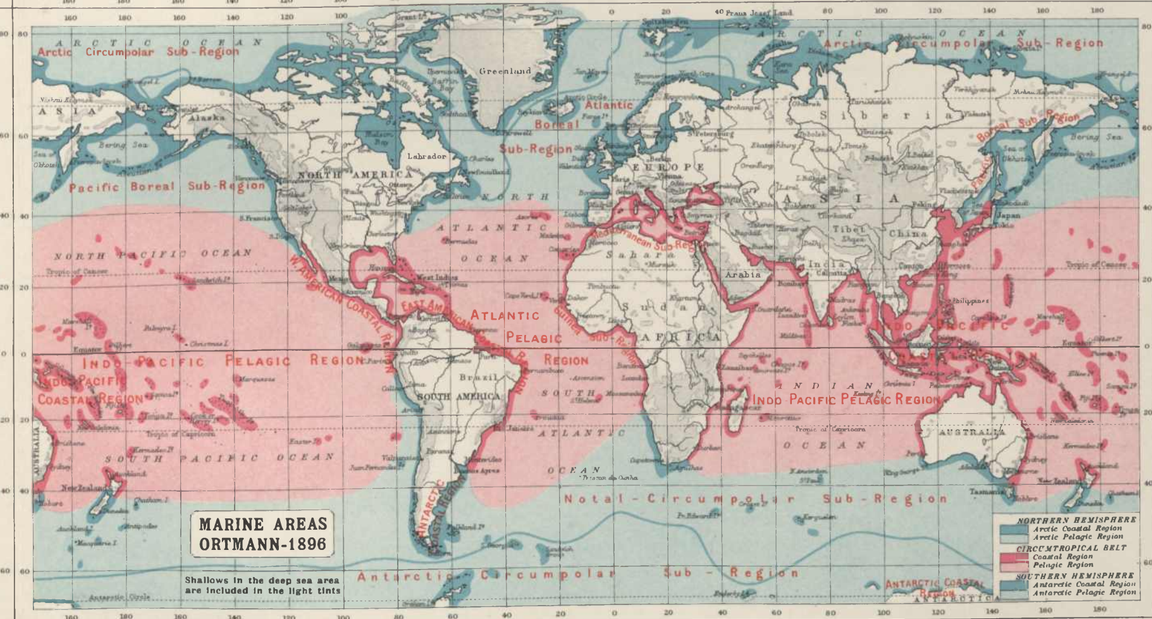


W. L. & P. L. SCLATER-1899



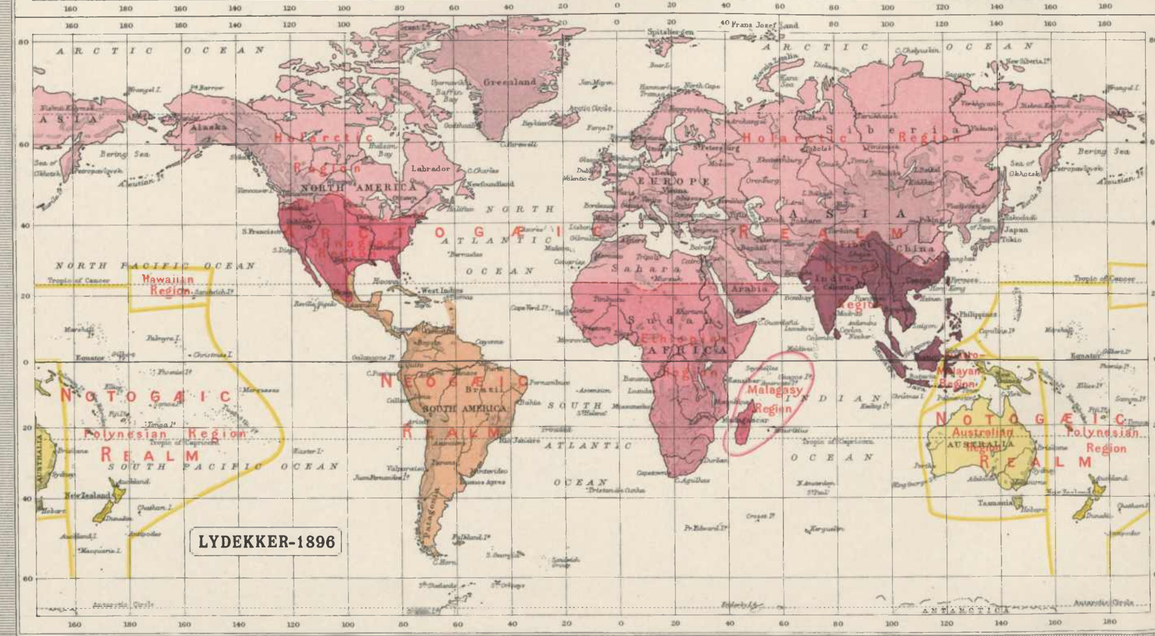
HEILPRIN-1887

Transition Tracts are shown by green tint

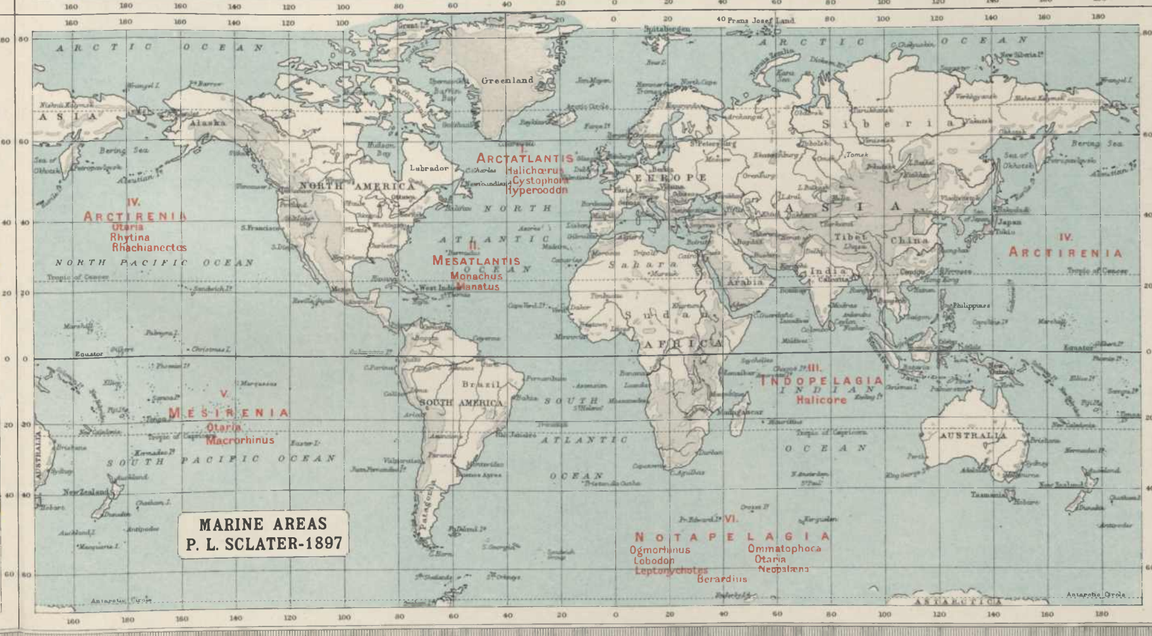


MARINE AREAS
ORTMANN-1896

Shallows in the deep sea area are included in the light tints



LYDEKKER-1896



MARINE AREAS
P. L. SCLATER-1897

Note

The Plateau Area above 3000 fᵗˢ is shown by a ruling of fine black dots thus

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MAMMALIA - PRIMATES, CHIROPTERA.

MAP I
PRIMATES, APES

Similidæ—Anthropoid Apes
Gorilla | Chimpanzee | Orang Utan | Hylobatidæ—Gibbons

MAP II
PRIMATES, APES, ETC.

Cercopithecidæ—Old World Monkeys | Cebidæ—American Monkeys | Callitrichidæ—Marmosets

MAP III
PRIMATES, APES, ETC.

Lemuridæ—Lemurs | Tarsiidæ—Tarsiers | Chiromyidæ—The Aye-Aye

MAP IV
CHIROPTERA, BATS

Phyllostomatidæ—Vampire Bats | Rhinolophidæ—Leaf-nosed Bats

MAP V
CHIROPTERA, BATS

Noctilionidæ—Free-tailed Bats | Nycteridæ—False Vampire Bats

MAP VI
CHIROPTERA, BATS

Vespertilionidæ—Typical Bats | Pteropodidæ—Flying Foxes

Note
The Plateau Area above 3000 ft is shown by a ruling of fine black dots thus

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J. G. Bartholomew.

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MAMMALIA - INSECTIVORA, CARNIVORA.

MAP I
INSECTIVORA, INSECTIVORES
Talpidæ—Moles
Chrysochloridæ—Golden Moles

MAP II
INSECTIVORA, INSECTIVORES
Centetidæ—Tenrecs
Solenodontidæ—Solenodons
Galeopithecidæ—Flying Lemurs

MAP III
INSECTIVORA, INSECTIVORES
Soricidæ—Shrews
Potamogalidæ—Potamogale

MAP IV
INSECTIVORA, INSECTIVORES
Erinaceidæ—Hedgehogs
Macroscelidæ—Elephant Shrews
Tupaiidæ—Tree Shrews

MAP V
CARNIVORA, CARNIVORES
Phocidæ—True Seals

MAP VI
CARNIVORA, CARNIVORES
Odobenidæ—Walruses
Otariidæ—Eared Seals

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Note
The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

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MAMMALIA - CARNIVORA.

MAP I
CARNIVORA, CARNIVORES
Procyonidæ—Raccoons and Catbears
Viverridæ—Civets and Ichneumons

MAP II
CARNIVORA, CARNIVORES
Mustelidæ—Skunks
Badgers
Weasels and Otters

MAP III
CARNIVORA, CARNIVORES
Ursidæ—Polar Bear
Bears

MAP IV
CARNIVORA, CARNIVORES
Protelidæ—The Earth-Wolf
Hyænidæ—Hyænas

MAP V
CARNIVORA, CARNIVORES
Canidæ—Wolf and its races
Dogs and Foxes
Jackals
Probably introduced

MAP VI
CARNIVORA, CARNIVORES
Felidæ—Cats
Lion
Tiger
Jaguar
Puma

W. Eagle Clarke Percy H Grimshaw

Note
The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

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MAMMALIA - RODENTIA.

MAP I
RODENTIA, RODENTS
Leporidæ—Hares and Rabbits
Ochotonidæ—Picas

MAP II
RODENTIA, RODENTS
Dasyproctidæ—Agouties
Chinchillidæ—Chinchillas

MAP III
RODENTIA, RODENTS
Caviidæ—Cavies
Dinomyidæ—Dinomys

MAP IV
RODENTIA, RODENTS
Hystricidæ—Porcupines
In New World, Erethizontidæ—American Porcupines
Octodontidæ—Spiny Mice

MAP V
RODENTIA, RODENTS
Geomyidæ—Pocket Gophers
Heteromyidæ—Kangaroo Rats and Pocket Mice
Spalacidæ—Mole Rats
Bathyergidæ—African Mole Rats
Lophiomyidæ—Crested Rats
Castoridæ—Beavers
Former distribution in Europe and Asia uncertain

MAP VI
RODENTIA, RODENTS
Jaculidæ—Jerboas
Pedetidæ—Cape Jumping Hare
Muridæ—Rats, Mice and Voles
Haplodontidæ—Sewellels

MAP VII
RODENTIA, RODENTS
Myoxidæ—Dormice
Sciuridæ—Squirrels and Marmots
Anomaluridæ—African Flying Squirrels

W. Eagle Clarke. Percy H. Grimshaw.

Note
The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

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MAMMALIA - UNGULATA.

MAP I

UNGULATA, HOOFED MAMMALS

Elephantidæ—Elephants

MAP II

UNGULATA, HOOFED MAMMALS

Rhinocerotidæ—Rhinoceroses

Procavilidæ—Hyraces

MAP III

UNGULATA, HOOFED MAMMALS

Equidæ—Wild Horses | Zebras | Wild Asses | Tapiridæ—Tapirs

MAP IV

UNGULATA, HOOFED MAMMALS

Bovidæ—Musk Ox | Sheep and Goats | Antelopes | Oxen, Bisons and Buffaloes | Yaks

MAP V

UNGULATA, HOOFED MAMMALS

Antilocapridæ—Prong Buck | Giraffidæ—Giraffe | Okapi | Tragulidæ—Chevrotains

MAP VI

UNGULATA, HOOFED MAMMALS

Cervidæ—Deer | Camelidæ—Camels and Llamas

Southern limit of Reindeer

MAP VII

UNGULATA, HOOFED MAMMALS

Suidæ—Pigs | Dicotylidæ—Peccaries | Hippopotamidæ—Hippopotamus

Note

The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

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MAMMALIA - CETACEA, SIRENIA.

MAP I
DELPHINIDÆ

- Monodon—Narwhal
- Delphinapterus—White Whale
- Phocæna—Porpoises
- Neomeris—Indian Porpoise
- Orca—Killer Whales
- Globicephalus—Pilot Whales

MAP IV.
BALÆNIDÆ, WHALE-BONE WHALES

- Balæna—Right Whales
- Balænoptera—Rorquals or Finners
- Megaptera—Hump-Backed Whales
- Neobalæna—Pigmy Whale

MAP II
DELPHINIDÆ

- Lagenorhynchus—Short-Beaked Dolphins
- Sotalia—Long-Beaked River Dolphins
- Delphinus—True Dolphins
- Tursiops—Bottle-Nosed Dolphins
- Steno—Rough-Toothed Dolphins
- Prodelphinus

MAP V
PHYSETERIDÆ, TOOTHED WHALES

- Physeter—Cachalot or Sperm Whale
- Kogia—Lesser Sperm Whale
- Mesoplodon—Beaked Whales
- Ziphius—Cuvier's Whale, &c.
- Hyperoödon—Bottle-Nosed Whale

MAP III
DELPHINIDÆ & PLATANISTIDÆ

- Grampus—Risso's Grampus
- Tursio
- Orcella—Indian Dolphin
- Cephalorhynchus
- Platanistidæ—Fresh-Water Dolphins

MAP VI
SIRENIA, SIRENIANS

- Halicoridæ—Dugongs
- Manatidæ—Manatees

W. Eagle Clarke. Percy H. Grimshaw.

Note
The Plateau Area above 3000 f^s is shown by a ruling of fine black dots thus

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MAMMALIA - EDENTATA, MARSUPIALIA, MONOTREMATA.

MAP I
EDENTATA, EDENTATES
Dasypodidæ—Armadillos

MAP II
EDENTATA, EDENTATES
Bradypodidæ—Sloths

MAP III
EDENTATA, EDENTATES
Orycteropodidæ—Aard-Varks
Manidæ—Pangolins
Myrmecophagidæ—Ant-eaters

MAP IV
MARSUPIALIA, MARSUPIALS
Macropodidæ—Kangaroos

MAP V
MARSUPIALIA, MARSUPIALS
Phalangeridæ—Phalangers

MAP VI
MARSUPIALIA, MARSUPIALS
Phascolomyidæ—Wombats

MAP VII
MARSUPIALIA, MARSUPIALS
Peramelidæ—Bandicoots
Notoryctidæ—Marsupial Moles

MAP VIII
MARSUPIALIA, MARSUPIALS
Dasyuridæ—Thylacine
Dasyures
Didelphidæ—Opossums
Cænolestidæ—Selvas

MAP IX
MONOTREMATA, MONOTREMES
Echidnidæ—Spiny Ant-eaters

MAP X
MONOTREMATA, MONOTREMES
Ornithorhynchidæ—Duckbills

Note
The Plateau Area above 3000 ft.s is shown by a ruling of fine black dots thus

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AVES - PASSERIFORMES.

MAP I

PASSERIFORMES, PERCHING BIRDS

Corvidæ

Corvinæ—Ravens, Crows, &c. | Fregilinæ—Choughs

Garrulinæ—Jays | Nucifraginæ—Nutcrackers

MAP II

PASSERIFORMES, PERCHING BIRDS

Paradiseidæ—Birds of Paradise | Ptilonorhynchidæ—Bower Birds | Sturnidæ—Starlings

Eulabetidæ—Glossy Starlings | Eurycerotidæ—Helmet Bird | Dicruridæ—Drongos

MAP III

PASSERIFORMES. PERCHING BIRDS

Oriolidæ—Orioles | Icteridæ—Cassiques & Hangnests

Ploceidæ—Weaver Birds | Tanagridæ—Tanagers

MAP IV

PASSERIFORMES, PERCHING BIRDS

Cœrebidæ—Honey-Creepers | Fringillidæ—Finches

Emberizidæ—Buntings | Alaudidæ—Larks

MAP V

PASSERIFORMES, PERCHING BIRDS

Motacillidæ: Anthinæ—Pipits | Motacillinæ—Wagtails

Mniotiltidæ—Wood-Warblers | Certhiidæ—Creepers | Meliphagidæ—Honey-Eaters

MAP VI

PASSERIFORMES, PERCHING BIRDS

Drepanididæ—Drepanis, &c. | Promeropidæ—Promerops

Nectariniidæ—Sun-birds | Dicæidæ—Honey-Peckers | Zosteropidæ—White-Eyes

W. Eagle Clarke Percy H. Grimshaw

J. G. Bartholomew

Note

The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

THE EDINBURGH GEOGRAPHICAL INSTITUTE

AVES - PASSERIFORMES.

MAP I
PASSERIFORMES, PERCHING BIRDS

Sittidæ—Nuthatches | Regulidæ—Goldcrests and Kinglets | Chamæidæ—Wren Tits

MAP II
PASSERIFORMES, PERCHING BIRDS

Paridæ—Titmice | Lanidæ—Shrikes | Ærocharidæ

MAP III
PASSERIFORMES, PERCHING BIRDS

Prionopidæ—Wood Shrikes | Vangidæ
Artamidæ—Swallow Shrikes | Ampelidæ—Waxwings

MAP IV
PASSERIFORMES, PERCHING BIRDS

Vireonidæ—Vireos | Sylviidæ—Warblers
Turdidæ—Thrushes, Chats, &c. | Accentorinæ—Accentors

MAP V
PASSERIFORMES, PERCHING BIRDS

Mimidæ—Mocking Birds | Cinclidæ—Dippers

MAP VI
PASSERIFORMES, PERCHING BIRDS

Troglodytidæ—Wrens | Timelliidæ—Babbling Thrushes, &c. | Pycnonotidæ—Bulbuls

W. Eagle Clarke. Percy H. Grimshaw.

Note
The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

J. G. Bartholomew.

AVES - PASSERIFORMES.

MAP I

PASSERIFORMES, PERCHING BIRDS

Campophagidæ – Cuckoo-Shrikes | Muscicapidæ – Fly Catchers | Polioptilinæ – Gnat Catchers

MAP II

PASSERIFORMES, PERCHING BIRDS

Hirundinidæ – Swallows & Martins | Atrichornithidæ – Scrub Birds | Xenicidæ | Philepittidæ

MAP III

PASSERIFORMES PERCHING BIRDS

Pittidæ – Pittas | Phytotomidæ – Plant Cutters | Cotingidæ – Chatterers

MAP IV

PASSERIFORMES, PERCHING BIRDS

Papridæ – Manakins

MAP V

PASSERIFORMES, PERCHING BIRDS

Oxyrhamphidæ | Tyrannidæ – Tyrant Flycatchers

MAP VI

PASSERIFORMES, PERCHING BIRDS

Dendrocolaptidæ – Wood Hewers, American Creepers | Conopophagidæ

MAP VII

PASSERIFORMES, PERCHING BIRDS

Formicariidæ – Ant Thrushes

MAP VIII

PASSERIFORMES, PERCHING BIRDS

Pteroptochidæ | Menuridæ – Lyre Birds | Eurylæmidæ – Broad Bills

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Note

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AVES - PICIFORMES, SCANSORES, COCCYGES, TROGONES, CORACIIFORMES.

MAP I
PICIFORMES, WOODPECKERS, WRYNECKS &c.
Galbulidæ—Jacamars
Bucconidæ—Puff-Birds
Picidæ—Woodpeckers
Iyngidæ—Wrynecks

MAP II
SCANSORES, BARBETS, TOUCANS, &c.
Indicatoridæ—Honey-Guides
Capitonidæ—Barbets
Rhamphastidæ—Toucans

MAP III
COCCYGES, CUCKOOS & PLANTAIN-EATERS
Musophagidæ—Plantain-Eaters
Cuculidæ—Cuckoos

MAP IV
TROGONES, TROGONS
CORACIIFORMES, ROLLERS, KINGFISHERS, HORNBILLS, &c.
Trogonidæ—Trogons
Steatornithidæ—Oil-Bird or Guacharo
Podargidæ—Frog Mouths
Leptosomatidæ—Kiroumbos

MAP V
CORACIIFORMES, ROLLERS, KINGFISHERS, HORNBILLS, &c.
Coraciidæ—Rollers
Alcedininæ—Kingfishers
Daceloninæ—Kingfishers

MAP VI
CORACIIFORMES
Bucerotidæ—Hornbills
Upupidæ—Hoopoes

MAP VII
CORACIIFORMES
Irrisoridæ—Wood-Hoopoes
Meropidæ—Bee-Eaters

W. Eagle Clarke. Percy H. Grimshaw

J. G. Bartholomew.

Note
The Plateau Area above 3000 ft.s is shown by a ruling of fine black dots thus

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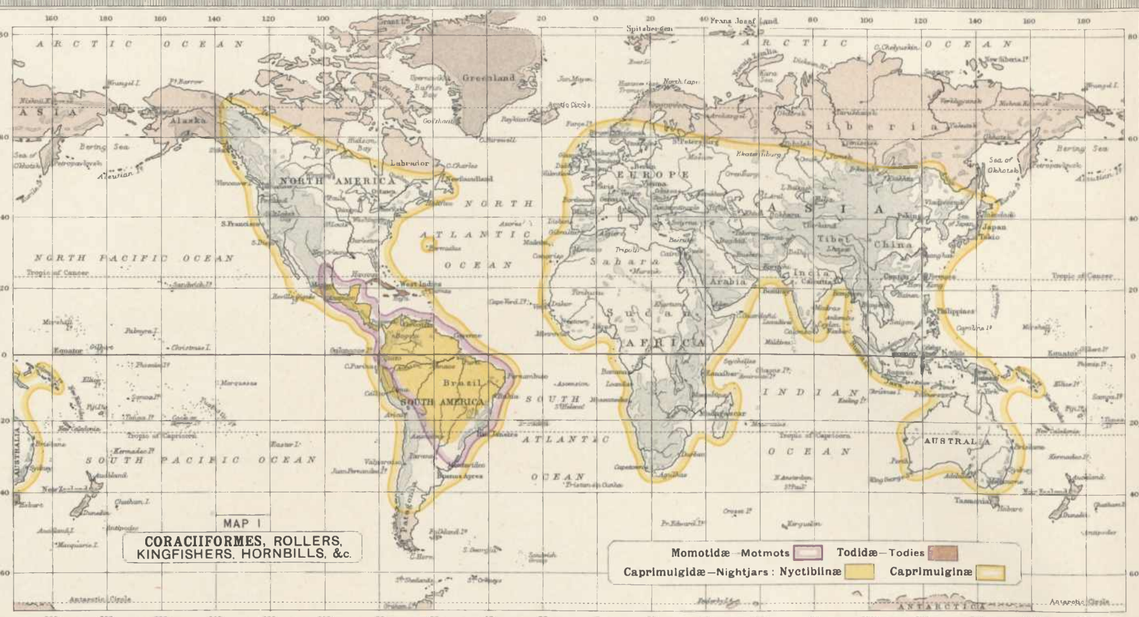
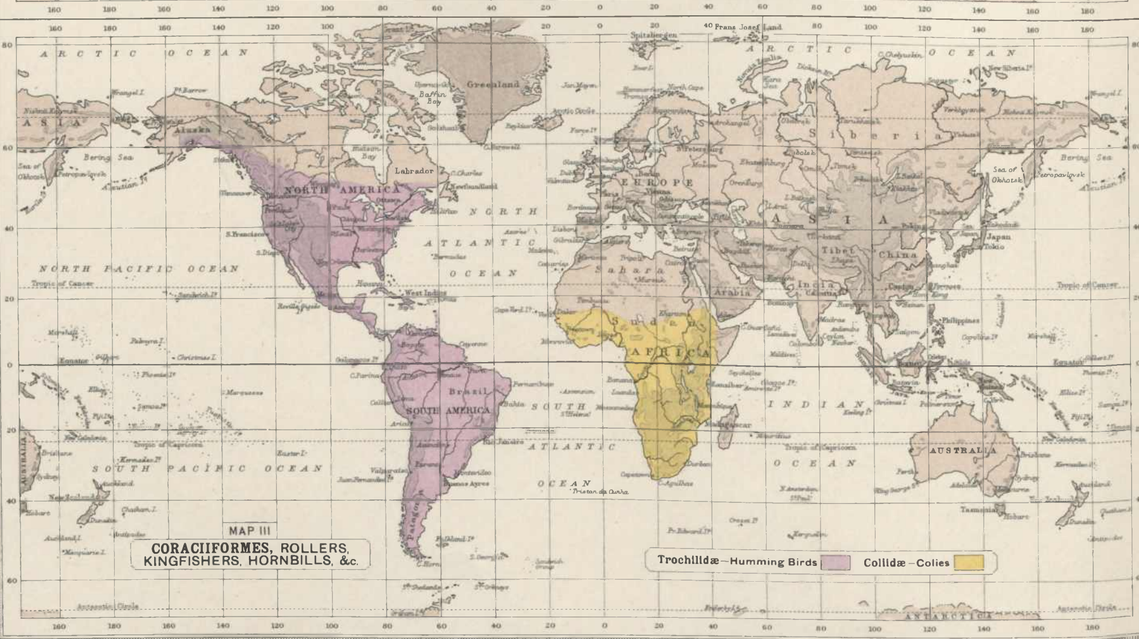
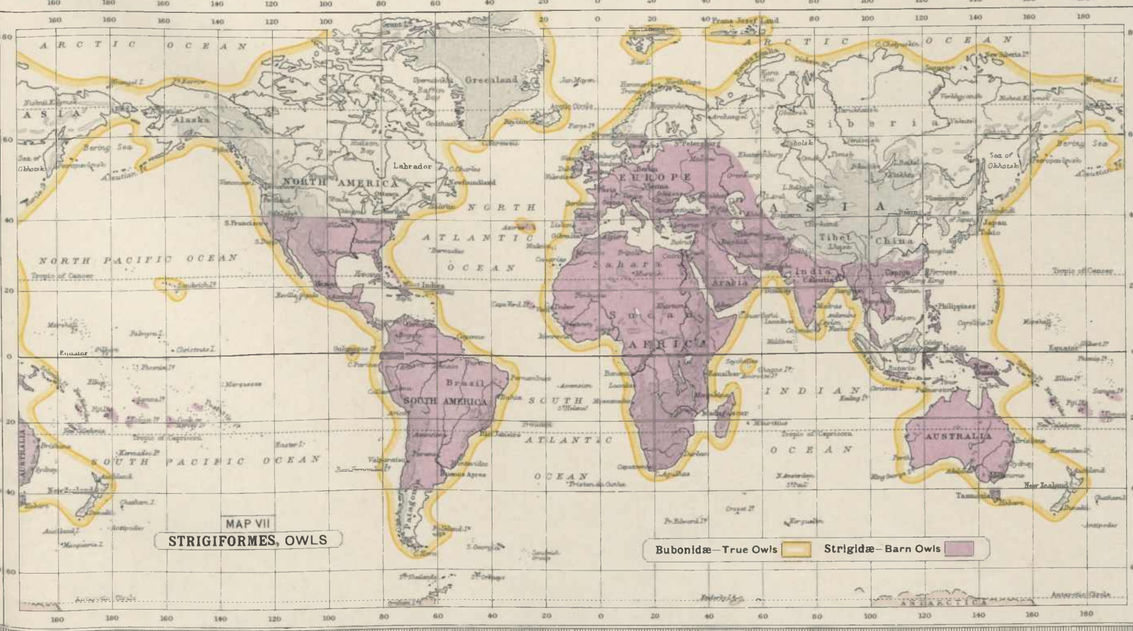
AVES - CORACIIFORMES, PSITTACIFORMES, STRIGIFORMES.







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Note

The Plateau Area above 3000 ft. is shown by a ruling of fine black dots thus

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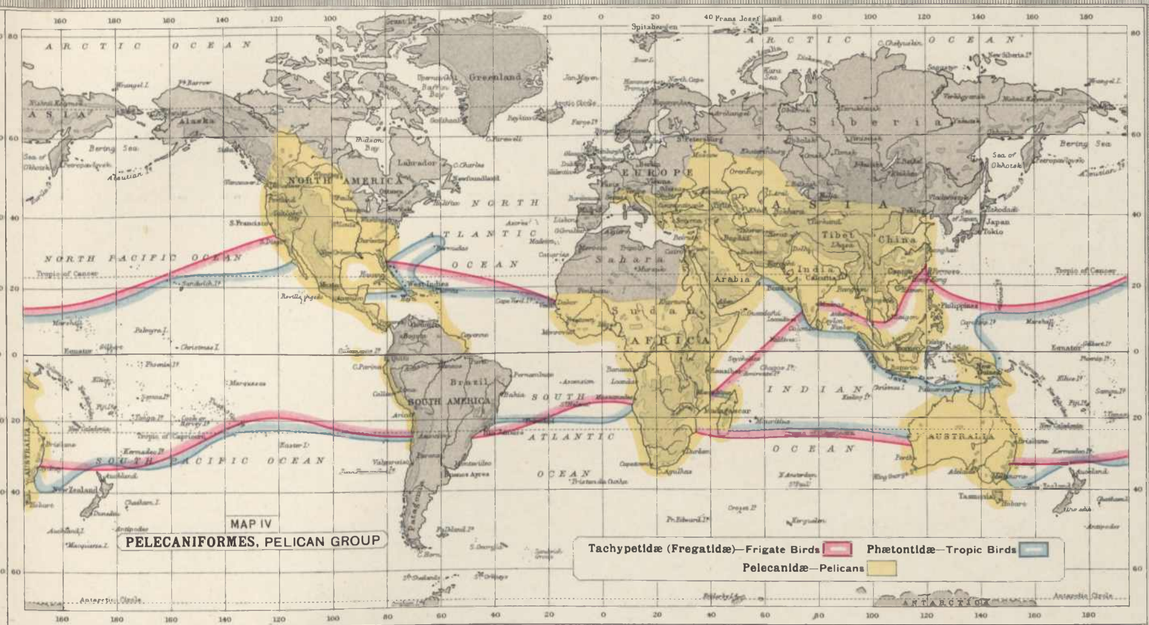
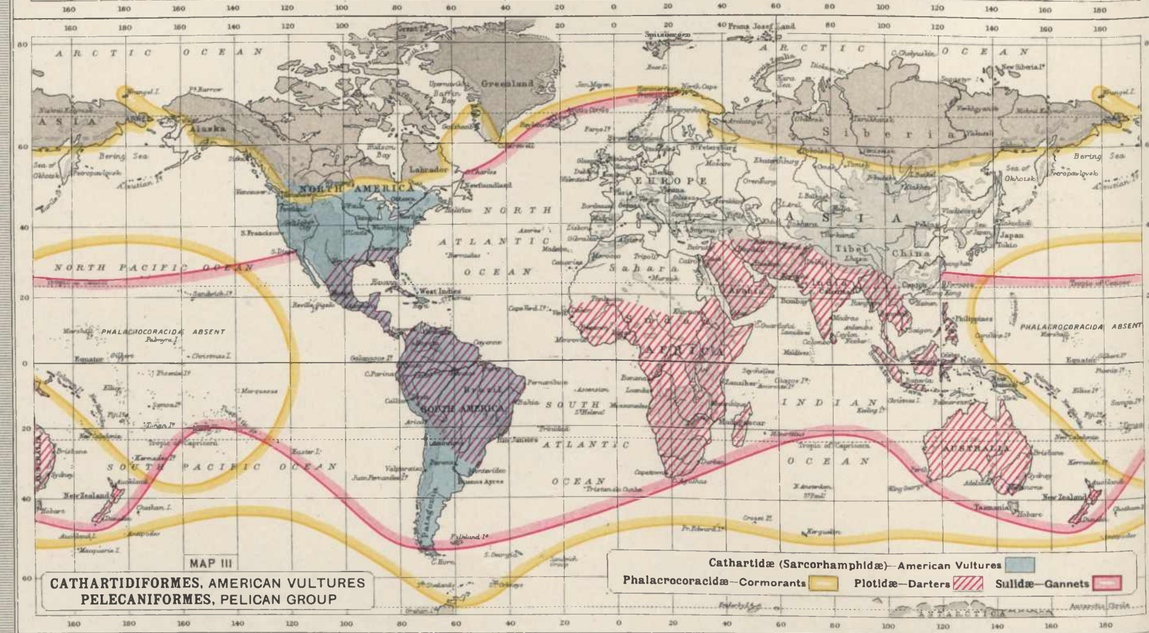
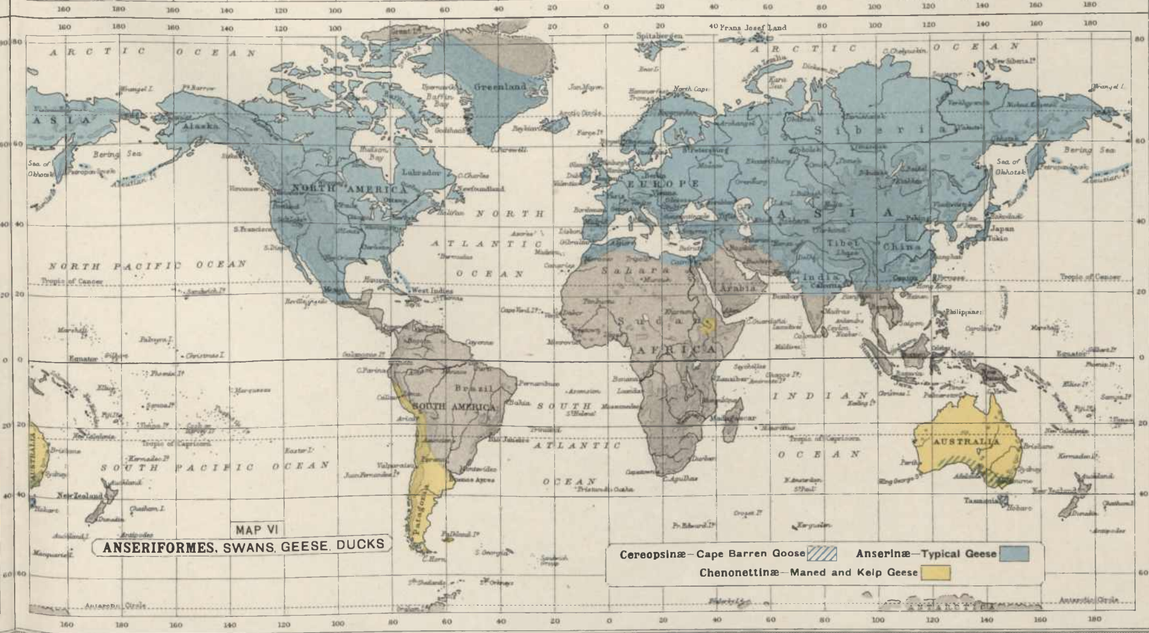
AVES - ACCIPITRIFORMES, CATHARTIDIFORMES, PELECANIFORMES, ANSERIFORMES.







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Note

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AVES - ANSERIFORMES, PHŒNICOPTERIFORMES, PALAMEDEIFORMES, ARDEIFORMES, GRUIFORMES.

MAP I
ANSERIFORMES, SWANS, GEESE, DUCKS

Anatinæ—Typical Ducks | Fuligulinæ—Diving Ducks

MAP II
ANSERIFORMES, SWANS, GEESE, DUCKS

Erismaturinæ—Lake & Musk Ducks | Merganettinæ—Torrent Ducks | Merginæ—Mergansers

MAP III
PHŒNICOPTERIFORMES, FLAMINGOES
PALAMEDEIFORMES, SCREAMERS

Phœnicopteridæ—Flamingoes | Palamedeidæ—Screamers

MAP IV
ARDEIFORMES, HERONS

Ibididæ—Ibises | Plataleidæ—Spoonbills | Ciconiidæ—Storks

MAP V
ARDEIFORMES, HERONS
GRUIFORMES, CRANES

Scopidæ—Hammer-Head | Balænicipitidæ—Whale-Head | Ardeidæ—Herons & Bitterns
Psophidæ—Trumpeters | Cariamidæ—Cariamas

MAP VI
GRUIFORMES, CRANES

Gruidæ—Cranes | Aramidæ—Courlans | Rhinochætidæ—Kagu
Mesœnatidæ—Mesites | Eurypygidæ—Sun-Bitterns

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AVES - CHARADRIIFORMES, LARIFORMES, ALCIFORMES, PROCELLARIIFORMES, SPHENISCIFORMES, COLYMBIFORMES, PODICIPEDIDIFORMES.

MAP I

CHARADRIIFORMES, PLOVER-LIKE BIRDS

Chionididæ—Sheathbills | Thinocorythidæ—Seed-Snipes

Charadriidæ—Sub-Families

Charadriinæ—Typical Plovers | Tringinæ—Sandpipers | Scolopacinæ—Snipes & Woodcocks

MAP II

CHARADRIIFORMES, PLOVER-LIKE BIRDS

Parridæ—Jaçanas | Cursoriidæ—Coursers | Glareolidæ—Pratincoles

MAP III

CHARADRIIFORMES, PLOVER-LIKE BIRDS

Dromadidæ—Crab Plovers | Œdicnemidæ—Thick-knees | Otididæ—Bustards

MAP IV

LARIFORMES, GULLS, TERNS, SKUAS, &c.
ALCIFORMES, AUKS, &c.

Laridæ: Sterninæ—Terns
Rhynchopinæ—Skimmers
Larinæ—Gulls
Stercorariidæ—Skuas
Alcidæ—Auks, Guillemots, &c

Southern Limit of Northern Species of Skuas
Northern Limit of Southern Species of Skuas

MAP V

PROCELLARIIFORMES, PETRELS, ALBATROSSES, &c

Procellariidæ—Typical Petrels
Puffinidæ—Shearwaters, Fulmars, &c
Pelecanoididæ—Diving Petrels
Diomedeidæ—Albatrosses

MAP VI

SPHENISCIFORMES, PENGUINS
COLYMBIFORMES, DIVERS
PODICIPEDIDIFORMES, GREBES

Spheniscidæ—Penguins | Colymbidæ—Divers | Podicipedidæ—Grebes

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AVES - RALLIFORMES, OPISTHOCOMIFORMES, COLUMBIFORMES, PTEROCLIDIFORMES, HEMIPODII, GALLIFORMES, TINAMIFORMES, APTERYGIFORMES, CASUARIIFORMES, STRUTHIONIFORMES, RHEIFORMES.

MAP I

RALLIFORMES, RAILS, CRAKES, COOTS, &c.
OPISTHOCOMIFORMES, HOATZIN

Rallidæ: Rallinæ—Rails & Crakes; Fulicinæ—Coots
Heliornithidæ—Finfoots; Opisthocomidæ—Hoatzin

MAP II

COLUMBIFORMES, PIGEONS

Treronidæ—Fruit Pigeons, &c.; Columbidæ—Typical Pigeons
Peristeridæ—Turtle-Doves & Ground Pigeons; Gouridæ—Crowned Pigeons

MAP III

COLUMBIFORMES, PIGEONS
PTEROCLIDIFORMES, SAND GROUSE
HEMIPODII, BUSTARD-QUAILS

Didunculidæ—Tooth-Billed Pigeon; Dididæ (*Extinct only*)—Dodos & Solitaire
Pteroclidæ—Sand Grouse
Turnicidæ—Bustard-Quails

MAP IV

GALLIFORMES, GAME BIRDS

Cracidæ—Curassows & Guans; Phasianidæ—Pheasants, Partridges, &c.
Phasianus—True Pheasants; Gallus—Jungle Fowls; Pavo—Peacocks

MAP V

GALLIFORMES, GAME BIRDS

Megapodiidæ—Megapodes & Brush Turkey; Tetraonidæ—Grouse; Numididæ—Guinea Fowls
Melesgridæ—Turkeys; Odontophoridæ—American Partridges & Quails

MAP VI

TINAMIFORMES, TINAMOUS
APTERYGIFORMES, APTERYGES
CASUARIIFORMES, EMUS & CASSOWARIES
STRUTHIONIFORMES, OSTRICHES
RHEIFORMES, RHEAS

Tinamidæ—Tinamous; Apterygidæ—Kiwis
Dromæidæ—Emus; Casuaridæ—Cassowaries
Struthionidæ—Ostriches; Rheidæ—Rheas or American Ostriches

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REPTILIA - OPHIDIA, LACERTILIA.

MAP I
OPHIDIA, SNAKES

Crotalidæ—Rattle-Snakes
Viperidæ—Vipers
Amblycephalidæ—Amblycephalus, &c.
Hydrophidæ—Sea-Snakes

MAP II
OPHIDIA, SNAKES

Elapidæ—Coral-Snakes
Homalopsidæ—Oriental Fresh-Water Snakes
Elachistodontidæ—Elachistodon
Dipsadomorphidæ—Tree-Snakes
Rhachiodontidæ—Dasypeltis

MAP III
OPHIDIA, SNAKES

Colubridæ—Colubrine Snakes
Acrochordidæ—Wart-Snakes
Xenopeltidæ—Xenopeltis
Boidæ—Boas

MAP IV
OPHIDIA, SNAKES

Pythonidæ—Pythons
Uropeltidæ—Shield-Tails
Ilysiidæ—Cylinder-Snakes
Glauconiidæ—Blind-Snakes
Typhlopidæ—Blind-Snakes

MAP V
LACERTILIA, LIZARDS

Chamæleontidæ—Chamæleons
Pygopodidæ—Scale-Footed Lizards
Amphisbænidæ—Amphisbænas
Aniellidæ—Aniella
Dibamidæ—Dibamus

MAP VI
LACERTILIA, LIZARDS

Anelytropidæ—Anelytropsis, &c.
Scincidæ—Skinks
Gerrhosauridæ—Gerrhosaurus, &c.
Lacertidæ—Typical Lizards

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REPTILIA - LACERTILIA, CROCODILIA, CHELONIA, PROSAURIA.

MAP I
LACERTILIA, LIZARDS

Tejidæ—Greaved Lizards
Xantusiidæ—Xantusia, &c.
Varanidæ—Monitors
Lanthanotidæ—Lanthanotus
Helodermatidæ—Poisonous Lizards

MAP II
LACERTILIA, LIZARDS

Anguidæ—Blind or Slow-Worms and Glass-Snakes
Zonuridæ—Girdled-Lizards
Xenosauridæ—Xenosaurus
Iguanidæ—Iguanas, &c.

MAP III
LACERTILIA, LIZARDS

Agamidæ—Agamas, &c.
Uropiatidæ—Uroplates
Eublepharidæ—Eublepharis, &c.
Geckonidæ—Geckos

MAP IV
CROCODILIA, CROCODILIANS
CHELONIA, TORTOISES & TURTLES

Crocodilidæ—Crocodiles
Alligatoridæ—Alligators & Caimans
Gavialidæ—Gavials
Trionychidæ—Soft Tortoises
Carettochelydidæ—Fly-River Turtle

MAP V
CHELONIA, TORTOISES & TURTLES

Chelydidæ—Side-Necked Tortoises
Pelomedusidæ—Side-Necked Tortoises
Chelonidæ—Turtles
Testudinidæ—Land Tortoises and Terrapins

MAP VI
CHELONIA, TORTOISES & TURTLES
PROSAURIA

Platysternidæ—The Big-Headed Tortoise
Cinosternidæ—Mud-Terrapins, &c.
Dermatemydidæ—Mud-Terrapins
Chelydridæ—Snappers & Alligator-Terrapins
Sphargidæ—Leathery Turtle
Hatteriidæ—Tuatera

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AMPHIBIA - ANURA, URODELA, APODA.

MAP I
ANURA, TAILLESS AMPHIBIANS

Dendrobatidæ—Solid-chested Tree Frogs
Ceratobatrachidæ—Ceratobatrachus
Ranidæ—Typical Frogs
Genyophrynidæ—Genyophryne

MAP II
ANURA, TAILLESS AMPHIBIANS

Dyscophidæ—Dyscophus, &c.
Dendrophryniscidæ—Dendrophryniscus & Batrachophrynus
Engystomatidæ—Narrow-mouthed Toads
Cystignathidæ—Leptodactylus & Allies

MAP III
ANURA, TAILLESS AMPHIBIANS

Hemiphractidæ—Hemiphractus, &c.
Amphignathodontidæ—Amphignathodon, &c.
Hylidæ—Typical Tree Frogs
Bufonidæ—Toads

MAP IV
ANURA, TAILLESS AMPHIBIANS

Pelobatidæ—Pouched Tree-Frogs
Pipidæ—Surinam Toad, &c.
Discoglossidæ—Disc-Tongued Frogs
Dactylethridæ—Clawed Toads

MAP V
URODELA, TAILED AMPHIBIANS

Sirenidæ—Mud-Eels
Salamandridæ—Typical Salamanders
Proteidæ—Proteus or Gilled Salamander, &c.
Amblystomatidæ—Axolotis, &c.

MAP VI
URODELA, TAILED AMPHIBIANS
APODA, LIMBLESS AMPHIBIANS

Plethodontidæ—Speierpes, &c.
Amphiumidæ—Fish-like Salamanders
Desmognathidæ—Desmognathus, &c.
Cœciliidæ—Cœcilia, &c.

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PISCES - DIPNEUSTI. TELEOSTEI.

MAP I

DIPNEUSTI, DIPNOI
TELEOSTEI, BONY FISHES

Lepidosirenidæ—Mud-Fishes
Ceratodontidæ—Lung-Fish
Molidæ—Sun-Fishes
Diodontidæ & Allies—Porcupine-Fishes
Tetrodontidæ—Globe-Fishes

MAP II

TELEOSTEI, BONY FISHES

Balistidæ & Allies—File-Fishes, &c.
Lophiidæ & Allies—Angler-Fish, &c.
Mastacembelidæ
Lophotidæ—Unicorn-Fishes
Trachypteridæ—Ribbon-Fishes

MAP III

TELEOSTEI, BONY FISHES

Ophidiidæ & Allies—Snake-Fishes, &c.
Zoarcidæ—Viviparous Blennies, &c.
Batrachidæ—Frog-Fishes
Blenniidæ & Allies—Blennies, &c.

MAP IV

TELEOSTEI, BONY FISHES

Gobiesocidæ—Sucker-Fishes
Trichonotidæ—Hairy-Backs
Trachinidæ & Allies—Weavers, &c.
Dactylopteridæ—Flying-Gurnards

MAP V

TELEOSTEI, BONY FISHES

Triglidæ—Gurnards
Agonidæ—Armed Bullhead, &c.
Cyclopteridæ—Lumpsuckers
Cottidæ & Allies—Bullheads, &c.

MAP VI

TELEOSTEI, BONY FISHES

Hexagrammidæ
Scorpænidæ—Scorpænoids
Echeneididæ—Sucking-Fishes
Gobiidæ & Allies—Gobies, &c.

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PISCES - TELEOSTEI.

MAP I
TELEOSTEI, BONY FISHES

Kurtidæ & Allies — Pleuronectidæ—Flat-Fishes — Zeidæ—Dories
Bramidæ — Coryphænidæ—"Dolphin"

MAP II
TELEOSTEI, BONY FISHES

Xiphiidæ & Allies—Sword-Fishes — Trichiuridæ—Scabbard-Fishes, &c.
Scombridæ & Allies—Mackerels, &c. — Carangidæ & Allies—Horse-Mackerels, &c.

MAP III
TELEOSTEI, BONY FISHES

Labridæ & Allies—Wrasses, &c. — Pomacentridæ—Coral-Fishes — Cichlidæ—Chromides
Embiotocidæ—Surf-Fishes — Osphromenidæ—Paradise-Fish, &c.

MAP IV
TELEOSTEI, BONY FISHES

Teuthididæ — Acanthuridæ—Surgeon-Fishes
Chætodontidæ—Butterfly-Fishes — Caproidæ—Boar-Fish, &c.

MAP V
TELEOSTEI, BONY FISHES

Mullidæ—Red-Mullets — Sparidæ & Allies—Sea-Breams, &c.
Sciænidæ—Croakers, &c. — Hoplognathidæ—Knife-jawed Fishes

MAP VI
TELEOSTEI, BONY FISHES

Cepolidæ—Band-Fishes — Serranidæ & Allies—Sea Perches, &c.
Percidæ—Fresh-Water Perches — Nandidæ

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PISCES-TELEOSTEI.

MAP I
TELEOSTEI, BONY FISHES

Centrarchidæ—Black Bass, &c. Berycidæ & Allies—Slime-Heads, &c.
Gadidæ & Allies—Codfishes Macruridæ—Long Tails

MAP II
TELEOSTEI, BONY FISHES

Anabantidæ—Climbing-Perches Ophiocephalidæ—Serpent-Heads
Stromateidæ—Butter-Fishes Sphyrænidæ—Barracudas Polynemidæ—Threadfins

MAP III
TELEOSTEI, BONY FISHES

Mugilidæ—Grey Mullets Atherinidæ & Allies—Sand-Smelts, &c. Ammodytidæ—Sand-Eels
Scombresocidæ—Gar-Pike, Flying-Fish, &c. Pegasidæ—Dragon-Fishes

MAP IV
TELEOSTEI, BONY FISHES

Syngnathidæ—Pipe-Fishes, &c. Centriscidæ & Allies—Trumpet-Fishes, &c.
Fistularidæ & Allies—Flute-Mouths Gasterosteidæ—Sticklebacks

MAP V
TELEOSTEI, BONY FISHES

Lamprididæ—The Opah or King-Fish Pierasferidæ—Pearl-Fishes
Notacanthidæ—Thornbacks Percopsidæ—Trout-Perches

MAP VI
TELEOSTEI, BONY FISHES

Amblyopsidæ—Blind-Fishes Cyprinodontidæ—Killifishes
Knerilidæ Scopelidæ & Allies—Lantern-Fishes, &c.

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PISCES - TELEOSTEI, HOLOSTEI, CHONDROSTEI.

MAP I
TELEOSTEI, BONY FISHES

Esocidæ—Pikes
Haplochitonidæ—Southern Salmon
Galaxiidæ—Pikelets
Muræniidæ & Allies—Murænoid Eels, &c.

MAP II
TELEOSTEI, BONY FISHES

Anguillidæ Absent

Anguillidæ—Typical Eels
Symbranchidæ & Allies—Single-slit Eels, &c.
Loricariidæ—Mailed Cat-Fishes
Siluridæ & Allies—Cat-Fishes, &c.

MAP III
TELEOSTEI, BONY FISHES

Cyprinidæ—Carps, &c.
Gymnotidæ—Electric Eels
Characinidæ
Gonorhynchidæ—The Beaked Salmon
Stomiatidæ & Allies

MAP IV
TELEOSTEI, BONY FISHES

Southern Boundary of Salmonidæ in the Northern Hemisphere

Alepocephalidæ—Smooth-Heads
Salmonidæ—Salmon, Trout, &c.
Clupeidæ & Allies—Herrings, &c.
Chirocentridæ—The Dorab
Pantodontidæ—The Chisel-jaw

MAP V
TELEOSTEI, BONY FISHES

Osteoglossidæ—Arapaimas
Notopteridæ—Feather-Backs
Hyodontidæ—Moon-Eyes
Mormyridæ—Beaked Fishes
Elopidæ—The Tarpon, &c.

MAP VI
HOLOSTEI
CHONDROSTEI

Lepidosteidæ—Bony Pike, &c.
Amiidæ—Bow-Fin, &c.
Aelpenseridæ—Sturgeons
Polyodontidæ—Toothed Sturgeons

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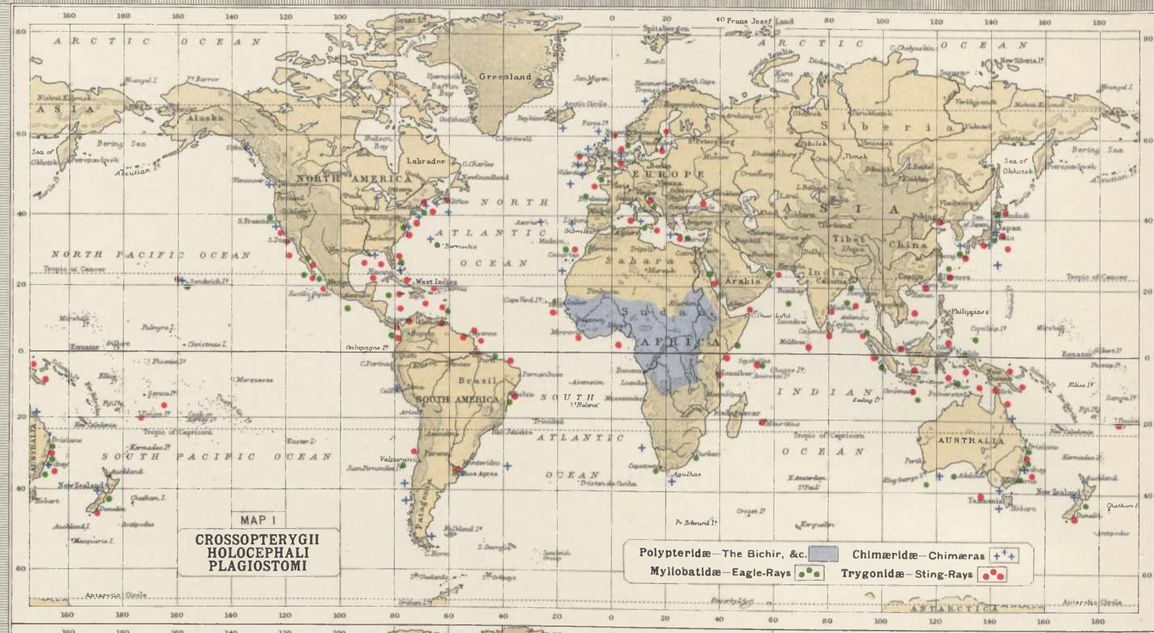
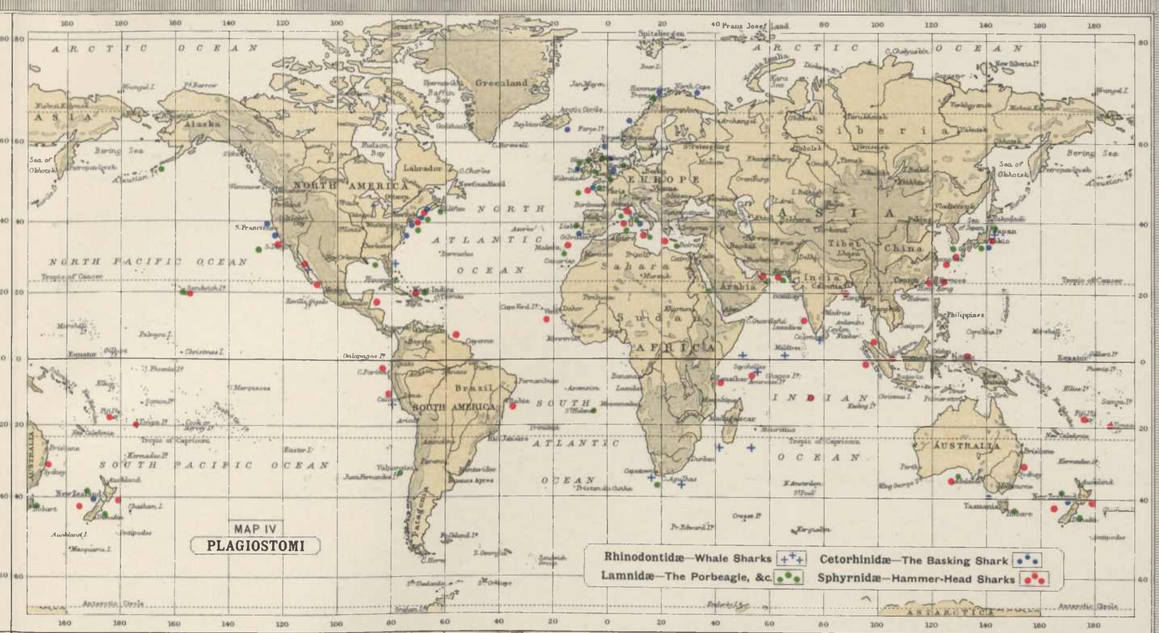
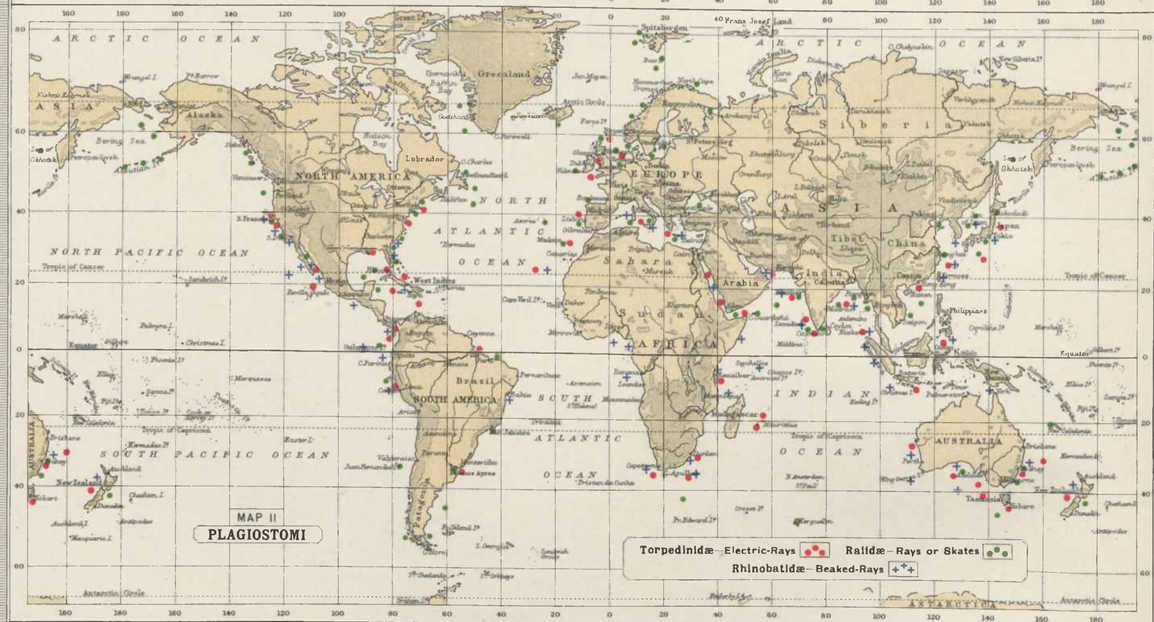
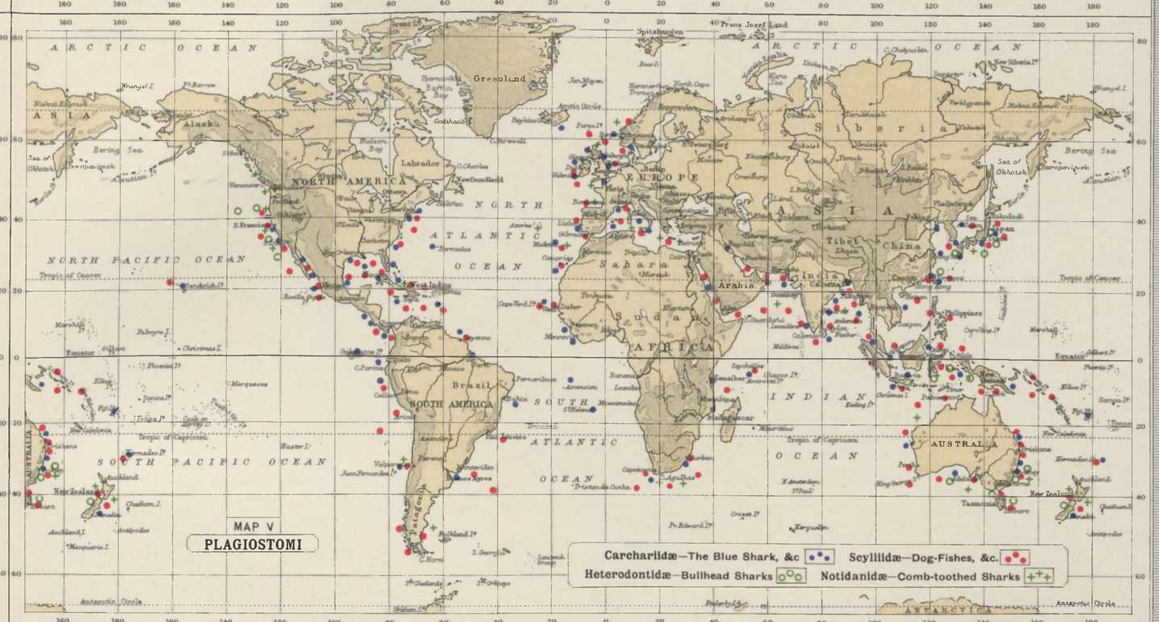
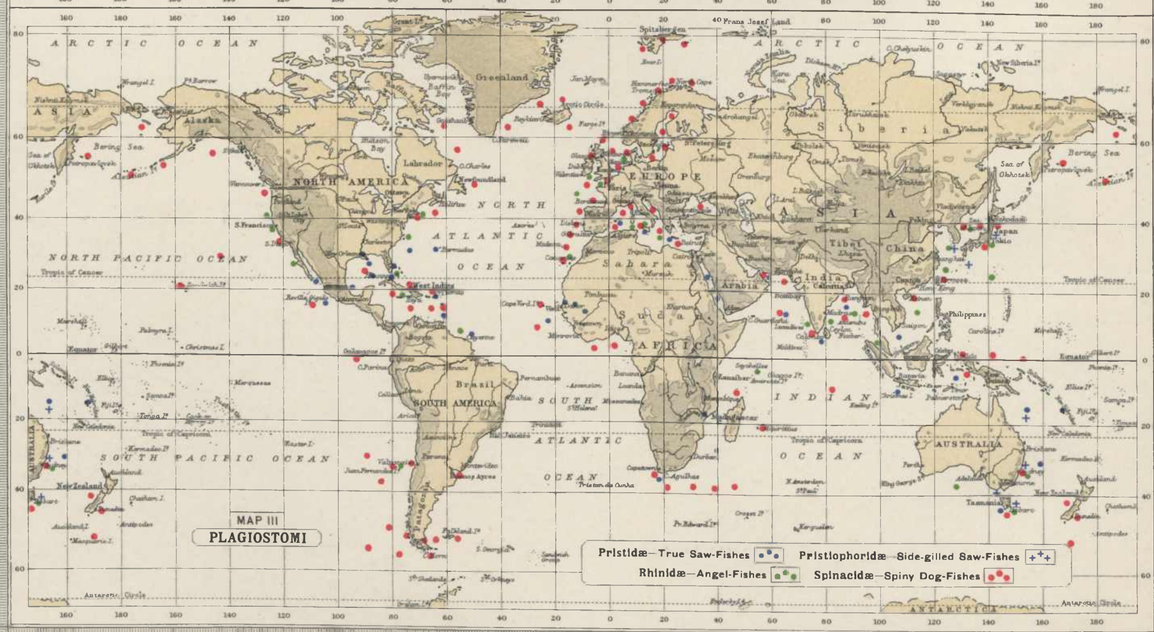
PISCES - CROSSOPTERYGII, HOLOCEPHALI, PLAGIOSTOMI, CYCLOSTOMATA, CEPHALOCHORDATA.











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MOLLUSCA - CEPHALOPODA, GASTROPODA (PULMONATA, PROSOBRANCHIATA).

MAP I

CEPHALOPODA,
SQUIDS, CUTTLE-FISHES, &c.

Octopodidæ—Octopus, &c. Argonautidæ—The Paper-Nautili
Loliginidæ—Squids Sepiidæ—Cuttle-Fishes

MAP II

CEPHALOPODA,
SQUIDS, CUTTLE-FISHES, &c.

PULMONATA,
LAND-SNAILS, FRESH-WATER SNAILS, &c.

Spirulidæ—Spirula Nautilidæ—Nautili
Testacellidæ—Shelled Slugs Limacidæ—True Slugs

MAP III

PULMONATA,
LAND-SNAILS, FRESH-WATER SNAILS, &c.

Helicidæ—Typical Land-Snails Orthalicidæ—Orthalicus
Bulimulidæ—Bulimulus, &c. Urocoptidæ—Urocoptis, &c. Pupidæ—Pupa, &c.

MAP IV

PULMONATA,
LAND-SNAILS, FRESH-WATER SNAILS, &c

Stenogyridæ—Agate-Snails, &c. Succineidæ—Amber Snails, &c.
Limnæidæ—Fresh-Water Limpets, &c. Physidæ—Physa, &c.

MAP V

PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS

Conidæ—Cones Olividæ—Olives
Volutidæ—Volutes Buccinidæ—Whelks, &c.

MAP VI

PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS

Muricidæ—Murex, &c. Cassididæ—Helmet-Shells
Cyprædæ—Cowries

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MOLLUSCA - GASTROPODA (PROSOBRANCHIATA), POLYPLACOPHORA, PELECYPODA.

MAP I
PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS

Strombidæ—Wing-Shells
Melanilidæ—Melania, &c.
Hydrobiidæ—Hydrobia, &c.
Paludinidæ—Viviparous Pond-Snails

Hydrobiidæ in South Victoria Land

MAP II
PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS

Valvatidæ—Valvata, &c.
Ampullaridæ—Ampullaria, &c.
Cyclophoridæ—Cyclophorus, &c.
Cyclostomatidæ—Cyclostoma, &c.

MAP III
PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS

Aciculidæ—Acicula
Proserpinidæ—Proserpina
Helicinidæ—Helicina, &c.
Trochidæ—Trochus, &c.

Trochidæ off South Victoria Land

MAP IV
PROSOBRANCHIATA,
FRONT-GILLED GASTROPODS
POLYPLACOPHORA, CHITONS
PELECYPODA, BIVALVES

Hallotidæ—Ormers
Patellidæ—Limpets
Chitonidæ—Chitons
Ostreidæ—Oysters

MAP V
PELECYPODA, BIVALVES

Mytilopsis
Mytilopsis

Pectinidæ—Scallop-Shells
Aviculidæ—Pearl Oysters, &c.
Meleagrina—The Pearl Oyster
Mytilidæ—Mussels (Fresh-Water Forms=Dreissensia & Mytilopsis)

MAP VI
PELECYPODA, BIVALVES

Unionidæ—Fresh-Water Mussels
Ætheriidæ—Fresh-Water Oysters
Cardiidæ—Cockles
Cyrenidæ—Cyrena, &c.

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LEPIDOPTERA - RHOPALOCERA

MAP I
RHOPALOCERA, BUTTERFLIES

PAPILIONIDÆ—SWALLOW-TAILS | Ornithoptera | Papilio

MAP II
RHOPALOCERA, BUTTERFLIES

Thais | Parnassius | PIERIDÆ—WHITES, CLOUDED YELLOWS, &c.

MAP III
RHOPALOCERA, BUTTERFLIES

Dismorphia | Pieris | Delias

MAP IV
RHOPALOCERA, BUTTERFLIES

Terias | Catopsilia | Gonopteryx

MAP V
RHOPALOCERA, BUTTERFLIES

Colias—Clouded Yellows | DANAIDÆ | Euploea

MAP VI
RHOPALOCERA, BUTTERFLIES

Amauris | NEOTROPIDÆ | ACRÆIDÆ | Acræa

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Note

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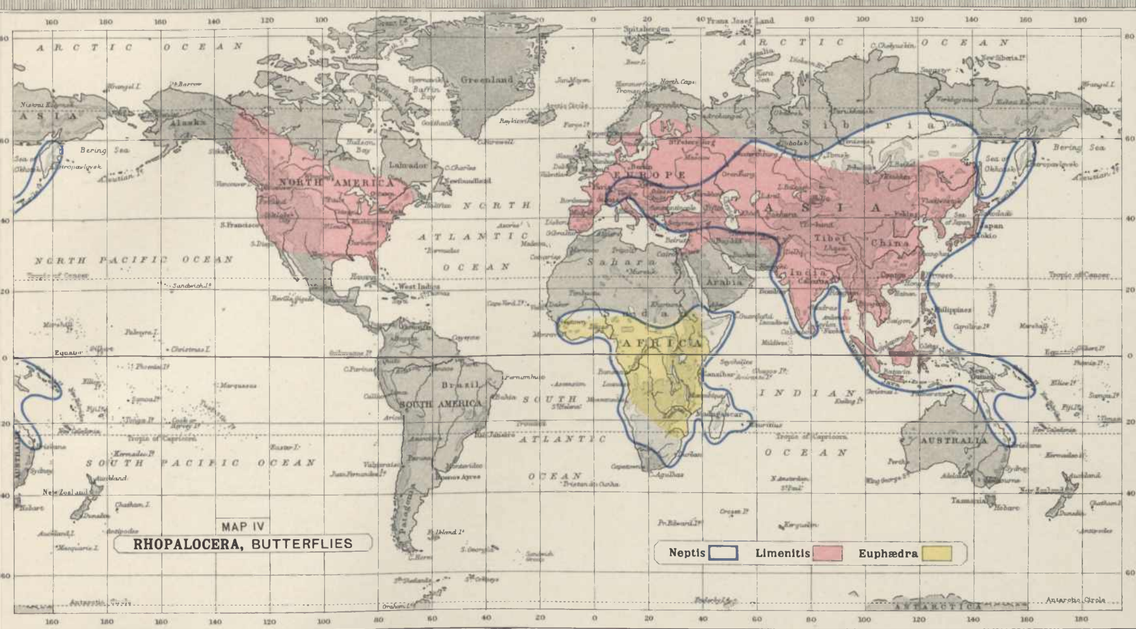

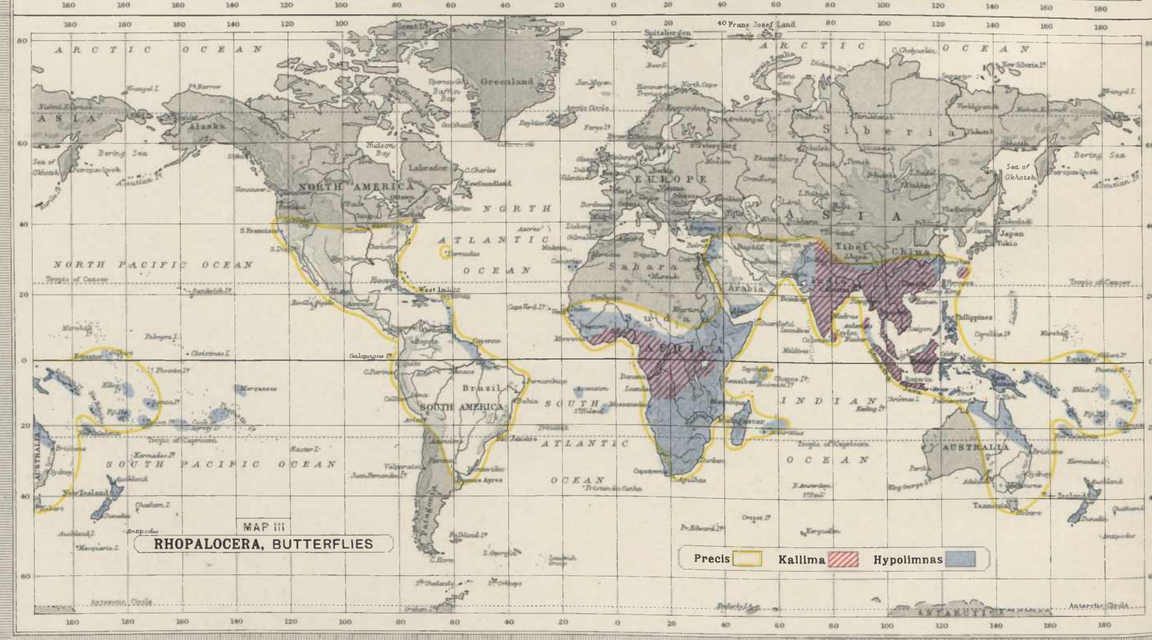

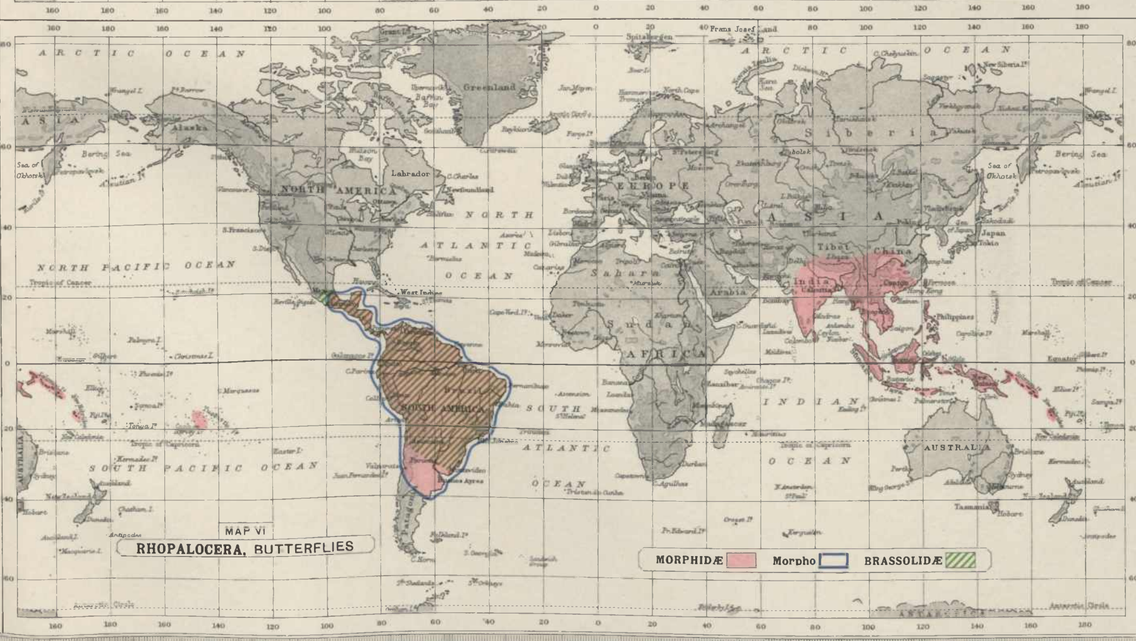

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LEPIDOPTERA - RHOPALOCERA.

MAP I
RHOPALOCERA, BUTTERFLIES
SATYRIDÆ—RINGLET GROUP | Pararge | Mycalesis

MAP II
RHOPALOCERA, BUTTERFLIES
Melanitis | Euptychia | Cœnonympha

MAP III
RHOPALOCERA, BUTTERFLIES
Erebia | Satyrus | Xeniea

MAP IV
RHOPALOCERA, BUTTERFLIES
Œneis | Pedallodes | ELYMNIIDÆ

MAP V
RHOPALOCERA, BUTTERFLIES
LIBYTHEIDÆ | NEMEOBIIDÆ | EUSELASIIDÆ

MAP VI
RHOPALOCERA, BUTTERFLIES
LEMONIIDÆ | LYCÆNIDÆ—BLUES & COPPERS | HESPERIIDÆ—SKIPPERS

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LEPIDOPTERA - HETEROCERA

MAP I
HETEROCERA, MOTHS
CASTNIIDÆ SATURNIIDÆ—EMPEROR MOTHS, &c. BOMBYCIDÆ—SILK MOTHS

MAP II
HETEROCERA, MOTHS
SPHINGIDÆ—HAWK-MOTHS NOTODONTIDÆ—PROMINENTS, &c
SESIIDÆ (ÆGERIIDÆ)—CLEAR-WINGS

MAP III
HETEROCERA, MOTHS
SYNTOMIDÆ ZYGÆNIDÆ—BURNET-MOTHS COSSIDÆ—GOAT-MOTH GROUP

MAP IV
HETEROCERA, MOTHS
HEPIALIDÆ—GHOST-MOTHS, &c. LASIOCAMPIDÆ—LAPPET-MOTHS, EGGARS, &c.
LYMANTRIIDÆ (LIPARIDÆ)—TUSSOCK-MOTHS, &c

MAP V
HETEROCERA, MOTHS
HYPSIDÆ (AGANAIDÆ) ARCTIIDÆ—TIGER-MOTHS, &c. AGARISTIDÆ

MAP VI
HETEROCERA, MOTHS
GEOMETRIDÆ—LOOPERS NOCTUIDÆ—NOCTUID MOTHS URANIIDÆ

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COLEOPTERA

MAP I
LAMELLICORNIA

PASSALIDÆ
LUCANIDÆ—STAG-BEETLES, &c.
Lamprima
Lucanus—Typical Stag-Beetles
Odontolabis

MAP II
LAMELLICORNIA

SCARABÆIDÆ—DUNG-BEETLES, CHAFERS, &c.
Scarabæus
Phanæus

MAP III
LAMELLICORNIA

Trox
Serica
Melolontha—Cockchafers
Gymnetis

MAP IV
ADEPHAGA

CARABIDÆ—CARNIVOROUS GROUND-BEETLES
Carabus—Typical Ground-Beetles
Graphipterus
Anthia

MAP V
ADEPHAGA & POLYMORPHA

CICINDELIDÆ—TIGER-BEETLES
DYTISCIDÆ—CARNIVOROUS WATER-BEETLES
STAPHYLINIDÆ—ROVE-BEETLES

MAP VI
POLYMORPHA

SILPHIDÆ—BURYING-BEETLES, &c.
COCCINELLIDÆ—LADY-BIRDS
ELATERIDÆ—CLICK-BEETLES

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COLEOPTERA.

MAP I
POLYMORPHA
BUPRESTIDÆ | Julodis | Chrysochroa

MAP II
POLYMORPHA
Psiloptera | Buprestis | Stigmodera

MAP III
HETEROMERA
TENEBRIONIDÆ—MEAL-WORM GROUP | Blaps—Churchyard or Cellar Beetles | Helops

MAP IV
HETEROMERA
Zophosis | Asida | Hopatrum

MAP V
PHYTOPHAGA
PRIONIDÆ—LONGICORNS | CERAMBYCIDÆ—LONGICORNS | LAMIIDÆ LONGICORNS

MAP VI
PHYTOPHAGA & RHYNCHOPHORA
CHRYSOMELIDÆ—PHYTOPHAGOUS BEETLES | CURCULIONIDÆ—WEEVILS

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HYMENOPTERA. DIPTERA. HEMIPTERA. NEUROPTERA. ORTHOPTERA.

MAP I
HYMENOPTERA

APIDÆ—BEES VESPIDÆ—SOCIAL WASPS FORMICIDÆ—ANTS

MAP II
DIPTERA

CULICIDÆ—GNATS OR MOSQUITOES
Anopheles—Malarial Mosquitoes Stegomyia—Yellow Fever Mosquito, &c.

MAP III
DIPTERA

TABANIDÆ—HORSE-FLIES, CLEGS, &c.
SYRPHIDÆ—HOVERER FLIES Glossina—Tsetse Flies

MAP IV
HEMIPTERA & NEUROPTERA

COCCIDÆ—SCALE INSECTS MYRMELEONTIDÆ—ANT-LIONS
TERMITIDÆ—TERMITES OR WHITE-ANTS

MAP V
NEUROPTERA, TRICHOPTERA AND ORTHOPTERA

ODONATA—DRAGON-FLIES TRICHOPTERA—CADDIS-FLIES
LOCUSTIDÆ—GREEN GRASSHOPPERS, &c.

MAP VI
ORTHOPTERA

ACRIDIDÆ—LOCUSTS PHASMIDÆ—STICK INSECTS MANTIDÆ—LEAF-INSECTS

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Note

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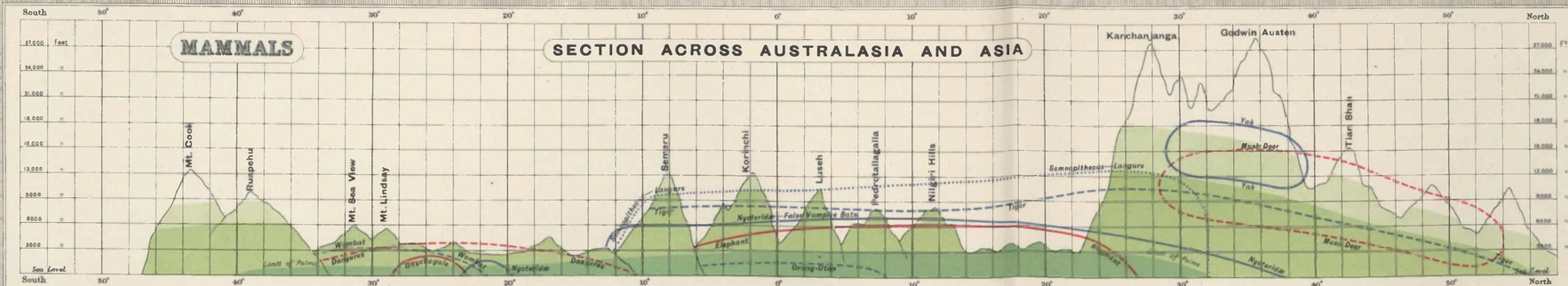

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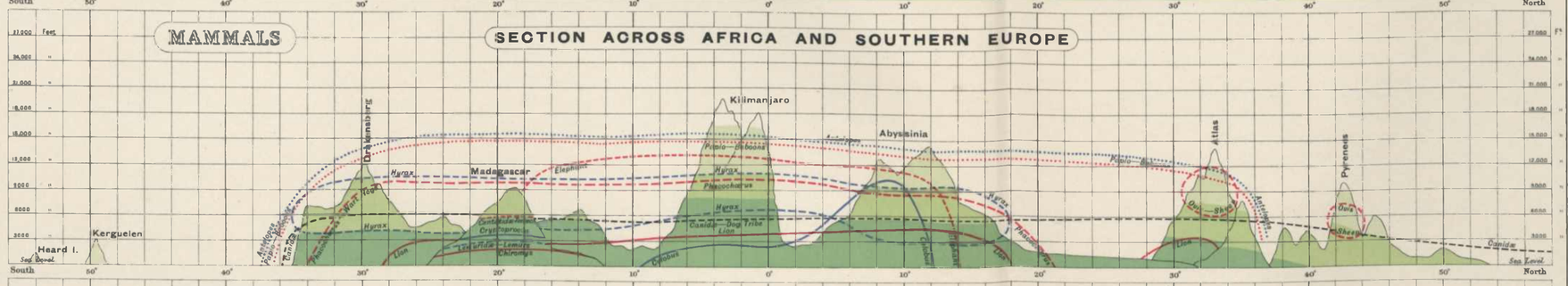

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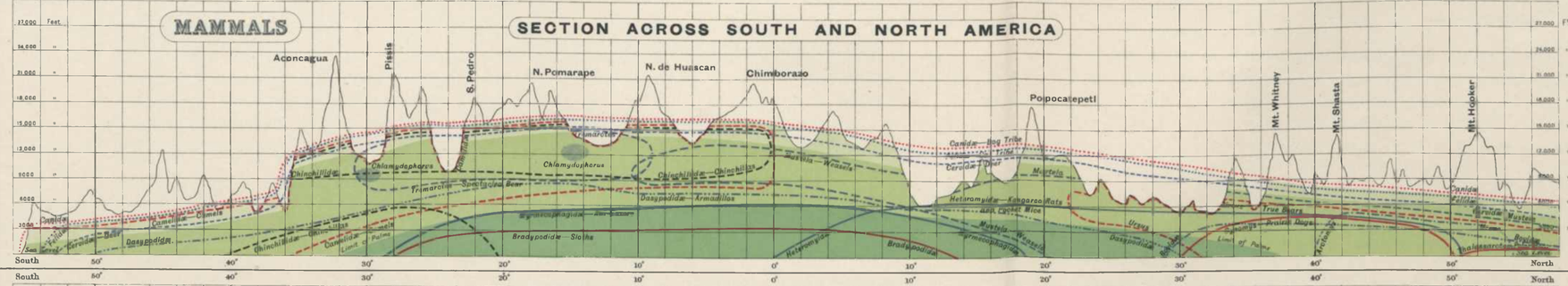

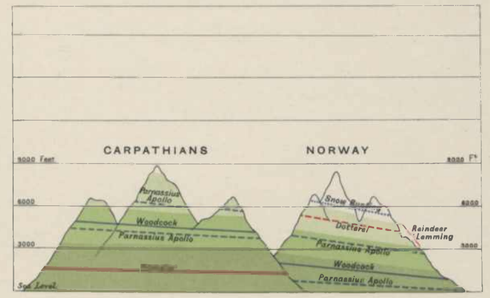

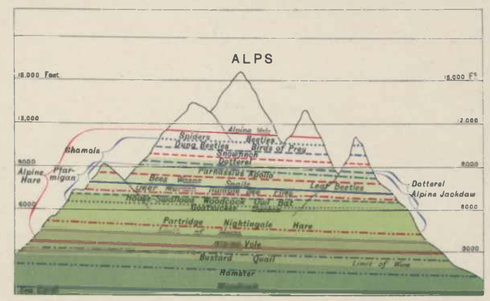

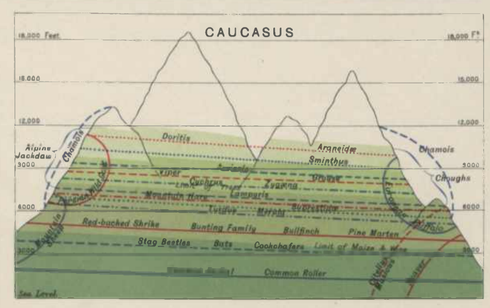

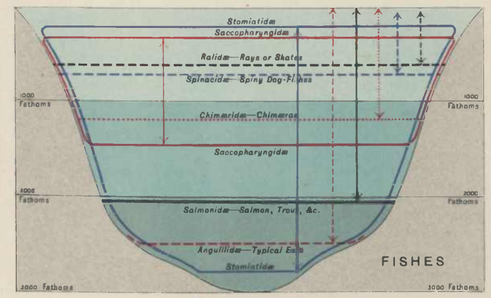

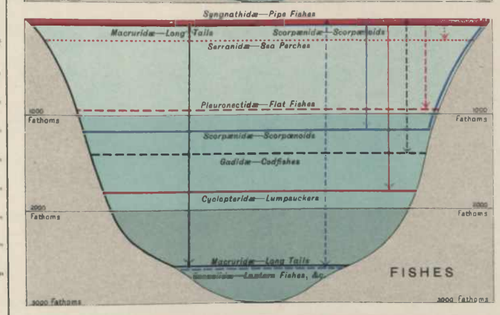

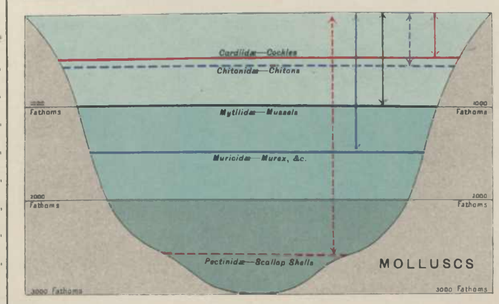

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