

# ZOOLOGY OF AUSTRALIA:

BY THE

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THE Fauna of Australia is, taking the Animal Kingdom as a whole, extremely rich and varied; it is also more distinctively local in its general character than that of any other large area of the earth's surface. But, though the strictly Australian character exists throughout, the Fauna varies considerably in different parts of the country, the variations being evidently caused in some instances by differences in soil and climate, and in others by contiguity to other Zoological regions.

Those which are produced by soil and climate alone,—such, for instance, as the marked difference in the Fauna of the East Coast Districts and the huge basin of the interior west of the Coast range,—are evidently mere changes in the indigenous Fauna, brought about by the instrumentality of these causes exercised over an immense period of time; while the still more marked distinctions between the Zoological productions of the southern and temperate regions of Australia and the tropical northern parts, though, no doubt, also much influenced by climate, may also be traced to the vicinity of the Indo-Malayan islands and seas, from which, undoubtedly, many of the North Australian Birds, Butterflies, Fishes, &c. have been derived. Wallace, in his great work on “The Geographical Distribution of Animals,” divides his Australian Region into—1, The Austro-Malayan; 2, The Australian; 3, The Polynesian; and 4, The New Zealand Sub-regions.

It is to the second of these only, the Australian—the Islands of New Holland and Tasmania—that the following observations will apply. But of the Zoology even of this limited portion of the whole region there is yet much to be learnt. Large portions of the north-west and centre of Australia are still a *terra incognita*, and even in the best known districts the smaller forms of Animal life have been but little investigated.

To begin with the Sub-kingdom *VERTEBRATA*. The Class first in rank and importance is the **Mammalian**, and in this Australia occupies certainly the most unique position in the universe. The absence of most of the Orders of this Class common in other parts of the world, and the prevailing

presence of Orders almost unknown except in Australia, are the most remarkable features of the Mammalian Fauna in Australia. The paucity of numbers is also a striking feature, the entire number of known species not exceeding 160 of all Orders.

The BIMANA are represented by a variety or species of the genus *Homo*, supposed to have migrated from countries north of Australia at some remote period. The Australian Blackfellow, as he is called, is believed to belong to the division of the human race known as the "Oceanic Negro," and though he does not present much resemblance to the Papuan, there can be little doubt but that both races emanate from the same source or centre.

The Order QUADRUMANA is entirely absent from Australia. The FERÆ are also unrepresented, with the exception of the Native Dog (*Canis dingo*), which in all probability is only coeval with man as an inhabitant of Australia. The PINNIPEDIA are represented by a few species of Seals, common to other parts of the Pacific as well as the Australian Coasts.

The CETACEA are mostly of wide range, and can scarcely be said to belong to any country; but the seas round Australia abound in whales of several species, and the shores swarm with porpoises. One genus, however, is peculiar to the warm seas of Northern Australia,—a species of Manatee (*Halivore Dugong*), an animal much valued for the medicinal qualities of the oil which it yields.

The important Order UNGULATA is entirely absent from Australia. There is not even a Native Pig, though two species are found on the adjacent island of New Guinea. Since the advent of the white man all, or nearly all, of the most useful animals of this Order have been successfully acclimatized. The Orders PROBOSCIDEA, EDENTATA, and INSECTIVORA are also totally unrepresented. The CHIROPTERA number about 30 species; of these five belong to the PTEROPODIDÆ or Frugiverous Bats, generally called Flying Foxes, and they are all probably importations from New Guinea and the islands of the Dutch Archipelago. The Insectivorous Bats are chiefly of the genera *Harpypia*, *Mollossus*, *Taphozous*, *Rhinolophus*, *Nyctophilus*, *Scotophilus*, *Vespertilio*, and *Nycticejus*.

The great Order of RODENTIA is limited in Australia to about 27 species of the Family MURIDÆ, and these are distributed thus:—15 species are placed in the genus *Mus*, nine in the genus *Hapalotis*, a genus only differing from *Mus* in the large ears and elongated tail, and three or four species of the genus *Hydromys*, the Beaver Rats of Australia and Tasmania.

But it is in the remaining two Orders of the Mammalia that Australia shows the greatest dissimilarity to the rest of the world.

The MONOTREMATA and MARSUPIALIA, the two Orders in question, comprise all the Implacental Mammalia known. The first of these, the MONOTREMATA, consists of two genera only—*Echidna* and *Ornithorhynchus*—the first (*Echidna*), containing three species—one found in New Guinea; and the other (*Ornithorhynchus*) of one species, exclusively Australian. The embryology and true position of these animals have long been a puzzle to naturalists; but investigations lately made by Mr. Caldwell, Fellow of Caius College, Cambridge, are likely to set all doubts at rest for ever. The results of his labours have not yet been published, but it is known that he has ascertained beyond question that both genera are oviparous. Dr. Miklouho Macleay has also lately been making observations on the temperature of the body of living Monotremata, and has found it to be extremely low for the class of animals to which they seem to belong, the temperature of the *Echidna* being not over 85° Fahrenheit, and that of *Ornithorhynchus* about 10° less, or 75° Fahrenheit.

The MARSUPIALIA form the main mass of the Australian Mammalia, an Order unknown elsewhere among recent animals, except in the case of the DIDELPHIDÆ (Opossums) of North America. This Order, to judge from the Fossil remains, had a wide and comprehensive range over the surface of the earth during the period known to geologists as the Jurassic, and the inference therefrom is that while other portions of the globe have been submerged since that period, and re-inhabited by a later growth of living things, Australia, or the greater part of it, has remained unchanged, except to the extent produced by extensive denudation and deep alluvial or glacial deposits during countless ages. Geological discovery bears out this hypothesis, inasmuch as it has demonstrated the existence, in the filled-up cavities of the Silurian Limestone Rocks and the deep Pleistocene deposits found throughout Australia, numerous bones of Mammals of extinct species, and some of gigantic size, but all Marsupial.

The existing Marsupials of Australia number a little over 100 species, and these may be very naturally divided into five groups, which very faintly represent, or are supposed to represent, some of the missing Orders of the Placental Mammals. Thus the grass-eating Kangaroos are said to represent the UNGULATA; the Leaf-eaters—Opossums, Flying Squirrels, &c.—the RODENTS; the Entomaphaga, the INSECTIVORA; and the Sarcophaga, the FERÆ. However, these are only relations of analogy—there is no real affinity. The first of these groups,

the grass-eating Marsupials, or MACROPODIDÆ, number over 50 species, and comprise the genera *Macropus*, *Halmaturus*, *Petrogale*, *Dendrolagus*, *Oxychogalea*, *Lagorchestes*, *Bettongia*, *Hypsiprymnus*, and *Hypsiprymmodon*. The second group, the ENTOMOPHAGA, are burrowing animals, and comprise the genera *Parameles* or Bandicoot, *Chæropus*, and *Tarsipes*: they number only eight species. The PHALANGISTIDÆ include the Opossum tribe, numbering about 10 species, of the genera *Phalangista*, *Dromicia*, *Cuscus*, and *Dactylopsila*; and the Flying Squirrel tribe, about six species, of the genera *Petaurista*, *Belideus*, and *Acrobata*. The Leaf-eaters will also include the very peculiar Sloth-like form of the *Phascolarctos* or Native Bear.

The Sarcophaga, or Carnivorous Marsupials, should properly be limited to the *Dasyurus* or Native Cat of Australia, two species of *Thylacinus* or Tiger of Tasmania, found fossil in Australia, and the *Sarcophilus* or Tasmanian Devil. But there are also a number of smaller Carnivorous Marsupials throughout Australia which can scarcely be classed with these extremely ferocious animals: these are *Chaetocercus*, 1 species; *Phascogale*, two species; *Antechinus*, about eight species; *Podabrus* six species, chiefly inhabitants of trees; and of non-arboreal genera, *Antechinomus*, and the very remarkable West Australian Anteater, *Myrmecobius*.

One very anomalous Australian Marsupial remains to be mentioned—"The Wombat." There are four species known to exist at the present day; they are root-eating animals of rather large size, burrow deep in the ground, and are nocturnal in their habits; the abundant fossil remains of *Diprotodon*, an allied genus, lead to the belief that the Wombats were once more numerous and larger than they are now. They are placed in the Marsupial Family of RHIZOPHAGA and the genus *Phascolomys*.

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### Class Aves.

The Birds of Australia are fairly numerous, and remarkable for the beauty of their plumage. The isolated character of the Fauna is less marked in this Class than in the Mammals, as might be expected from their superior powers of locomotion, but still it possesses a very distinctive character.

The most complete list of the Australian Birds is that of E. P. Ramsay, F.R.S.E., published in 1877 in the Proceedings of the Linnean Society of New South Wales. He gives there the number of the described Birds of the country as 744, and a few species added since brings the number up to 760, or about

one-sixteenth of the total number of known birds, estimated at 12,000 species.

The ACCIPITRES of Australia number about 40 species out of a total of 600, chiefly of the Family Falconidæ. The STRIGIDÆ are not numerous, and the VULTURIDÆ are not represented at all. The most noticeable species in this Order are of the sub-genera *Gypoictinia* and *Lophoctinia*.

The Order VOLITORES, or the FISSIROSTRES, is well represented in some of its families; thus, the CAPRIMULGIDÆ number nearly 20 species, chiefly of the Australian genus *Podargus*, and the ALCEDINIDÆ about 15 species, those of the genus *Dacelo*—generally known as “Laughing Jackasses,” from their peculiar cry—being of large size and peculiar to the Australian region. There are five species only of the HIRUNDINIDÆ, and one of the CYPSELIDÆ. A species of *Eurystomus* and a *Merops* are also found in the country, both summer visitants from New Guinea. The families CAPITONIDÆ, BUCEROTIDÆ, TROGONIDÆ, TROCHILIDÆ, &c. are entirely unknown.

The Order PICI is also unknown in Australia. The SCANSORES are represented by the CUCULIDÆ, of which Family there are 15 species, and some of the genera, such as *Scythrops*, *Eudynamys* and *Centropus*, are confined to the Australian region. The Order PSITTACI is distinguished for the variety and beauty of the Australian species. They number 70 out of a total of 560 species, or one-eighth of those of the whole world. Among the Cockatoos the genus *Calyptorhynchus*, or the Black Cockatoos, are the most characteristic forms. Among the Parrots the most populous genera are *Platycercus*, *Psephotus*, and *Euphemia*.

The Order PASSERES occupy in Australia, as in all the rest of the world, the most important position as regards numbers. Many families of them, familiar objects in other parts of the world, are here wanting, and those which are represented here are for the most part of distinct genera.

The NECTARINIDÆ count only 1 *Dicaeum* and 1 *Cinnyris*. The MELIPHAGIDÆ, on the contrary, are a Family peculiar to Australia, seeming to occupy the position of the Trochilidæ in America and the Nectariniidæ of Asia. They are very numerous, consisting of 19 genera and nearly 200 species. The genus *Ptilotis* is the most numerous and most typical of the group.

The CERTHIDÆ and SITTIDÆ are represented by a few species of *Climacteris*, *Orthonyx*, and *Sittella*. The PITTIDÆ consist of one genus only, *Pitta*; four species are Australian, the others belong to the tropical regions north of Australia. Under the Family of ORIOLIDÆ may be classed a number of truly Australian Genera, including the singular Bower Bird, several

special species, the Regent Bird, and *Oreocincla* and *Cinclosoma*.

Among the large Family of AMPELIDÆ there is but one Australian genus, *Pardalotus*, but it constitutes a peculiar Australian group. In the family DICRURIDÆ the genus *Artamus* furnishes eight species, and is almost entirely Australian.

The LANIIDÆ, CAMPHEPHAGIDÆ, and MUSCICAPIDÆ are rich in species of the genera *Grauculus*, *Camphephaga*, *Pachycephala*, *Colluricincla*, *Falcunculus*, *Manucodia*, *Rhipidura*, *Seisura*, *Myiagra*, *Micræca*, *Monarcha*, *Gerygone*, *Smicornis*, *Petroica*, *Melanodryas*, *Pæcilodryas*, *Drymodes*, *Eopsoltria*, and *Memura*, the last the most remarkable of all Australian genera. The weaker forms of the DENTIROSTRES, which may be included in the Family SYLVIIDÆ, are also numerous, and the genera are almost entirely Australian; they include the genus *Malurus*, *Cisticola*, *Acanthia*, *Geobasilea*, *Ephthianura*, &c. Of the ALAUDIDÆ there are only two species known; of the STURNIDÆ one only. The FRINGILLIDÆ, the most numerous Family in other parts of the world, are almost unknown; the few species there are belong to the *Ploceidæ* section and to the genera *Estrelida*, *Munia*, *Donacola*, *Emblema*, *Poephila*. Of the CORVIDÆ there are but four species, and these are of mostly strictly Australian genera. The lovely Family of the PARADISIDÆ does not, except in the instances of the three species of *Ptilorhis* (the Rifle Birds) reach so far south as Australia.

The Order COLUMBÆ is rather richly represented as to numbers, and remarkably so as to beauty of plumage. In the north or tropical parts, the Polynesian group comprised in the genus *Ptilopus* is represented by four species; a few large fruit pigeons of varying genera are also found abundantly in Northern Queensland, while the more temperate parts of Australia possess a number of species of Ground Pigeons of the genera *Phaps*, *Geophaps*, *Lophophaps*, *Ocyphaps*, *Geophelia*, &c.

In the next Order, the GALLINÆ, Australia shows a greater departure from the rest of the world than in any other Order of the Aves. There is really nothing in common with any other country, except the possession of a few species of Quails, and these mostly are only occasional birds of passage, and come probably from Central Asia. The PTEROCLIDÆ, the TETRAONIDÆ, with the exception just mentioned, the PHASIANIDÆ, and all the well known GALLINÆ of other countries are entirely absent, and the Order is represented by a family of extraordinary appearance—the *Megapodidæ*, or Mound-builders. This family comprises three genera—*Leipoa*—one species inhabiting the arid wastes of the interior; *Talegalla*—one species confined to the East Coast, as far south as New South Wales; and *Megapodius*—two species, limited to the extreme north. Of this last genus, species have been found on

many of the islands of the North Australian Coast and Polynesia.

The Order GRALLÆ, or Waders, numbers about 80 species, but they do not differ so much from those of the rest of the world as in the preceding Orders. The most noticeable genera are *Esacus*, *Porphyrio*, and *Tribonyx*.

The ANSERES, or Natatores, number about 150 species in Australia, but present few local or distinctive characters. The ANATIDÆ are represented by one Swan (a black one), and about 20 species of Ducks. The genus *Cereopsis* is Australian, and so is *Anseranas*. *Biziura* is also a remarkable form. The Gannets, Cormorants, Darter, and Pelican are, with the exception perhaps of the last, the same the wide world over. The Frigate and the Tropic Bird are found in the warm seas of the north. The *Procellariidæ* are numerous at sea, the *Laridæ* and *Sternidæ* on the shore. Divers and Grebes are numerous, and in the extreme south the Penguins make their appearance. Indeed it may be said that all the Ocean Birds, from the ALCIDÆ of the Antarctic Regions to the PHÆTODONLIDÆ of the Tropics, are to be found within the circuit of the Australian Seas.

The STRUTHIONES form an Order of which there are few living species; and of the five known living genera—*Struthio*, *Rhea*, *Dromaius*, *Casuarius*, and *Apteryx*—two are exclusively of the Australian Region. The genus *Dromaius* (the Emu) consists of two species, one of Eastern and one of Western Australia. The other genus, *Casuarius* (the Cassowary), comprising one Australian species, is also found in New Guinea and New Caledonia.

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In the Third Class of the Vertebrata, the **Reptilia**, Australia sustains in a marked manner its distinctive character. The CHELONIA are, with the exception of the marine TESTUDINÆ, or Turtles, which are common to all the seas of the Tropical Ocean, of strictly Australian species, and are found in every river in the country; and though not so numerous in species as the Order appears to be in America, yet when well known they will be found to be much more numerous than is at present supposed. Eight species only are recorded in Krefft's "List of Australian Vertebrata," published several years ago, belonging to the genera *Chelodina*, *Chlamys*, *Elseya*, all solely Australian.

The CROCODILIA are limited in Australia to two species, so far as at present known. One of them, *Crocodylus porosus*, is common about the mouths of all the rivers of Australia within the line of the tropic, and indeed sometimes south of it. The other, *Tomistonia Krefftii*, a Gavial, has not been seen except in rivers in the vicinity of Rockingham Bay.

The Third Order of the recent Reptilia (for in this Class there are whole Orders known only in the fossil state) is the OPHIDIA. They are numerous in all parts of Australia, but the tropical districts are much the most productive. In a Census of the Snakes of Australia, by the Hon. W. Macleay, published in the Proceedings of the Linnean Society of New South Wales in 1884, the total number of species of the Order in Australia is put down at 108, and of these 73 are venomous; and deducting the species of *Hydrophidæ*, which, being Pelagic animals, are not limited to Australia, it leaves the number of venomous Land Snakes of Australia at 58, a number far in excess of those of India and America.

These are all Colubrine Snakes, of the Family ELAPIDÆ, with the exception of one genus, *Acanthophis* (represented by one species, known as the "Death Adder"), which shows some affinity to the VIPERIDÆ. The genera of these venomous Snakes (almost exclusively Australian) are *Diemenia*, *Pseudonaja*, *Pseulecthis*, *Brachysoma*, *Furina*, *Rhinclaps*, *Brachyrophis*, *Petrodymon*, *Cacophis*, *Vermicella*, *Elapocranium*, *Hoplocephalus*, and *Tropidechis*.

There are 7 species of the TYPHLOPIDÆ known, and 11 species of the BOIDÆ, of the genera *Morclia*, *Liasis*, *Aspidiotes*, and *Nardoa*.

The COLUBRIDÆ are far from numerous. One species of the genus *Coronella* has been described, one of *Herbertophis*, one of *Zamenophis*, and two of *Tropidonotus*. Several species of DENDROPHIS are found in the tropical forests of the north; one species only extends into the temperate regions of New South Wales.

Three species of the DIPSADIDÆ have been noticed. The extreme north-west of the country has supplied single species of the genera *Cerberus*, *Myron*, and *Fordonia*, all of the family HOMALOPSIDÆ. The CROTALIDÆ are entirely unknown in Australia, and the VIPERIDÆ are represented by only one species, the "Death Adder," mentioned previously.

The SAURIA, or Lizards, are also numerous. The total number of species of the Order in the world may amount to 900, and of these about 150 are Australian, or one-sixth of the whole. The families AMPHISBENIDÆ, CHAMELEONIDÆ, IGUANIDÆ, LACERTIDÆ, AMEINIDÆ, CERCO SAURIDÆ, CHALCIDIDÆ, and ZONURIDÆ are entirely absent from the country.

The GEISSOSAURA are very numerous; indeed the families GYMNOPHTHALMIDÆ and SCINCIDÆ are chiefly Australian; the snake-like genera *Pygopus*, *Delma*, *Aprasia*, and *Lialis* are solely so. The same is the case with the Gymnophthalmic genera, *Cryptoblepharus*, *Moretria*, *Menelia*, *Miculia*, and *Serista*. The Australian genera of the Scincidæ are *Hinulia*, *Mocoa*, *Lygosoma*, *Tetradactylus*, *Hemiergus*, *Chelomeles*,



*Omolepida*, *Siaphos*, *Rhodona*, *Soridia*, *Trachydosaurus*, *Cyclodus*, *Silubosaurus*, *Egernia*, *Tropidoleipsma*.

The NYCTISAURA are also fairly numerous, and are represented by the genera *Aedura*, *Straphitra*, *Diplodactylus*, *Peripiu*, *Gehyra*, *Goniiodactylus*, and the very peculiar and strictly Australian genus *Phyllurus*.

The tribe of the STROBILOSAURA is confined in Australia to the family AGAMIDÆ, and to the genera *Tiaris*, *Chelosauria*, *Gindalia*, *Physignathus*, *Chlamydosaurus*, *Lophognathus*, *Diporophora*, *Grummatophora* (many species), and the very remarkable genus, *Moloh*.

The Class **Amphibia** is limited in Australia to the one Order, the BATRACHIA SALIENTIA, or Tailless Amphibia. The *Cæciliidæ* and the *Urodele* are unknown. The number of described species is about 50, and nearly half of these belong to the family of *Hylidæ*, or Tree Frogs, and none of the genera of that family are peculiar to the country.

The RANIDÆ, on the other hand, exhibit a decidedly local character; the genera *Myzophyes*, *Lymnodynastes*, *Cryptolis*, *Crinia*, *Hyperolia*, *Cheiroleptis*, *Heleioporus*, *Pseudophryne*, *Notadon*, and *Myobatrachus* being strictly Australian.

The Fifth Class of the Vertebrata, the **Pisces**, are very numerous in Australia. They were catalogued by the Hon. W. Macleay, F.L.S., at 1291 species in 1883, and as over 100 species have since been described by Chas. de Vis, Director of the Queensland Museum, they may now be estimated at 1400, or one-seventh of the total number of species of fish on the globe, which may be roughly taken at 10,000. There is, as might be expected from the limitless nature of the element they inhabit, less speciality among the Fishes than among the Land Animals; but still there is sufficient to give an easily recognisable character to the Australian Fauna. The Fresh-water Fishes, though not numerous, are solely, or almost solely, of genera unknown elsewhere. The Fishes of the Sea Coast are to a much less degree distinct from those of other places, while the Ocean, or Deep-sea Fishes, seem to differ very little from those of the rest of the world.

There are among this Class also, as with the Birds, wide differences in the Fauna in different parts of Australia, arising from climate, temperature, currents, and other causes; thus the Fishes of the Victorian, South Australian, and Tasmanian Coasts are almost entirely different from those of the warm regions of the north, where the Polynesian type predominates; mixed towards the north-west with Indo-Malayan forms; while the coast of New South Wales, with its warm current, forms

the meeting-ground of the Fishes of both zones. The Fishes of the West Coast are but little known.

There are about 200 species of Percoid Fishes in Australia. Of the group PERCINA, there are a few species of *Lates*, which are the best fishes of the East Coast and Victorian rivers of strictly Australian genera—*Microperca* and *Enoplosus*. The SERANINA or Rock Cod groups are numerous, the genus *Serranus* generally occupying the warmer seas, and *Plectropoma* the temperate; *Mesoprion* is also numerously represented. There are several other genera, but the most distinctive are *Myriodon* and *Glaucosoma*. There are two species of *Priacanthus* in Australian waters. The *Apogonina* are small fishes, and present no forms of a marked local character. The genus *Ambassis* is found in the north, but in other parts its place seems to be occupied by *Pseudo-ambassis*, a genus only found in Australia; *Edelia*, *Acanthoperca*, and *Mannoperca* are also Australian genera belonging to this group. Some species of the genera *Apogon* and *Apogonichthys* are inhabitants of fresh water, and Castelnau's genus *Gulliveria* is entirely a river fish. The group GRYSTINA consists, with a few exceptions, of freshwater fishes, mostly of considerable size and great value. The chief exception to this rule is the genus *Arripis*, of which there are two species;—the one best known, *Arripis salar*, the Salmon of the Colonies, is a handsome fish of large size, which frequently appears on the coast of New South Wales and Victoria in large shoals, and is most destructive to other fish; it is of little value for food, and in form and habit resembles more one of the raptorial *Scombridae* than a true perch. The Freshwater genera of this group are *Oligorus*, the genus of the far-famed "Murray Cod," of which some species are found in rivers on the Eastern Coast, and also in salt water. *Ctenolates*, several species, fine fish inhabiting the Murray system of rivers; *Murrayia*, the same; *Riverina*, the same; *Dules*, northern rivers; and *Therapon*, many species inhabiting all rivers, and some species Marine Fishes.

The group PRISTIPOMINA contains a number of species of the genera *Pristipoma*, *Dagrammo*, *Gerres*, *Scolopsis*, *Dentex*, *Apharens*, &c.; only two genera seem remarkable—*Hyperoglyppe* and *Histiophorus*: the latter contains two species, large fishes, and apparently very rare.

The SQUAMIPINNES are rare in the temperate parts of the Australian seas; but in the tropical regions the genera *Chatodon*, *Heniochus*, *Holacanthus*, and *Chelmo* become abundant. The genera *Scorpiis* and *Atypus* placed in this family are almost exclusively Australian forms. The NANDIDÆ are only represented by a very few species of *Plesiops* and *Trachinops*, Australian forms, to which may be added the genus *Ruppellia* of Castelnau. The true NANDIDÆ (fresh-

water fishes), are unknown. The MULLIDÆ number about 12 species of the genera *Upeneus*, *Upeioides*, and *Mulloidis*; they are most abundant in the warm seas.

The SPARIDÆ are numerous. The section of these which are vegetable feeders and have incisor teeth is largely represented by the genera *Girella* (Blackfish), *Pachymetopon*, *Tephræops*, and *Haplodactylus*; those with molar teeth embrace some of the most valuable food fishes of the country, including species of *Pagrus* (the Schnapper), *Chrysophrys* (the Black Bream), *Lethrinus*, and *Sphærodon*. The *Cirrhitidæ*, also very valuable as food fishes, are represented by genera entirely, or almost entirely, Australian; these are *Latris* (the Trumpeters), *Chilodactylus* (the Morwhangs), *Nemodactylus*, *Dactylophora*, *Psilocranium*, and *Mendosoma*,—this last a Chilian genus.

The SCORPÆNIDÆ are more remarkable than numerous; *Sebastes* and *Scorpæna* are widely distributed genera, but the others are for the most part confined to Australian waters, and are some of them of peculiar forms. Among these are *Glyptanthen*, *Pteros*, *Centropogon* (some of them river fish), *Holoxenus*, *Pentaroze* (the Forty-skew), *Agriopus*, *Aploactis*, and *Synancidium*.

The TEUTHIDIDÆ number about 10 species, with one or two exceptions all inhabitants of the coral reefs of the north, and of wide range. The BERYCIDÆ are few; there is a fine *Beryx* (the Nanygai), found on the East Coast. Three species of *Trachichthys* (a very extraordinary form, peculiar to Australia and New Zealand) are known. *Monocentris* is said to have been found, and the few species of *Myripristis* and *Holocentrum* included in the list of Australian Fishes are all from the tropical parts of the country.

There are five or six species of the KURTIDÆ, of the genera *Pempheris*, *Neopempheris*, and *Kurtus*. The POLYNEMIDÆ are met with chiefly in the estuaries of the Queensland rivers, and even in fresh water; there are in all six species known to be inhabitants of Australia, and some of these attain a great size.

Six or seven species of SCIÆNIDÆ are also found in Australia. The *Sciæna* of the Mediterranean is said to be the same as the Australian *Sciæna Antarctica*. *Otolithus*, or Teraglin, is a well-known Fish in Sydney. The other two genera, *Corvina* and *Umbrina*, seem to frequent the estuaries and river mouths of Queensland. The XIPHIIDÆ and TRICHIURIDÆ are represented, but being Fishes of enormous range they present no Australian peculiarity. The ACANTHURIDÆ are numerous, but inhabit chiefly the coral seas of the North and for the most are identical with the species of the Polynesian seas. The CARANGIDÆ are in Australia, as in some other parts of the world, a most

important family. They number about 40 Australian species, chiefly of the genus *Caran*, and are most abundant in the warm latitudes, while the genus *Seriola*, including the "King Fish" and "Samson Fish" of Sydney, and the "Yellow Tail" of Melbourne, fishes of very large size, are only found in the temperate zones. The genus *Neptonemus* is the only one of limited range, and that extends to New Zealand. The NOMEIDÆ, CORYPHÆNIDÆ, and CYTTIDÆ, everywhere families of small extent, are in Australia represented by two species each, *Nomens Gronovii* and *Platylathens cultratum*, a genus limited to Norfolk Island and New Guinea, of the first of these families; *Coryphæna punctulata*, and *Brama Raii* of the second, and *Cyttus Australis* (John Dory) of the third. The SCOMBRIDÆ are all Ocean Fishes, and of unlimited range; they are therefore all found, as might be expected, in one or another part of the Australian seas. All, or nearly all, the genera are represented, and a few new species have been described, but there seem to be no marked or distinctive local characters. The TRACHINIDÆ include some very remarkable Australian forms. Among the group URANOSCOPINA are the extraordinary genera *Kathetostoma* and *Leptescopus*. Among the TRACHININA are *Percis*, *Sillago*, *Aphrites*, and *Bovichthys*,—almost exclusively Australian or South Pacific forms. *Opisthognathus* is another curious genus abundant in these seas, though not exclusively confined to them. The BATRACHIDÆ are represented by four species of the genus *Batrachus*. Of the PLEDICULATI there are 12 species of *Antennarius*, chiefly from the tropical regions of Queensland, and three species of the curious Tasmanian genus *Brachionichthys*. The COTTINA are richly represented by the genus *Platycephalus* (the Flatheads), which abound in all the Indian seas. Twenty species are found in Australia, some of them being among the most valuable food fishes of the country; the other Australian COTTINA are limited to a few species of *Trigla*, *Lepidotrigla*, and *Dactylopterus*. The GOBIIDÆ are numerous, but do not seem to differ much from those of other parts of the world. The species are chiefly of the genera *Gobius*, *Apocryptes*, *Gobiosoma*, *Gobiodon*, *Periophthalmus*, *Eleotris*, and *Callionymus*; the only entirely Australian genus is *Aristeus*, which Castelnau has placed with this family. It is found in rivers only. The BLENNIDÆ are numerous and some of them of eccentric appearance, the genus *Pataæus* most remarkably so. The genera richest in species are *Petroseirtes*, *Salarius*, and *Cristiceps*. There are several other genera, but with few species. The SPHYRÆNIDÆ are represented by two species of *Sphyræna* and a genus (strictly Australian) possessing one species, *Lanioperca mordax*, generally placed in this family.

The ATHERINIDÆ seem to be abundant about the river mouths in all parts of Australia, but only a small number have been described, and these, with the exception of the genus *Nematocentris*, present no remarkable features.

The MUGILIDÆ number about 25 species; they are to be seen sometimes in enormous shoals, and are inhabitants of the coasts, estuaries, and rivers. The species differ on different parts of the Coast, but they are everywhere fishes of the finest quality, and might be converted into a most valuable article of export. The genera are *Mugil*, *Agonostoma*, and *Myxus*, the last two solely Australian.

The curious Gasterosteiform fishes, the FISTULARIDÆ, are represented by one *Fistularia* and one *Aulostoma*; the CENTRISCIDÆ by two species of *Centriscus* and two of *Amphisile*. The GOBIOSCIDÆ possess two genera in Australia, the Tasmanian genus *Crepidogaster*, of which there are two species, and one species of *Gobiosox*.

The OPHIOCEPHALIDÆ are represented by one species only—*O. striatus*, Bl. The TRACHYPTERIDÆ are seldom seen. *Regalecus gladius* is said to have been caught on the Tasmanian Coast. *Regalecus Jacksonensis* has been described by Ramsay from Port Jackson from one specimen, and a specimen of *Trachypterus Alirelis Kner* has been lately taken on the East Coast of Tasmania. One species of the NOTACANTHI, *Notacanthus seespiris*, has been taken in King George's Sound.

The POMACENTRIDÆ are numerous in the warm latitudes of North Australia. *Parma* and *Glyphidodon* are the only genera found in the temperate regions.

The LABRIDÆ must number quite 100 species in Australia. The genera are for the most part identical with those of the Indian Seas. There are 17 genera in all. The most numerous in species of those inhabiting tropical seas are *Charops* and *Pseudoscarus*. The most populous genus of the Southern Coasts is *Labrichthys*, which numbers nearly 40 species. A very extraordinary genus—*Siphonognathus*—perhaps the most marvellous looking fish in existence, is placed by Gunther in this family, and in the group ODACINA. It is found on the South Australian Coast.

The next Order of Fishes—the ANACANTHINI—are not largely represented in Australia, but an Australian character is distinct throughout. The GADOPSIDÆ constitute a strictly Australian family, having only one genus and one species. It seems to form a link between the Acanthopteryginous fishes and the Gadidæ. It is found in most of the rivers of New South Wales, Victoria, Tasmania, and South Australia.

The LYCODIDÆ are represented by a single species of a single Australian genus, found in Northern Queensland. The GADIDÆ, which occupy such a prominent position in other

regions, both for their numbers and their value to the human race, are here few in number and unimportant, being limited to a few species of *Lotella*, *Physiculus*, and *Pseudophysis*. The OPHIDIDÆ are far from numerous, but are sufficiently interesting. A species of *Dinemolichthys* comes from the extreme North. A *Gemypterus* (two feet long) is found in Hobson's Bay. *Typhlonus* and *Aphyonus* are genera found at great depths ("Challenger") on the North-east Coast, and *Fierasper* and *Congrogadus* come from the coral reefs of the North. The MACRURIDÆ of Australia consists of one species of *Macrurus* and three of *Coryphænoides*, all from the South Coast, one at a depth of 2000 fathoms ("Challenger.")

The PLEURONECTIDÆ of Australia number about 40 species. They are probably much more numerous, as the use of the trawl net, the only means of catching them, has never been introduced into the country. The well-known genera and species of this family in the European seas are represented in Australia by different genera for the most part, but there is nothing conspicuously distinctive. The SILURIDÆ are not numerous. Several genera are found in the fresh waters of the northern portion of Australia, and a fine species of *Copidoglanis* is abundant in most of the inland rivers. The genus *Cnidoglanis* is abundant on the East Coast. Species of *Arius* are found among the coral reefs.

The SCOPELIDÆ are deep sea fishes, and probably widely distributed. The genera chiefly represented in Australia are *Saurus* and *Saurida*. The beautiful *Aulopus* (Sergeant Baker) is not uncommon. *Scopelus* and *Alæpidosaurus* are also found occasionally. Of the STOMIATIDÆ two species have been found at depths of over 2000 fathoms, one on the North-west, the others on the South Coast ("Challenger.")

The great family of SALMONIDÆ is entirely unknown in Australia, with the exception of two very curious genera, each of one species, found in the rivers of the colder regions of the south. These are the genera *Prototoctres*, a small fish found in the Victorian and Tasmanian rivers, and *Retropinna*, also found in New Zealand rivers. The GALAXIDÆ constitute a family remarkable in many respects. They are found only in the rivers of the extreme south of South America, of the Falkland Islands, of the South of New Zealand, of Tasmania, of Victoria, and the rivers of New South Wales flowing from the great mountain range of the country. The peculiar distribution of these very peculiar fishes gives support to the belief held by many scientific men that a great Antarctic Continent at one time extended from America to Australia. About 20 species of the one genus *Galaxias* have been described from Australia.

All the genera of the SCOMBRESCODIÆ are found in

Australasia. One genus—*Hemirhamphus*—containing several species, all known as “Gar Fish,” is highly valued as an edible fish. The large families of CYPRINIDÆ and CYPRINODONTIDÆ are unrepresented in Australia. One species of the GONORHYNCHIDÆ is found on the South Coast. In the northern rivers of Queensland a large fish of a semi-Ganoid character is found; it is the *Burramuuli* of the Aborigines, and is of the genus *Osteoglossum*, a genus known to exist also in rivers of tropical America and the East Indies. It is one of the most remarkable of Australian fishes.

The CLUPEIDÆ are rather numerous; about 25 species are recorded in Macleay’s catalogue. They are chiefly of the genera *Eugrantis* and *Clupea*, and several of them frequent fresh water. One species—*Clupea sagax*—almost identical with the English Pilchard, visits the coasts of Victoria and New South Wales at certain seasons in vast shoals, but no attempt has ever been made to catch and utilise them. A species of the ALEPOCEPHALIDÆ was dredged by the “Challenger” naturalists from a depth of 1400 fathoms in North Australian waters. The SYMBRANCHIDÆ of Australia consists of one species of *Symbranchus* and two of *Chilobranchnus*, a genus peculiar to Australia. The MURENIDÆ are abundant in the seas and many of the rivers of the country. The genus *Muraena* is most numerous about the coral seas of the north. The two very remarkable, though very distinct forms, *Leptocephalus* and *Pegasus*, generally ranked with the “TELEOSTEI,” are found in Australia.

The Order LOPHOBRANCHII is nearly Australian; that is, out of a total for the world of about 100 species there are nearly 50 Australian. Most of the genera known in other parts are represented, while there are several genera known only from Australia.

The Order PLECTOGNATHI is also of a decidedly Australian character. The SCLERODERMI, out of a total of about 100 species, number over 50 Australian, chiefly of the genus *Manacanthus* and *Ostracim*; while the GYMNOdontes, out of a total of 80 species, number quite 30, and several of the genera are solely Australian.

A species of *Orthogarisceus* seems to attain an enormous size in the Australian Ocean.

The GANOIDÆ, if represented at all, are represented by a very anomalous fish, peculiar to the Burnett and Dawson Rivers of Queensland. It is of the family Sirenoideæ, and is the analogue of the *Protopterus* of the rivers of tropical Africa, and of the *Lepidosiren* of the River Amazon of South America. Mr. Krefft first discovered its affinity to the fossil genus *Ceratodus*, of Agassiz, and named the genus *Ceratodus Forsteri*. The Embryology and mode of reproduction of this curious fish

has been investigated lately by Mr. Caldwell, a distinguished science student of Cambridge, and he has found its affinity in these respects to the Newt extremely close.

One species of the CHIMÆRIDÆ, of the genus *Callorhynchus* is found in the cold seas of the south. The PLAGIOSTOMATA occupy a marked place in the Fauna of Australia. The SELACHOIDEI, or Sharks, number about 40 species, in a total of about 126. All the main groups or families are included in the 40 species, and one family, consisting of the genus *Heterodontus*, may be regarded as almost an Australian form. It seems to have been common in the Jurassic period, but the only species known at the present day are two species Australian, one Californian, one Japanese, and one Galipago Islands. It is known in Australia as the "Port Jackson Shark." A remarkable discovery has lately been made of a large specimen of the Arctic Basking Shark (*Selache maxima*) on the South Coast of Victoria, near Portland Bay.

The BATOIDEI are not quite so proportionally numerous in Australia, being only about 25 species in a total of 140, but still a large proportion. All the families are represented, and some of the species are of great size. A specimen of *Ceratoptera* in the Australian Museum, Sydney, is of gigantic dimensions.

Of the Order MARSÍPOBRANCHII, the Family PETROMYZONIDÆ is represented by a species of *Mordacia*, a genus found also on the Chilian Coast, a species of *Neomordacia* exclusively Australian, three species of *Geotria*, a genus also found on the Chilian Coast, and one species of a strictly Australian genus *Yarra*, all from fresh or brackish water on the South Coast. One species of the Australian *Amphioxus*, or Lancelot, may be readily obtained on almost all parts of the Coast of Victoria and New South Wales by dredging at some depth on a sandy bottom.

## SUB-KINGDOM MOLLUSCA.

The Mollusca of the entire world must number nearly, if not quite 30,000 fossil and recent species. The number of Australian species is about 5000. This is a large percentage (1-6th) for Australia; but the climate, the large sea-frontage, the nature of the coast-line, all combine to make Australia a favourable resort for this sub-kingdom.

There is less, however, in the Mollusca than in any other sub-kingdom of the Animalia of a peculiarly Australian character to be observed,—in fact, except in one or two not very important peculiarities, there is nothing to separate the region from the rest of the world. Of the Class BRANCHIOPODA there are only about 80 existing species. Of these eight are Australian, one of the CRANIIDÆ, the rest TEREBRATULIDÆ; six of them found in Port Jackson. The Class LAMELLI-



BRANCHIATA, which includes nearly all the Bivalves, is said to number in all, Recent and Fossil, 14,000 species, and as it is calculated that there are quite 2000 species of existing species of this Class, it is evident that they must be proportionally exceedingly numerous in Australia. Almost all the Families are represented, those most conspicuously so being the PECTINIDÆ, AVICULIDÆ, MYTILIDÆ, ARCIDÆ (including the Australian genus *Trigonia*), UNIONIDÆ, TELLINIDÆ, SOLENIDÆ, and MACTRIDÆ. Of the Class PTEROPODA nearly every Family is represented, but there are not more than 15 Australian species known in all. The Class GASTROPODA, everywhere numerous, quite keeps up its character in that respect in Australia. The Order SCAPHOPODA is represented by 15 species of the DENTALIDÆ. The Order OPISTHOBRANCHIA is well represented. Of the Section ABRANCHIA there are six species. Of the NUDIBRANCHIA 125 species, of all the families. Of the INFEROBRANCHIA three species of *Phyllidia*; and of the TECTOBRANCHIA about 50 species, belonging to all the families. Of the next Order of the Gastropods, the PSOROBRANCHIA, there are little short of 1500 species in Australia against a total of 12,000. All the Families are to be found in Australia, but some in more than average abundance. The VOLUTIDÆ alone number 200 species, and Australia is considered the metropolis of the genus *VOLUTA*; the CYPRINIDÆ, CONIDÆ, TEREBRIDÆ, and MURICIDÆ are also very numerous. A species of the LITTORINIDÆ of the genus *Raulinia* is found alive in New South Wales, while another species of the same genus is found fossil in the Paris Basin. The last Order of the Gastropods, the PULMENIFERA, are sufficiently numerous, but only two of the five families are included in the Australian Fauna,—the AURICULIDÆ, of which there are about 100 species, and the HELICIDÆ, numbering in Australia nearly 400 species. Australia is regarded as the true home of the genus *Helix*. Of the small class of HETEROPODA, few in number everywhere, there are in all eight Australian species, belonging to the genera *Janthina* and *Reclusia*.

The CEPHALOPODA are abundant on the Australian Coasts. There are two species of *Nautilus*, one of *Spirula*, four of *Sepia*, two of *Sepiola*, ten of the *Loliginidæ*, three of *Octopus*, and three of the *Argonautidæ*. The Class TUNICATA are apparently very numerous, the ASCIDIOIDIA particularly, but they have never been much studied, and really very little is known about them. Of the BIPHORA there are four species of the *Salpidæ*.

The third Sub-kingdom of the Animalia, the ARTHROPODA is, as in all parts of the world, exceedingly numerous

in species. Pascoe calculates their numbers at 200,000. Of the four classes into which the Sub-kingdom is divided, the Insecta are very much the most numerous, and the position they occupy in the Australian Fauna will be best ascertained by taking the different Orders in succession.

Though all or nearly all of the most important Families of the various Orders are well represented, yet the genera are as a rule so distinct from those of other parts of the world, that anyone having the slightest acquaintance with Entomology would at a mere glance recognise an Australian collection.

The Order COLEOPTERA is the most numerous and best worked out in Australia of all the Orders of Insecta. The numbers of this Order for the whole world are estimated at 80,000, and of these quite 10,000 may be quoted for Australia, and it is probable that in a few years' time thousands may be added to that estimate.

The CICINDELIDÆ are not very numerous, and the most noticeable feature about them is the appearance of the African genus *Megacephala* and the South American genus *Tetracha*. The Family of the CARABIDÆ is a very large one, and presents marked peculiarities. The true CARABIDÆ, containing the genera *Carabus*, *Tefftus*, *Cychrus*, *Leistus*, *Nebria*, *Elophrus*, *Omophron*, &c., are entirely unrepresented, except by two species of *Calosoma* and the Australian genus *Pamborus*.

The TRUNCATIPENNES are also very numerous, but they differ very much from the Truncatipennes of other countries. A numerous group, the *Helluonidæ*, are almost exclusively Australian, as are also the genera *Xanthophlea*, *Homothes*, *Sarathrocrepis*, *Philophlens*, *Agonochila*, *Cataseopus*, *Scopodes*, *Silphomorpha*, and *Adelotopus*.

The MORIO group is fairly numerous, and includes the largest known Carabideous insect (*Campylænemis Schrætten*.) The BIPARTITI are numerous in Australia by a section of the Sub-Family of SCARITIDÆ, originally all contained in the Fabrician genus *Carenum*. It is now divided into ten genera, and comprises over 200 species. The FERONIDÆ and HARPALIDÆ are also numerous, but are, with a few exceptions, very like insects of the same families elsewhere. The BEMBIDIIDÆ seem to be few, but is not unlikely that their small size may have caused them to escape the notice of collectors. The Families DYTISCIDÆ and GYRINIDÆ are not numerous in representation, and exhibit no peculiar characteristics.

The PALPICORNIA are few in species, but all the families are represented.

The STAPHYLINIDÆ are remarkably few in number; the PSELAPHIDÆ seem to be abundant. The Clavicorn Beetles are not very numerous, but most of the families have their

representatives—the PAUSSIDÆ, in the genus *Arthropterus*, 40 species; the SCYDMENIDÆ in the genera *Scydmanus*, *Heterognathus*, &c., in all 16 species; the SILPHIDÆ, in one species of *Ptomaphila* and two of *Choleva*; and the SCAPHIDIDÆ, by six species.

The HISTERIDÆ number 25 species; the PHALACRIDÆ one species; the NITIDULIDÆ 30 species, chiefly of the genera *Brachypeplus* and *Carpophilus*. The TROGOSITIDÆ are represented by the curious genus *Leperina*. The PASSALINI are well represented; the COLYDIIDÆ by *Meryx*, *Deretrachus*, *Bothrideres*, and other genera, in all about 40 species. The CUCUJIDÆ and all the other families are sparingly represented. The LUCANIDÆ are not numerous, the prevailing forms being of the genera *Rhyssonotus*, *Lamprima*, *Dorcus*, *Lissotes*, *Figulus*, &c.

The LAMELLICORNIA are not numerous, but they possess in a marked degree a distinct Australian character. The country is singularly deficient in the large COPRIDÆ, though there are a good number of such genera as *Onthophagus* and the entirely Australian genera *Cephalodesmius* and *Tesserodon*. The Sub-Family CETONIIDÆ are few in species; they consist for the most part of beautiful insects of the almost entirely Australian genus *Schizorhina*, though in the Northern districts the Indo-Malayan genus *Lomaptera* makes its appearance. The RUTELIDÆ of other parts of the world are here represented by the very showy genera *Anoplognathus*, *Repsimus*, and *Calloodes*. The MELOLONTHIDÆ are very numerous, the most characteristic Australian genera being *Diphucephala*, *Phyllotocus*, *Mæchidius*, *Liparetrus*, &c. The DYNASTIDÆ are not numerous, but there are a few large and remarkable species of the family found in the country. The genera *Bolhoceras*, *Tro*, and the remarkable Australian genus *Cryptodus*, abound in species.

The STERNOXI are as abundant in Australia as in any part of the world. The BUPRESTIDÆ are enormously numerous, the most characteristic Australian genus *Stigmodera* possessing over 220 described species. The THROSCIDÆ and EUCNEMIDÆ are few in number. The ELATERIDÆ are very numerous, the chief genera being *Alaus*, *Tetralobus*, and *Monocrepidius*.

Of the MALOCODERMES Australia possesses no CEBRIONIDÆ; several RHIPICERIDÆ of the genera *Rhipicera*, and *Callirhipis*; two species of the DASCILLIDÆ; and of the TELEPHORIDÆ a very limited number, chiefly of the genera *Metriorrhynchus*, *Telephorus*, *Laius*, and *Carpurus*. The CLERIDÆ number over 100 species, many of them of genera almost entirely Australian. The other families of the Malocodermes are very sparingly represented.

The TETRAMERA are abundant, but show a remark-

able absence of some of the most populous groups of other parts of the world; thus the TENEBRIONIDÆ in Australia, though numerous enough, show few of the European, American, and African Sub-Families, and are chiefly represented by the genera *Amarygnus*, *Adelium*, *Cephaleus*, *Heleus*, and genera allied to them. The genus *Zopherosis* is one of the most remarkable of the Australian forms. All the Trachelidous families of the Heteromera are present, but some, as the CANTHARIDÆ and MELANDRYIDÆ, very sparingly.

The TETRAMERA are very numerous. The RHYNCPHARA alone must number in Australia quite 2000 species; the groups formed of the genera *Leptops*, *Catasarcus*, *Amycterus*, *Psalidura*, *Gonipterus*, *Rhinaria*, and the host of genera formed out of them, are among the many characteristic Australian forms in this division of the Tetramera.

The XYLOPHAGA are few in number.

The LONGICORNIA, on the other hand, abound. About 550 species have been described, chiefly by Mr. Pascoe; the genus *Phoracantha* among the CERAMBYCIDÆ, and *Sympheletes* and *Penthea* among the LAMIIDÆ, form the largest Australian groups. The PHYTOPHOGA are extremely numerous as a whole, particularly the families CRYPTOCEPHALIDÆ and CHRYSOMELIDÆ; in the latter family the genus *Paropsis*, an Australian form, numbers over 200 species. The EUPODIDÆ are few, but include the noticeable genera *Carpophagus* and *Megamerus*. The CASSIDIDÆ and HISPIDÆ are very few in number. The HATTICIDÆ and GALERUCIDÆ are fairly numerous. The EROTYLIDÆ are limited to about 10 species, mostly of the genus *Episcapha*. The Australian Trimerous Beetles consist of a few of the APHIDIPHAGA, of the genus *Epilachna*, and a very few of the *Fungicola*.

The next Order, the HYMENOPTERA, have not been so much attended to as the Coleoptera, so that no estimate can be formed of their numbers, but they are undoubtedly very numerous. The CYNIPIDÆ, CHALCIDIDÆ, PROTOTRUPIDÆ, and ICHNEUMONIDÆ are not only numerous, but they present some very remarkable forms. The FORMICIDÆ are still more abundant. The FOSSORES are also very numerous, the genus *Thynnus* constituting the most strictly Australian group. The APIDÆ are not very numerous. The TENTHRIDINIDÆ are represented only by the genera *Perga* and *Nematus*.

The Order ORTHOPTERA is, if not so numerous as the other Orders, quite as remarkable. BLATTIDÆ are numerous; the MANTIDÆ and PHASMATIDÆ of Australia are remarkable for their size and beauty. The GRYLLIDÆ contain species of very singular forms, and the ACRIDIIDÆ include some very destructive species of *Ædipoda* or Locusts. The EUPLEXOPTERA (Earwigs) are also numerous.

The NEUROPTERA and TRICHOPTERA have been little studied in Australia, and, with the exception of the large-sized species, are little known, but they are certainly rather numerous on the whole, the EPHEMERIDÆ being the least numerous, and the TERMITIDÆ the most so.

The LEPIDOPTERA form everywhere a very populous Order, and nowhere more so than in Australia. It is difficult to guess even at their probable numbers; but Mr. Meyrick, who has been engaged upon the Microlepidoptera for some years, estimates their number at many thousand species. The Diurnal Butterflies of Australia consist, according to Masters's Catalogue, of 200 species, but the greatest number of these are from Northern Queensland, and are evidently originally migrants from the Indo-Malayan region; among these may be ranked the magnificent genus *Ornithoptera*, of which four species or varieties are found in Australia.

The readiness with which some Butterflies change their residence is exemplified by the passage of an American Butterfly (*Danaus Erippus*, Cram.), of late years from the west coast of America to Australia, and its now complete voluntary acclimatization in that country. *Eurycus* is the only entirely Australian genus among the PAPILIONIDÆ; but among the Day-flying Moths there are several, such as *Synemon*, *Euschemon*, *Damias*, and *Agarista*. The SPHINGIDÆ, BOMBYCIDÆ, NOCTUIDIÆ, and GEOMETRIDÆ are numerous, handsome, and many of them of large size. The MICROLEPIDOPTERA seem to be in incalculable numbers. Mr. Meyrick calculates the CECYPHORIDÆ alone at 2000 species.

The DIPTERA is also an Order extremely rich in numbers, but the smaller and more numerous of the Australian groups have never been studied. Schiner, in "The Diptera of the Novara," estimates the Diptera of the world at 19,449 species, and of these he gives only 1056 to Australia. Three times that number would probably be under the mark. The CECYDOMYIDÆ, for instance, are very numerous in Australia, and yet only three species have been described.

The JABANIDÆ, ASILIDÆ, ACRO CERIDÆ, BOMBYLIIDÆ, and MUSCIDÆ are very numerous, and present some local peculiarities. SYRPHIDÆ, on the contrary, are rare, and the CESTRIDÆ are unknown.

The HEMIPTERA and HOMOPTERA are numerous, and most of the families are represented. Of the first of these Orders the REDUVIIDÆ are the most largely distributed. The Hemiptera are not only numerous but are most peculiar and interesting; most of the families however, more particularly the COCCIDÆ and PSYLLIDÆ, are almost unknown.

The Class ARACHNIDÆ are numerous proportionally to the rest of the world. The PHALANGIIDÆ are very few, but

the CHELIFERA and Scorpions abound; the Spiders are extremely numerous, and of many families, and the ACARIDÆ, IXODIDÆ, TROMBIDÆ, GAMASIDÆ, &c. abound throughout the country. The Class MYRIOPODA comprises in Australia numbers of JULIDÆ, and an amazing number of species of SCOLOPENDIDÆ.

The CRUSTACEA, the last Class of the Anthropoda, are, as far as the Malacostracea are concerned, well known. Mr. Haswell, M.A., B.Sc., having lately completed an excellent catalogue of them. The number of species by that catalogue is 538, which, with others described since, will probably bring the total to 600. Mr. Haswell has also lately published a paper on the PYCNOGONIDÆ of Australia, about eight in number.

The other Sub-classes of the Crustacea, the ENTOMOSTRACA, EPIZOA, and CIRREPEPIA, are undoubtedly numerous, but they have been very little studied.

The VERMES, the fourth Sub-kingdom of Animals, are in all their heterogeneous Classes well represented in Australia, but with the exception of some groups of the ANNELIDÆ and POLYZOA, are very little known. Mr. Haswell has lately described a number of the Australian forms of the Order CHÆTOPODA. The OLIGOCHÆTA are few in number, but comprise one at least giant species. HIRUDINIDÆ are numerous. The SCOLECIDA are probably as numerous in Australia as in any part of the world, but no one has paid much attention to them. All the Mammals, Birds, and Fishes seem to be well stocked with them, all probably distinct species; but the genera seem to be the same as in other places. All, or nearly all, the Entozoa of man and the domestic animals are found in Australia, but they probably came with the European.

The ROTIFERA are believed to abound. *Sagitta* is found.

The Fifth Sub-kingdom of Animalia, the ECHINODERMATA, are exclusively Marine Animals, and in a country with an extensive seaboard and a favourable climate like Australia, might be expected to hold a predominating position, and they do so.

The vast mass of coral reefs and islands known as the Barrier Reef, extending from the latitude of about 25° to 8° south, or until it reaches New Guinea, skirting the East Coast of Australia for over 1000 miles at a distance varying from three to ten miles from the coast, enclosing a smooth and warm sea, and receiving through numerous passages the clear waters of the ocean without, offers for all Marine Animals a haven of the most tempting character, and

the Echinodermata seem to have availed themselves of it to an unprecedented extent. But the prevalence of Echinoderm life is not confined to such favoured regions,—throughout all the Australian seas it appears in various forms. The four Classes CRINOIDEA, ECHINOIDEA, STELLARIA, and HOLUTHUROIDEA are all very numerously represented in proportion to their numbers throughout the rest of the world. Some of the species of one of these Classes, the HOLUTHURIDÆ, furnish a valuable article of commerce to China known as “trepang” or “bêche-de-mer.”

The Sub-kingdom CŒLENTERATA is evidently largely represented in Australia, but as yet but little has been done in the examination of it. Dr. Von Lendenfeld has lately been investigating the Class of SPONGIA, which he has found so numerous and peculiar on the Australian Coasts as to necessitate a change in nomenclature and classification.

The Order CALCAREA or CALCISPONGIA he has found to number 53 species, and three of the families—HOMODERMIDÆ, LEUCOPSIDÆ, and TRICHONIDÆ—are peculiar to Australia. The MYSOSPONGIÆ are few in number; but there is an interesting genus, BAJATUS, peculiar to Australia.

The CERAOSPONGIÆ are found by Dr. Lendenfeld to be richer in species in Australia than in the rest of the world united.

The MONATICERÆ also predominate in Australian waters.

The HEXACTINELLIDÆ and TETRACTINELLIDÆ are few in species.

The MONACTIPHALÆ are numerous enough, but not proportionally so as compared with other parts of the world.

The Class ANTHOZOA is also well represented. Of the Order ALCYONARIA, five PENNATULIDÆ are found, and GORGONIDÆ are abundant.

Of the ZOANTHARIA, the ACTINIIDÆ are chiefly found in the cool waters of the temperate regions, the SCLERODERMATA in the tropical parts, the MEDREPORIDÆ forming the chief part of the extensive coral reefs which surround the North Coast.

The Class HYDROZOA are, as a whole, also abundant. The HYDROMEDUSÆ of Australia number 243 species, the Polyp-colonies, with chitinous skeletons, predominate; the Australian SERTULARIDÆ and PLUMULARIDÆ exceed in number those of the rest of the world added together; the ephemeral EUCAPILLIDÆ are peculiar to Australia. Large TRACHOMEDUSÆ are comparatively rare.

The *Hydra* is found in Australian rivers. The SYPONOPHARA are rare, and show no peculiar forms.

Of the Order SCYPHOMEDUSÆ only 26 Australian species are known, but additional species may be expected from better acquaintance with the productions of the seas on the north coast. The very curious genus *Pseudorhiza* is peculiar to Australia. The RHIZOSTOMÆ constitute the chief Australian group. The CTENOPHORA are present in Australia, but in very small numbers, as far as at present known. The Orders EÜRYSTOMATA, SACCATÆ, and TÆNIATÆ are each represented by one or two species. A very beautiful Beroid has been described from Port Jackson.

The last Sub-kingdom of the Animalia, the PROTOZOA, may be passed over: they are much the same everywhere. The Australian representatives of the various classes comprising the Sub-kingdom have never been investigated.

