David Scott Mitchell.

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G. METCALFE, M.A.,

Teacher, Department of Public Instruction, New South Wales,

TREE-KANGAROO *(Lumholtz).*

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CONTENTS.

INTRODUCTION.

THE absence of a general work on the important forms of animal life peculiar to Australasia led to the publication of this manual. The fauna is not so well known as the flora. Not only was the field unoccupied, there were also inquiries in parliament, in the press, and in other places, for information on the poisonous snakes so dangerous to human life : for this reason ophidians have been made a specialty. During the last forty years men unskilled and skilled have sought for a specific to neutralize those few drops of lethal fluid, which the lurking reptile injects into its victim. The empiric, encinctured with snakes like the priest of Troy, proffered his mystic bottle for sale, while giving proofs of the efficacy of the lotion on his punctured arm. The professor experimented on the canine tribe in his well-equipped laboratory at the university, and published the results of his investigations for the benefit of humanity. The doctor, in his home and on his professional rounds among the "beautiful Australian Alps," pondered for an antagonist of snakebite, which he unluckily had suffered almost unto death. A snake gave him the first lesson, but a quarter of a century had passed away before the problem was wrought out ; it was done silently without an elaborate course of experiments on animals. Two Australian Governors have brought his remedy under the notice of the Viceroy of India, and Her Majesty has promised to have a course of experiments with it performed in that portion of her empire. In the meantime a native doctor is successfully employing it. The antidotes furnished successive y were the nostrum of the quack, the ammonia of the professor, the strychnine of the physician, and, ammonia having been abandoned, the chloride of lime of the professor. Snake-charmers have appeared upon the scene and perished with their "pets" close at hand ; Underwood in Victoria many years ago was the first member of the series ; West at Grenfell, New South Wales, June, 1893, another. He had been to Lake Cowal, where he procured seven tiger snakes, one of which escaped from his bag and bit him in the back. Hullar was bitten during a performance with a tiger snake at Echuca and died, May, 1893 ; a female snake-charmer averted a similar fate by the immediate use of ammonia. Nor have their audiences experienced complete immunity, a magistrate in Melbourne bitten in public by a tiger snake at an exhibition succumbed, notwithstanding the best medical aid. The antidotes already discovered in Victoria have saved many sufferers from the effects of snakebite, some of whom were almost *in articulo mortis*, but a specific has not yet been found that will cope with every variety and condition of subtle ophidian virus.

What are known as the animals typical of Australia—the emu, the kangaroo and the lyre-bird have due prominence given them. Dr. Bennett erred in concluding that the emu always laid an odd number of eggs for a sitting: so did Mr. Gould in trusting the statements of the blacks that the lyre-bird laid two eggs. These inaccuracies having been mechanically copied are taught in schools to this day. There is much confusion with the various species of seals. The fourth reading book of the Australian series (N.S. Wales) says: "The seal most commonly found upon the coasts of Australia is that called, from the colour and marking of its coat, the sea-leopard." The sea-bear, not the sea-leopard, is that most commonly found. A school history of Australia made the reckless assertion—that no seals are now found on the coast of this continent, all having been exterminated. The mound-raising birds have been allotted considerable space in these pages. Bower-birds in the grounds of the Acclimatisation Society, Melbourne, are domiciled in very large aviaries of wire network, enclosing small trees, shrubs and long grass; the interior is arranged in such a way as to be assimilated as closely as possible to their natural home. The director informed the author that he had seen bower-birds attempt to erect in the ground with their beaks small pieces of stick and grass for a bower, just as they do in a state of nature. Another of the staff of this Society remarked:—"The amount of misconception as to the playhouses of the bower-birds—for they are nothing more—is most extraordinary. Not long ago, here in Melbourne, what was supposed to be a scientific paper was read before a number of gentlemen in which, among other things, it was suggested that the peculiar markings on their eggs were to be accounted for by the reflection of the sun's rays, through the interstices in the walls of the bower. Now, it ought to be known by this time that the birds do not make their nest in the bower, but in a tree some distance away from the scene of their gambols." The number of known species of birds inhabiting Australia in 1865 was 672; this has been increased of late years by the discoveries of new species, and by occasional visitors from other countries to 744, most of which are found in north-east Australia. In the vicinity of Rockingham Bay nearly 300 species are found. By reason of the diversified nature of its flora, and the style of country in general, this is perhaps the richest district in Australia; it is the only part of northern Queensland in which the scrubs at all approach to those rich brushes or scrubs of the Richmond River.

It seems somewhat remarkable that strangers are so successful in discovering new species. Mr. Gould visited this continent in 1838 and remained two years; as a discoverer of new species of birds he stands pre-eminent. In 1880 a Norseman undertook an expedition to Australia. Having proceeded to the north-east and having travelled and camped with the wild blacks for months, he succeeded in finding four new species of mammals—one being the handsome tree-kangaroo, the rest were species of opossums. A few years later, Mr. De Vis announced to the Royal Society of Brisbane the dis-

covery of another species of the genus Dendrolagus, which he designated bennettianus. Such is the reservation with which *confrères* in science receive fresh announcements that Mr. Ogilby, of Sydney, in his Catalogue of Australian Mammals, 1892, observed: "There is not at present sufficient evidence to justify the retention of Mr. De Vis' two supposed species D. bennettianus and D. rufus as distinct from Collett's animal." If not then, there was proof of the existence of the former before the close of the following year, for Adelaide received two living specimens and Melbourne four. Bennett's tree-kangaroo turned out to be a new species of a very marked character, and quite a surprise to scientific men—that within ten years two fairly-sized mammals had been submitted to zoologists, which had previously been known only to the wild blackfellow. Is it not remarkable that the first species of kangaroo was discovered at Endeavour River, and that the last concealed itself more than a century later, though only a degree south of this locality? Through the courtesy of the Curator of the Sydney Museum, access was allowed to the latest information on Bennett's tree-kangaroo. Its external characters are:—"Fur on the back directed backwards, body brown, neck rufus, tail black ventrally, lighter dorsally." Tree-kangaroos are located at the Zoological Gardens, Melbourne, in large enclosures, securely hemmed in by wirework; boxes are fixed in the trees for the seclusion of the captives. Being difficult to keep alive on account of the absence of their native food, lettuces and birds' nest ferns were found suitable. In September, 1894, another contingent shipped at Cooktown was despatched to Melbourne in the steamer *Wodonga*. The *Sydney Morning Herald* says: "Whilst on board one of the smaller specimens escaped and immediately jumped into the rigging, up which it went with amazing speed, and seemed perfectly in its element when in the vicinity of the masthead. This clearly demonstrates that the climbing power of these animals, which was formerly looked upon as mythical, is founded on fact." Are not the tree-kangaroo and the cassowary emblematic of Queensland just as the black swan is of Western Australia? In 1883 a Cambridge student came to Sydney, having proceeded to the northern colony, he found eggs in the pouch of the echidna, and concluded that the platypus also lays eggs. When the north-west of Australia shall have been fully explored, what strange forms may it not yield? It is a vast tract nearly isolated by the ocean and the desert, which hem in animal life. Italians ransacked New Guinea for fresh species, and assisted in proving the close relationship of its fauna with that of the continent. No less than 143 species of birds are common to the Australian and the south-east coast of New Guinea. In all probability foreigners will be the pioneers of science in the north-west of the continent. Lumholtz left Australia having no doubt about the existence of a marsupial tiger which has yet to be found; it is stated in northern Queensland that a sort of "tiger" has been seen and its footprints noted, and that it is the natural enemy of the tree-kangaroo.

Tasmania is famous for the size and ferocity of its carnassial marsupials, also for the superiority of the furs of its phalangers. The skins of the opossum and platypus have a large commercial value, and find a ready sale in the other colonies; these mammals are rapidly being destroyed. When New Zealand was discovered, the only indigenous quadruped was the Maori rat, and the birds enjoyed an immunity that was rarely disturbed by the native hunters. In some parts wild pigs now roam the forests; these are the "cookies" of the colonists, being so called from the famous navigator, who released their primogenitors in Maori land. Dogs, which have escaped from civilization and taken to the woods, wild cats; and the stoats, weasels, and ferrets, introduced in the vain hope that they would keep down the rabbits, are too much for the terrestrial indigenous birds. In the Taranaki district, hunting weasels with fox terriers is now a popular pastime. The kakapo or ground parrot is becoming a scarce bird; the kiwi is being confined to restricted areas, and without care will become one of the memories of New Zealand. The huia (says the *Standard*), after which Lord Onslow named the son born during his governorship, is to be protected. This has been done at the request of the native chiefs, who have from time immemorial worn its feathers as distinctive marks. Its present scarcity is, however, so great that, when the Governor presented his infant son to the Maori dignities, they assured him that the bird, after which the boy was named, was practically confined to three districts, so that unless the "pakehas" were restrained from shooting it, the child would never have the opportunity of seeing the bird alive.

The articles contained in these pages were mostly written from information obtained in fragmentary form, and culled from every variety of possible source. The descriptions of venomous snakes, the carpet snake, seals, sharks, and cicadæ were partly drawn from the "Prodromus of Zoology," by Professor McCoy, whose lectures at the Melbourne University the author attended. Mr. Gould's "Mammals and Birds of Australia" furnished some of the descriptions of the fauna and the avi-fauna; but as the works were somewhat antiquated, hence defective, supplementary matter was obtained from the "Proceedings," also from the "Transactions of the Zoological Society," London, to which Australian naturalists contributed. The records of the Linnean Society of New South Wales furnished valuable material; so did the works of Dr. Bennett, Mr. Thomas, Mr. Krefft, Dr. Ramsay, and Carl Lumholtz. The pamphlets of the various Royal Societies of South Australia, Queensland, and Tasmania supplied excellent extracts; nor must the help from the unfinished work of Mr. Diggles be unacknowledged. Mr. Gould, being but a sojourner in this land for two years, had no time to become acquainted with either the nidification of its birds or the extent of their range. He often deplored this defect in his work. Since his visit Dr. Ramsay furnished important facts on the nesting and range of the well-known birds—a subject next treated of by Mr. North. This ornithologist ably combined

his own investigations with the observations of his late "chief" in a work entitled "North's Nests and Eggs of Birds Breeding in Australia." This interesting part of the information on birds was drawn from Mr. North's book. To make dry scientific facts attractive, and to give illustrations of the views of the first settlers and the early history of the species, the works of Cook, Collins, Phillip, Hunter, Leichhardt, Mitchell, Eyre, Sturt, Oxley, Grey, McKinlay, Hume and Hovell were looked through, and what was appropriate was adopted. The accounts of the habits of the species were much enriched by extracts from the daily newspapers, which supplied up-to-date information and facts worthy of a space in any treatise on Australian zoology.

AUSTRALIAN ZOOLOGY.

Wedge-tailed Eagle—*Aquila fucosa.*

Discovery.—Captain Waterhouse, in an excursion made by him in March, 1800, to the north arm of Broken Bay, wounded and secured a bird of a species never seen before in New South Wales—at least by any of the colonists. It was a large eagle, which gave proof of its strength by driving its talons through a man's foot while it was lying in the bottom of the boat with its legs tied together. It stood about three feet in height, and during the ten days it was in captivity it was remarkable for refusing to be fed by any but one particular person. It divided the strands of a rope with which it was fastened and escaped. Latham and Gray designated this bird *Aquila audax*; but Cuvier styled it *Aquila fucosa*. The colonists called it the eagle hawk. It is also known as the mountain eagle of New South Wales.

Description.—It is the largest raptorial bird in Australia, being the representative of the golden eagle of the Northern Hemisphere. One that was shot by Mr. Gould weighed nine pounds, and measured six feet eight inches from tip to tip of the opposite pinions. As to the plumage, the adults have the head, throat, and all the upper and under surface blackish brown, stained on the edges and extremities of many of the feathers, particularly the wing and the upper tail coverts, with pale brown; the back and sides of the neck are rusty-red. The cere and the space round the eye are yellowish white. The bill is of a yellowish horn colour, passing into black at the tip. The feet are light yellow; the claws are strong, curved, and formidable, three being directed forward and one behind. The beak is short, strong, and hooked, that is, bent downwards at the tip; the upper mandible is rather larger than the lower. The female has the general plumage of a lighter tint, and the feathers margined in a larger proportion with the rusty-red. The lengthened and wedge-shaped form of its tail gives to the Australian bird a somewhat pleasing and elegant outline. The female is larger than the male.

Habits.—The wedge-tailed eagle frequents the interior portion of the country rather than the shores or the neighbourhood of the sea. It dwells both in the dense forests and the open plains. It finds an asylum in the impenetrable forests, secure from the inroads of the destroying hand of man; but by reason of constant warfare its numbers are becoming diminished in the settled districts. The flight of this species is soaring and majestic, and its evolutions are

performed frequently at an immense elevation, when it appears as a small speck in the blue sky. It circles round and round, with scarcely a movement of the wings, and from its high position descends with startling rapidity upon its quarry. When it swoops down upon a wallaby, the latter seems paralysed, and thus forms an easy prey. Like the vulture, it delights in carrion ; the carcass of a horse or a bullock never comes amiss to it. It mostly feeds on animals fresh killed, but to the north of Liverpool Plains thirty or forty eagles have been seen tearing the body of a dead bullock. When gorged, they resort to the nearest trees, and perch there till prepared to renew the feast. At this juncture they are not so difficult to approach. It is generally seen in pairs. Sturt says that two of these birds frequented the Depôt Glen, in latitude 29° 40′ and longitude 142°, one of which was secured. They generally rested on a high pointed rock, whence their glance extended over the whole country ; and it was only by accident that one was killed. In some districts it is more plentiful at one time than at another. The two birds seen in the Glen were the only ones observed by Sturt in the interior to the north-west of the Barrier or Stanley's Range. He remarks that it is common on the Murray and the Darling, and is widely, perhaps universally, distributed over the Australian continent. Wedge-tailed eagles are persecuted by the shepherds of the squatters, who poison or shoot them on account of the destruction they deal out to lambs and poultry. All that has been said respecting the courage, power, and rapacity of the golden eagle of Europe applies with equal force to the eagle of Australia and Tasmania. Mr. G. Barnard, who found a jabiru's nest near Rockhampton, noticed that eagles attacked the birds, which ultimately caused them to desert the nest. In the Mudgee district they have been seen to attack a foal and full grown kangaroos, two taking turns in chasing them. When they are troublesome about stations, the aid of strychnine is usually resorted to as the best means of getting rid of them. In Tasmania rewards are offered for their destruction. They not only destroy large birds, such as the black-necked stork, but also prevent them from rearing their young.

Nidification.—The nests of these birds are easily found, inasmuch as they are large structures placed in conspicuous positions. They are often three feet high, and consist of a mass of sticks piled up between the forks of the topmost branches of the largest eucalypti, or are placed at the end of a leaning bough ; one was seen built in a pine. The lower part of the nest is made of thick sticks, smaller ones being used for the top, and the whole is lined with twigs and grasses. Bulk rendering concealment impossible, difficulty of access procures security from intrusion. The nest is not invariably near the top, but always in the most inaccessible position. A nest was secured at Cardington, a station on the Bell River, near Molong, in August, 1860. It had been built on a fork near the end of one of the main branches of a large gum tree. It was fully 70 feet from the ground, hence no easy task to get it. A black boy climbed the tree by *stepping* it. The nest referred to was

3½ feet high, 4 or 5 feet broad, and 18 inches deep. It was lined with tufts of grass, down and feathers plucked from the breasts of the birds. Upon this bed the eggs were placed, two in number, nearly round, the shell being very thick and rough.

Several years ago a pair of eagles were sent to England, and placed in the Zoological Gardens, London. The hen laid three eggs one season, which were the first known in Europe. She had laid two the previous year, but immediately destroyed them, only the fragments being found by the keeper of the aviary. In the Sydney museum there are two eggs from Mossgiel, New South Wales. The eggs are 3 inches in length and 2⅜ in breadth. The ground colour of one is white, thickly blotched, and minutely freckled with rust-red, light yellowish-brown, and obsolete spots of a lilac tint. The other egg is nearly all white, having only a few blotches of a light brown, and some fine dots of light rust-red. In the Melbourne museum there is an egg obtained at Cranbourne. Mr. Gould, writing of Tasmania, says:—"Those nests which I had opportunities of seeing were placed on the most inaccessible trees. The eggs, I regret to say, I could never procure, although I have shot the birds near their aerie, no one but the aboriginals, of whom none remain, being capable of climbing such trees." Some of these trees rose to more than 100 feet before giving off a branch.

Food.—It preys indiscriminately on all the smaller species of kangaroo that occupy the plains and the open crowns of the hills. It kills birds, even the noble bustard, the weight of which is twice that of its enemy; rats also form a principal portion of its food. It will follow kangaroo hunters for many miles, and even for days together, for the sake of the refuse of the animals left by them. The breeders of sheep find in this bird an enemy which commits extensive ravages among their lambs. It also commits depredations in the poultry yards at the homesteads. The *Evening News*, of June 11th, 1895, says:—"The eaglehawk pest is more troublesome than usual this year in the Deniliquin district, but the bonus offered by the Stock and Pastures Board of half-a-crown each for the destruction of the birds bids fair to accomplish the desired end. Within the last week or two the local board has paid about £30 in the shape of bonuses. No less than 128 of the birds were sent in from one station and 78 from another, and nearly 100 from a third station.

Where found.—In New South Wales, Tasmania, on all the larger islands in Bass' Straits. It has been met with at Derby, in North-West Australia, near the Gulf of Carpentaria, Cape York, Rockingham Bay, Port Denison, Wide Bay, Dawson River, in the interior of of the continent, in Victoria, South Australia, Western Australia. Mr. White, of Adelaide, says he found it very plentiful in all parts of South Australia, he having seen sixty or seventy eagles at a time, soaring high in the air or perched about in the trees. Professor Tate, also of Adelaide, records that it was met with near Franklin Harbour. In North-West Australia this bird was observed by Sir G. Grey; he described it as a very large bird,

of a dark colour, in size, appearance, and flight closely resembling the golden eagle, which he had seen in the North-West of Ireland. Living specimens are kept in the Botanical Gardens, Sydney; also in the Zoological Gardens, Sydney, Melbourne, and London. The Macleay museum has an exhibit from King George's Sound.

Species.—In the genus *Aquila* of the *Falconidæ* family there are two species:—1. The wedge-tailed eagle. 2. The little Australian eagle, which has been found at Yarrundi, on the river Hunter; also in Victoria and at Cooper's Creek.

Tree-Kangaroo—*Dendrolagus bennettianus.*

Discovery.—On 8th Jan., 1886, Mr. De Vis read a paper before the Royal Society of Queensland, commencing thus:—"The relics before you, scanty as they are, seem to indicate in Queensland a species of *Dendrolagus* not identical with that which a short time ago was found by Dr. Lumholtz in the mountain scrubs of the Herbert River. The animal now claiming attention was obtained alive by Mr. Smith, a resident of the Daintree River, from whom the skin was received, through the Curator of the Botanical Gardens." Nothing more than the skin of the animal being before the Society, and that being by no means perfect, there was hardly sufficient evidence to diagnose a species from it alone; nevertheless, the author of the paper remarked:—"Should it prove that the skin before us really represents a distinct species, I trust that the name *D. bennettianus* will be the one conferred upon it." This was in honour of the late Dr. Bennett, who had often insisted on the probability of *Dendrolagus* being indigenous to Queensland. About Sept., 1893, Mr. D. Le Souef spent some time in Northern Queensland for the purpose of collecting tree-kangaroos and other animals for the Melbourne Zoological Society. He was very successful, and obtained six specimens of this new species, four of which reached Melbourne alive. Mr. Le Souef published an interesting account of his experiences, wherein he mentions that the tree-kangaroos were identified by Mr. C. W. De Vis as the supposed species he had tentatively named *D. bennettianus*. In Sept., 1894, a steamer from Cooktown called at Sydney on the way to Melbourne. She had started with a consignment of eight cages, containing 16 tree-kangaroos. Two had died before reaching Sydney—an adult female and a half-grown male. These, together with two roughly-prepared skins, were purchased for the Australian Museum, Sydney; and, being now stuffed and skilfully mounted, attract a good deal of attention. At the first glance it was apparent that the species was perfectly distinct from *Dendrolagus lumholtzii*; neither could it be reconciled with the descriptions of Papuan forms. In Sept., 1894, Mr. E. R. Waite, zoologist of the museum, read a paper on this animal before the Linnean Society of New South Wales. This gentleman kindly supplied the writer with the information on this new mammal.

Description.—The fur is soft and long, especially on the back and sides. The hair radiates from a point some distance behind the shoulders, whence it is directed upwards to the head, and meets the hair of the face in front of the ears, and forms a tortuous crest; but little indication of a crest is noticed in the living animal. The face is grey, passing into chestnut and rufous on the head; the upper surface of the body is dark warm brown, black at and around the point of radiation, and generally dark on the vertebral line; the tint is lighter on the sides, haunches, and rump; the back of the neck is a rich reddish-brown; the lower surface is generally darker from the chest to the pouch, thence more rusty but lighter beyond. The tail, which is longer than the head and body together, is cylindrical, thick at the base and tapering; its fur is harsher than that on the body; it gradually lengthens towards the tip, and forms a distinct tuft. At the upper base of the tail is a conspicuous reddish-brown patch, passing abruptly into black, which colour extends for 4 or 5 inches, and somewhat suddenly gives place to light rufous brown; this tint extends to within a third of the tip, and insensibly merges into black. The ventral surface of the tail is black throughout the entire length. The fore feet are black; so are the hind feet, but with lighter hairs above. All the toes and claws are black. The dorsal surface of an animal, including the tail, is generally darker than the ventral surface. To this rule exceptions are extremely few. In both the Queensland species the colouration of the tail is reversed, the ventral surface being the darker. The length of the body is about two feet.

Habits.—It is nocturnal. In the day time this tree-kangaroo frequents the top branches of the trees, but comes down in the evening to feed upon creepers, ferns, and fruits. It has been found down on the flat land, but as a rule it seems to be most numerous on or near the top of the high ridges, which are from 1500 to 2500 feet high. When found in the day time it is generally asleep, with the head hanging on the breast between the fore limbs, the tail being used as a balancing pole. Normally the ears have a horizontal aspect, but are drooped somewhat during sleep. When the animal is alarmed they are suddenly pricked, but never pressed backwards. In this respect it resembles the phalangers. When roused and hunted it has been seen to jump 20 to 30 feet from one tree to another, and leap 60 feet to the ground without hurting itself. When jumping it seems always to land on its fore feet. Mr. Hislop says:—"Though I have repeatedly shaken tree-kangaroos down from a great height, I never saw one injured, as they always (like a cat) fall on their feet."

The tail is never used to hang by, only to balance with; but it has been seen to bend its tail over a branch while it reached down below the branch upon which it was sitting to secure some berries. The tail is usually passed under the body and carried in front. Mr. Le Souef writes:—"When on the ground their tails are curved upwards, and do not as a rule rest on the ground as with the ordinary kangaroos." The males are very pugnacious, and, if two

are put into an enclosure, will fight till one is killed. These tree-kangaroos associate in families, some numbering from three to five females and one male. The young males, and also the very old ones, are generally found by themselves, or two or three of them together without any females. The females breed twice a year, and have only one young one at a birth.

Food.—The leaves of several species of eucalyptus and white cedar. In the scrub it has a partiality for the bird's-nest fern, the moustera, and a small climber like the pepper plant. It eats almost any of the wild fruits so plentiful in its habitat. When in captivity it soon becomes quiet, and takes readily to eating bread, sweet potatoes, apples, oranges, mangroves, and yams. On the voyage from Cooktown the captives were fed upon milk and unripe bananas, and, with two exceptions, did well. In its native state it is believed this species drinks little water. The vegetation at the altitude of its favourite resort is almost invariably enveloped in moisture all night—just at the time when these animals are out feeding on it—so that they must get nearly all the water they require with their food. They feed mostly in the trees and among rocks.

How captured.—The time for hunting is early in the morning, while the scent is fresh upon the ground. The blacks, who are very fond of its flesh, use a dingo or mongrel (the former being better), which scents the tracks of the animal to the foot of the tree it has climbed to "camp" for the day. If the tree is low it is tolerably easy to find the animal; but it often happens that it has passed from one tree to another before finding a suitable "camp." In this case it is necessary for a black to ascend a high tree near that the animal has ascended, so as to look down upon the surrounding trees, as the kangaroo sits right out in the sun, and is more easily seen from above than from below. If one approaches quietly it is quite easy to catch the animal by the tail and slip it into a bag while up the tree; but the least noise rouses it, and it is surprising how quickly it can travel, jumping tremendous leaps from one tree to another, or dropping from a high tree to the ground. When it is hunted down it is captured by the blacks waiting below, one of whom, as soon as it reaches the ground, holds its head down with a forked stick, while another passes an open bag under and over its hind quarters and slips it over its head. The blacks are afraid of seizing a full-grown one, as they say it shows fight. A collector, who was with some blacks, caught one with a lasso—a method which they adopt, except when the animal is out of reach.

Where found.—The habitat of this species is Northern Queensland, in the vicinity of the Bloomfield and Daintree rivers, south of Cooktown. These kangaroos are most plentiful among rocky hills, where the scrub is thick and stunted.

LYRE-BIRD—*Menura superba.*

Discovery.—In Collins' Account of the English colony in New South Wales, the author, writing of a journey to the westward in February, 1798, by three persons who had been sent out to discover a country wherein they might live more at their ease, says: "They returned on the 9th, having travelled south-west from Parramatta about 140 miles. They brought in with them one of the birds, which they had named pheasants, but which, on examination, appeared to be a variety of the bird of paradise."

Description.—In size the lyre-bird may be compared with a pheasant. The general plumage is brown. The secondary wing-feathers nearest the body, and the outer webs of the remainder are rich rufous brown; the upper tail-coverts are tinged with rufous; the chin and front of the throat are rufous, which is much richer during the breeding season. All the under surface is a brownish ash-colour. The upper surface of the tail is blackish brown, the under surface is silvery grey, becoming very dark on the external web of the outer feather; the inner webs of these feathers are fine rufous, crossed by numerous bands, which at first appear of a darker tint, but, on close inspection, prove to be perfectly transparent. The margin of the inner web of the two lyre feathers and their tips are black. The tail of the male bird is about two feet in length, and formed of some beautiful feathers; two of which are the principal, having the interior sides seemingly scalloped. These two feathers cross each other at the volition of the bird. Two other feathers of equal length, and of a bluish or lead colour, are within these, they are very narrow, and have fibres on only one side of the stem. Twelve feathers are within these of a pale grey colour below and of the most delicate texture; they diverge in a fan-like form. The tail bears a striking resemblance, in its graceful form, to the shape of the lyre of the Greeks; from this circumstance the bird received the name of the lyre-bird of Australia. The female differs in wanting the singularly formed tail, and in having the bare space round the eye smaller, and less brilliantly coloured. A bunch of dark feathers constitutes her tail, having the appearance of being a rudimentary form of that of the other sex. The bill and the nostrils are black; the irides blackish brown. The legs and feet are black, the scales on them being mealy. The feet and claws are large.

Habits.—It has extraordinary powers of running, but its power of flight is feeble. The tail is carried horizontally when the bird is running through the scrub. Its large feet enable it to pass with ease over loose stones, and the sides of rocky gullies and ravines. It has been stated that this bird can spring ten feet perpendicularly from the ground. It is very shy and distrustful, hence difficult to procure. The cracking of a stick, or the rolling of a stone, is sufficient to alarm it. It may sometimes be approached in the more accessible scrub by a man on horseback, it having less fear of animals than of man. The early morning and the evening are the

periods when this bird is the most active. In the brushes it pours forth its loud and liquid calls, and although there may be several birds in a locality, a sportsman will fail to get even a sight of one of them for days together unless he exercises determined perseverance and extreme caution. He must advance only when the bird's attention is occupied in singing, or in scratching up the leaves in search of food. The black approaches it with noiseless and gliding steps, unseen and unheard; when within range he shoots it—if supplied with a gun: or if not, he kills it with his own weapons. The lyre-bird seldom, if ever, attempts to escape by flight, but eludes pursuit by running. It frequents the precipitous sides of gullies and ravines, covered with tangled masses of creepers and umbrageous trees; also the deepest recesses of the fern gullies of the Dividing Range with the yellow-breasted robin, the satin bird and the bell bird as its neighbours. It is fond of traversing the trunks of fallen trees. It is of a wandering disposition, and although it probably keeps to the same brush, it is constantly engaged in passing over the locality from one end to the other. All the beauty of the *Menura superba* lies in the plumage of the tail of the male bird, the new feathers of which appear in February or March, but do not attain their full elegance and perfection till June; for the four succeeding months the tail is in its finest state; after this the feathers are shed, to be resumed at the period stated above. The natural notes of the lyre-bird are rich and varied. Its loud full call may be heard reverberating over the gullies to a distance of at least a quarter of a mile; it also possesses an inward and varied song, the lower notes of which can only be heard when one has approached within a few yards of the bird. Its notes, too, are heard more frequently than they are recognised, for it is a consummate mimic and ventriloquist. It imitates to perfection the notes of all other birds, the united voicing of a flock of parrakeets, the barking of dogs, the sawing of timber, and the clink of the woodman's axe. Thus it is the *Menura* has earned for itself the title of the Australian mocking bird. Parrots and magpies are taught to speak; as a mimic the lyre-bird requires no teacher. In the early morning and in the afternoon the male birds can be heard mocking the magpies, laughing jackasses, and other birds; and if one is fortunate enough to see as well as to hear, he will note that each is dancing on a small mound scraped together and making a brave display of feathers.

Nidification.—The nest differs according to the locality frequented by the birds, some being constructed of rough material, such as large sticks, stringy bark, and dead ferns; others of very fine rootlets, &c., which make a remarkably neat nest. In no instance has more than *one* egg or *one* young bird been met with in the same nest. The birds begin to build in May, and lay their eggs in June and July. The female is not fed by the male while she is sitting, nor has the male bird ever been observed near the place where she has laid her egg. The female frequently leaves her egg during the middle of the day to search for food. This may account for the length of time taken in the hatching, which sometimes

extends over a month. The young one does not leave the nest until it is eight or ten weeks old. When one is standing in front of the nest, the egg or the young bird can easily be seen in it. The female enters the nest head first, and then turns round and settles herself on the egg, with her tail sometimes over her back, but more often bent round by her side. Thus in time the tail becomes quite askew. The nests are for the most part placed on the darker side of the gullies and ravines. They are large, oval, domed structures, with the entrance in the front, and are usually placed on the ground at the foot of some stump or tree, or by the side of a fallen log. Sometimes they are placed on a ledge of rock in the face of the cliff at a considerable height from the ground. Occasionally a nest is found in the end of a log which has been hollowed out by fire and formed in the shape of a scoop. They are always built on some solid foundation, for the nest being bulky and loosely built could not hold together if placed otherwise. Collectors have to exercise great care in removing the nests or they would fall to pieces. Three nests, that were procured in the Illawarra district from the ravines and gullies in the locality near Appin and Wollongong, were obtained thus :—One was taken from the hollow end of a log ; the second from a ledge of rock ; and the third was found by the side of a fallen tree. The first and third are much the same in appearance and size, being large, oval, domed-shaped structures of sticks, twigs, and roots, interwoven loosely with pieces of bark and moss, roots of ferns and fronds. The inside is lined with rootlets, and, finally, the long loose feathers from the flanks and backs of the birds. The entrance, which is in the side (or front), is not covered with a hood, nor does its upper edge hang over so as to conceal the egg. The total length of the nest is 26 inches, height 12 and width 18. The entrance is five or six inches in diameter, and its lower edge 4½ inches in thickness. The interior being lined with feathers somewhat similar in colour to the egg, helps to protect it and hide it from view. The second nest referred to above is composed of fine roots, with pieces of hypnum, and lined with feathers. This nest is much neater, smaller than the others, and looked very beautiful while the ferns and moss, which covered the whole of the outside, were fresh and green. Occasionally the same nest is used more than once after being lined afresh with feathers. The eggs are of three varieties at least :—Var. A. The most common is of a light stone grey, with darker coloured blotches and spots, and a few jet-black dots. Dimensions : 2.4 x 1.6 inches. Var. B is of a reddish-brown colour, with dark blackish-brown spots, and a beautiful blush of pinkish purple over the whole surface. Size : 2.3 x 1.6 inches. Var. C is a most peculiar looking egg of a uniform dark metallic blackish-brown, having obscure spots and blotches of a darker tint, almost invisible at a short distance. Size : 2.5 x 1.7 inches. Like many of the other specimens, this variety has jet-black lines and dots dispersed over the surface.—(P. Z. S., 1868).

Where found.—The lyre-bird is peculiar to Australia, and is chiefly confined to the south-eastern portion of it. It is met with in

New South Wales, southern Queensland, Victoria, and South Australia. It is abundant in the Illawarra district, in the ravines and gullies extending from the vicinity of Appin to Wollongong. It is a denizen of the Liverpool Range, and the mountains of the Tumut country; Dr. Bennett found it in the latter district. It inhabits equally the brushes on the coast district and those that clothe the sides of the mountains. What is called the *Menura victoriæ* is found in Victoria and South Australia. It was abundant in South Gippsland and near Western Port.

Fears are entertained (writes the Melbourne *Age*, of Aug., 1893) that the lyre-bird is doomed to extinction. The killing of it has been made illegal, but the market continues supplied with *Menura* tails, and the other day the Secretary of Customs had one sent to him anonymously, as if the intention were to publicly flout the law. There are more reasons than one why the lyre-bird should be preserved. From a purely utilitarian point of view it is of value, for it is insectivorous, and preys upon insects which are apt to prefer orchard fruit to their natural bush food. But the bird has as well a national and sentimental value. Next to the emu it is the most typical Australian bird. It is peculiar to Australia, for in no other country is it to be seen. Comparatively speaking it is a *rara avis* even in Australia itself. We are informed by Mr. French, the Government Entomologist, that the public has no conception of the enormous destruction which is going on, and that the law as it stands is of little use. Although it is against the law to kill a lyre-bird, there are, he says, hundreds of tails in the Melbourne shops, and hundreds go to Europe by every mail steamer. If the police interefere they are told that the tails were purchased in New South Wales, and are unable to get a conviction. Mr. French, therefore, strongly urges that we should go a step further with our legislation by prohibiting the sale of tails. Something must be done, he says, or between the dealers and the foxes, the Victorian *Menura* will be a bird of the past. He knows from personal experience that there are many lyre-birds even yet about Mount Baw Baw and in the interior of Croagingolong, but even in these places the destroyers are at work. The hen lays but one egg, and that only once a year; consequently they cannot multiply rapidly even under the most favourable circumstances. It is safe to say that under present conditions, they do not multiply at all, and that judging from the tails offered for sale in Melbourne shops and at the wharfs, sad havoc is still being carried on amongst them.

Australian museums have exhibits of these birds and their nests in large glass cases in which, by the skill of the ornithologist, some locality is imitated with its recumbent ferns, or ledge of a rock, and the nest placed so as to give visitors an idea of its natural site. In the Melbourne museum there are exhibits of the *Menura superba* from the Dandenong Ranges in Victoria and Mount Palmer in New South Wales. In 1867, a living lyre-bird arrived in London, and was located in the gardens of the Zoological Society. It had been sent from Sydney in the "La Hogue." It attracted great attention

in England. It had been obtained from Broughton Gate, Illawarra district, N.S. Wales.

Food.—The food of the lyre-bird consists principally of insects, particularly centipeds and beetles. It also eats shelled snails. The gizzard is very strong and muscular.

Species.—Of lyre-birds there are two, the *Menura superba* and the *Menura alberti*. Mr. Gould considered that there are three, the third being *Menura victoriæ*, but this last has not been generally adopted. It has been pointed out that the differences in the plumage of the Port Phillip birds and those of New South Wales are too trivial to warrant the establishment of a third species for the former. Nevertheless, in some of the South Australian and Victorian specimens, the bars of the two outer tail feathers are more defined, especially at the base, and of a deeper tint than are those in the lyre-birds of New South Wales. The plumage of the former is also of a slightly darker hue. Such distinctions mark varieties rather than species. These objections to a third species were mooted in a communication from Sydney, read before the Zoological Society, London, Mr. Gould being in the chair as vice-president. He exhibited several skins of his *Menura victoriæ*, also an egg, and a chick only two days old. The upper parts of the young one were covered with sooty black down, which, near the head, assumed the form of a hood; the under surface was sparsely clothed, the throat, flanks, and thighs being naked. It thus presented such an extraordinary appearance as to render it difficult for the most astute ornithologist to determine to what genus it belonged.

Great Green Cicada—*Cyclochila australasiæ.*

Description.—The colour of this species is pale-yellowish grass-green, or pale-tawny horn-brown, or various irregular mixtures of these two colours. The variation from all grass-green to all pale testaceous (shelly) tawny-brown is so gradual and irregular, when a large series is examined, that there cannot be a doubt of both extremes belonging to one species. The eyes are yellowish-grey; the ocelli are amber-red, surrounded by a small black patch; the membrane of both pairs of wings is clear and unspotted. The males and females are much alike in colour; but the females are often larger in the expanse of wings, and have the head a little more acute than the males. The great width of the circularly dilated margin of the prothorax, between the head and the wings, is the main generic peculiarity separating this from the other cicadæ, with which it agrees in most other points in structure. The pupa resembles that of the *C. mœrens*, but is larger, and the tooth-like spines on the anterior legs are darker, larger, and stronger; and the large basal tooth has a small additional spine near its base.

Sound.—The song begins like the quacking of a duck for some time before breaking into the continuous "whir," and is far louder than that of the *C. mœrens*, becoming perfectly unbearable and deafening where they abound. It is silent in wet weather and

after nightfall. The blacks in the north of Australia have superstitious ideas concerning this insect; they originate from this loud shrill sound, which comes from every direction, and is not to be traced to any particular place. A traveller, who had been deserted by his aboriginal guides, muses thus:—"Not a leaf was seen to stir, and the only sound that came to my ears was the monotonous melancholy humming of the cicadas in the tree-tops—a sound that only served to increase the sense of desolation." The effect which the incessant din has on any person depends very much on the condition and state of mind he may be in. This insect is not peculiar to Australia: its querulous song was referred to by the writers of ancient Rome. Both Virgil and Juvenal celebrated the counterpart of the Australian type. By that figure of speech known as Metonymy —a putting of the effect for the cause, the sign for the thing signified—Juvenal wrote cicada for *æstas;* that is, cicada for summer.

Habits.—It seems to frequent the various species of acacia, popularly called wattles, quite as often, or more often, than the eucalypti. It appears at about the same time as the *C. mœrens*, in the hottest time of the year; but it is much less widely distributed. It is not uncommon along the banks of the Yarra near Melbourne. The pupa resembles that of the *C. mœrens*, but is larger.

Where found.—So far as at present ascertained, cyclochila is confined to Australia.

Australian Cassowary—*Casuarius australis.*

Discovery.—The existence of a cassowary in Australia was first made known in 1848 by the late Mr. Thomas Wall, who perished from starvation in the inhospitable wilds of York Peninsula on Dec. 28th of that year. Mr. Wall was the naturalist of an exploring party that left Sydney in the previous April, and landed at Rockingham Bay. It consisted of thirteen persons, Mr. Kennedy being leader, Mr. Carron, botanist, and one of the number an aboriginal, Jacky Jacky. In the narrative of Mr. Carron, one of the three survivors, is the following entry:—"Nov. 4th. This morning Jacky went to examine a scrub through which we wanted to pass, and while out shot a fine cassowary. It was very dark and heavy, not so long on the leg as the common emu, and had a larger body, shorter neck, with a large, *red* (not correct) stiff horny comb on its head. Mr. Wall skinned it, but from the many difficulties with which we had to contend, the skin was spoilt before it could be preserved." The specimen first described was shot in the district situated to the north of Rockingham Bay, where, in the deep and almost inaccessible gullies, this species was found. It was unfortunately left at Weymouth Bay, during the terrible sufferings of the exploring party. An account of the bird was published by Mr. Wall's brother, who was curator of the museum, Sydney. In 1866, Mr. W. J. Scott communicated to the Zoological Society of London that on the Upper Burdekin River, about 100 miles from Rockingham Bay, there was a bird known to the natives as the black emu,

but that it was difficult to obtain. In the autumn of the same year, Mr. G. R. Johnson, while on a visit to Rockingham Bay, shot a cassowary in the Gowrie Creek scrub, which he preserved and presented to the museum of Sydney. This was subsequently identified with Wall's species by Mr. Carron. In 1868, Mr. C. Scott, of Queensland, sent a very fine and perfect skin of the Australian bird to the Zoological Society, and this discovery set at rest all doubts which might have existed as to the distinctiveness of this species from the cassowary of Ceram. It was the first skin that had reached Europe. The bird was shot by the overseer of the Herbert Station.

Description.—The cassowary is the stateliest bird of Australia. Its eyes cannot fail to be admired; they form its most beautiful feature. Their expression is defiant and proud, as that of the eagle's eyes. This bird, although having three toes like the rheas of South America, differs from them and from the ostrich in having the head bare and crowned with a horny casque or helmet. When erect it stands 4½ feet high, its length being 4¼ feet. The general plumage is black, the feathers being brown at the base, and deep black from about the middle to the tip, and similar in shape to those of the emu; at a distance they present the appearance of coarse hair rather than of feathers. The head is surmounted by a compressed helmet, the front height of which is about equal to its base, from 5½ to 6½ inches; it is horn colour. The beak is black, and the irides rich light-brown. The skin of the neck is smooth; thin, soft, hair-like feathers cover it on each side. The lower part of the neck of the living male bird is furnished with a few thick glandular fleshy ridges, this portion having the appearance of being fluted or puffed, and being of a deep blue. The skin from the bill, fringing the casque on the top of the head, and extending five inches down the back of the neck, is marine blue; below this, still following the back of the neck down to the point at which the feathers become thick, a length of five inches, the colour is of a cinnabar-red. The under side of the head and throat from the bill downwards is ultramarine; the small triangular portion immediately joining the feathers is indigo blue. At the bottom of the throat are two pendent caruncles or wattles of a bright-red colour, somewhat similar to those of the common turkey-cock; they are about four inches in length. The leg is very stout and powerful. The crest of the Australian bird differs from that of other cassowaries in rising more erect from the head, and in being larger; it is compressed towards the edges. There is a marked peculiarity in the shape of the helmet of the males. The hinder part of the top ridge is wrinkled and bent over to the right, as if the growth on the hinder margin had been retarded, while that of the front had overgrown, which caused it to be wrinkled and curved. The rudimentary wings are provided on the right side with five long smooth shafts resembling those of the porcupine; a sixth, nail-like and short, finishes the series. The left wing has four long and straight shafts, and a fifth curved one about two inches long.

Habits.—Although it is nearly akin to the ostrich and emu, it does not, like these, occupy the open plains, but the thick brush-wood. The hostility of the blacks, its shyness and retirement prevented its discovery till a comparatively recent date. It departs on the slightest noise, and sometimes evades its pursuers by crossing a creek. It frequents the gullies in the thick jungles with the brush turkeys and jungle fowl. It sometimes traverses more open parts of the scrub, but it seldom ventures out on the plains. It is very wary, but its presence may be easily detected by its utterance of a peculiarly loud note, which is taken up and echoed along the gullies. In the rainy season it is occasionally compelled to take to the water, and proves itself to be a good swimmer.

Nidification.—Cassowaries breed during August and the three ensuing months. The first nest procured was found by Inspector Johnstone's black troopers, from whom a settler on the Herbert River purchased some of the eggs, one of which is of a light-green variety. The nest consists of a depression among the fallen leaves and *débris*, with which the ground in the scrubs is covered, with the addition of a few more dry leaves. The place selected is always in the most dense part, and well concealed by entangled masses of vegetation. The eggs were five in number in two instances recorded, and in both cases one of the eggs in each set differed from the others, being of a light-green colour, and having a much smoother shell The others all have a rough shell covered rather sparingly with irregular raised patches of dark but bright green on lighter green and smooth ground. In the pale variety, the raisings on the shell are close together and not so well developed. On the whole the eggs closely resemble *Casuarius bennettii*, in which similar variations are noticeable; but they are larger and of a greater diameter, being greatest in the middle. The light-green egg has a smooth shell, its dimensions being 5.3 x 3.7 inches; the dark-green with rough shell is 5.3 x 3.8 inches. (P.Z S., 1876.) As the young are not all hatched at the same time, the male cares for those that are first produced, while the female completes her share of the incubation; but, like the ostrich, he takes his turn in sitting on the eggs. The young can run about as soon as they leave the shell, and when all are produced the pair jointly support the brood. In Paris, in the Jardin des Plantes, the Australian cassowary laid eggs and reared young.

Food.—Herbage is its chief diet and such native fruits as it can find in the scrubs. During the months of July, Aug., and Sept., its food consists chiefly of an egg-shaped, blue-skinned berry, the fruit of a large tree. It frequents localities which produce large fig-trees in search of the fruit. It is particularly fond of the astringent fruit of a species of maranta, which produces bunches of large seed pods filled with juicy pulp, resembling in appearance the inside of a ripe passion fruit.

Where found.—In Northern Queensland from the Burdekin River northwards to the Endeavour River, in all the large vine scrubs on the banks of the rivers, and on the high mountains of the coast. A few years ago it was plentiful in the neighbourhood of

Cardwell and Herbert River, but the sugar planters who settled there have ruthlessly destroyed it. On account of their inroads these birds remain during the day in the densest parts of the scrubs, wandering about the sides of the watercourses and creeks, diving through the bushes and vines at the slightest noise; only towards evening and early morning do they visit their former haunts, hence it is most difficult to get a shot at them. This bird is peculiar to the north-east portion of Australia. Specimens have been obtained from Cape York, Rockingham and Trinity Bays, and Herbert River. A nest was found near Cairns. It is not rare on Hinchinbrook Island, and to get there must swim a distance of two miles from the mainland. Cassowaries are kept in the Zoological Gardens, London, Paris, Sydney, and Melbourne. They are quarrelsome, and have generally to be provided with separate enclosures. They kick and hiss violently at strangers.

Uses.—The blacks use part of the plumage for ornamenting their bodies; prior to the discovery of this bird by the white man, the settlers wondered whence the aboriginals procured some strange feathers which had been taken out of a native hut in Northern Queensland. As food for the natives, they hunt the cassowary with the aid of their dingoes, which are able to kill the half-grown, and sometimes even the old birds. The flesh tastes very much like beef, and is very fat The sugar planters use the skins for rugs and door mats. These birds are eagerly sought after by collectors, for, when their skins are stuffed and mounted in a life-like posture, they form a valuable addition to the museums of Australia, Europe, and America. In 1875, the Marquess of Normanby, before quitting the government of Queensland for that of New Zealand, sent a living cassowary to England. It was placed in the Zoological Gardens, London. In the same year another bird was received from Sydney. In 1866, Mr. Sclater had exhibited to the Zoological Society, London, a small bundle of feathers of a cassowary, supposed to belong to an Australian bird. They were of great interest as being the only portion of this bird that had been brought to Europe up to that date; the bird itself had been seen by some black troopers of the native police, but when pursued escaped into a scrub.

Species.—The genus *Casuarius* comprises nine:—1. The Australian. 2. The Ceram cassowary, found in that island; this is also called the common cassowary. There are specimens of it in the Leyden museum. 3. Beccari's cassowary, found in Wokan, the most northern of the Aru Islands. 4. The two-wattled cassowary, found in the Aru Islands. There are several specimens of it in the Leyden museum, which were obtained from the Aru Islands. 5. The one wattled cassowary, found in the Isle of Salwatti and the opposite coast of New Guinea. 6. The Papuan cassowary, found in northern New Guinea. 7. Westermann's cassowary, found in the Isle of Jobi, off New Guinea. 8. The painted-necked cassowary, found in southern New Guinea. 9. The mooruk or Bennett's cassowary, found in New Britain. In 1857, a specimen of this bird was brought to Sydney in the cutter "Oberon." It was secured by Dr.

Bennett, and named *Casuarius bennettii*. A living bird sent by him to England arrived at the Zoological Gardens in May, 1858. After a residence of two years this bird laid an egg, which was of a pale grass-green colour, closely freckled with paler colouring, its shape was more elongated and pyriform than that of the emu's egg. Four of the nine species have two pendent neck-wattles; a fifth is characterised by possessing a single wattle, and the remaining four are destitute of any such appendage.

BROWN-BANDED SNAKE (Krefft, New South Wales), or TIGER SNAKE (McCoy, Victoria), or CARPET SNAKE (Tasmania).—*Hoplocephalus curtus*.

Ergo quisquis id vulnus exsuxerit, et ipse tutus erit, et tutum hominem præstabit.—CELSUS.

Description.—A large tiger snake from the junction of the Murray and Darling measured four feet two inches, but three others were from three feet six inches to two feet eight inches, the tail being six inches. The body and tail are moderately thick and tapering. The head is subquadrate—that is, somewhat square—depressed, and rounded in front. Usually there are 19 rows of scales on the middle of the body. The colour varies from brownish-olive to light yellowish-brown above, with about 38 to 50 darker brown dusky undefined transverse bands, about two scales broad, with a rather narrower interval between them. As in all snakes, the colours are most vivid just after casting the skin; before it, they are darker and the markings less distinct. The bands vary very much in distinctness, and are often very obscure towards the head and tail; in some specimens they are rendered very conspicuous by an extension of some of the yellowish colour of the belly on to two or three rows of the lateral scales, between the ends of the bands. This species goes under the colonial name of tiger snake, from its tawny cross-banded colouring and its ferocity. The head is a dark olive bronze, the chin plates being freckled with bright blue; the throat and the belly vary from straw colour to yellow. The tail is conic. The fangs are single or double. They are small, and situated in the upper jaw under the junction of the second and third labial plates. One or two (rarely four) smaller teeth are under the anterior part of the fourth labial plate. The fangs are curved backwards, but when the snake bites, they are raised upright by reason of the mobility of the premaxillary bone. The iris is orange, the pupil seems circular and not elongate, as Schlegel states. It is the most dangerous of all Australian reptiles, and a fair bite from it will kill animals the size of a goat in about an hour.

Habits.—The tiger snake is well known to frequently inflict bites rapidly fatal to men and dogs. It is extremely vicious in disposition, reminding one strongly of its near ally—the cobra di capello of India—like which it flattens and extends the skin of the side of the neck laterally, when irritated, to twice its width when quiet;

the black stretched skin is then very visible between the separated scales. It retires into the ground in winter, and makes its appearance in Aug. or Sept., according to the temperature of the locality. The young are about 30 in number. They are like the adult in all respects, and are brought forth in Jan. It has been established beyond doubt that snakes swallow their helpless young as a means of protecting them.

Experiments.—The greater number of cases of fatal snakebites to men and dogs near Melbourne, most of the experiments by Professor Halford and others to test the power of the poison, and the efficacy of the injection of ammonia into the blood, and other modes of treatment, refer to this species. In Dr. Halford's experiments at the University of Melbourne, of 31 dogs bitten by captive tiger snakes, 27 died and 4 recovered; the deaths occurred on the average in 2 hours 2 minutes. Deputy-Inspector-General Macbeth, having caused in India 29 dogs to be bitten by cobras, found they all died, on the average in 2 hours 42 minutes. Dr. McCrae, the Chief Medical Officer of Victoria, caused 14 dogs to be bitten by tiger snakes, and none recovered. No remedies were used in any of these three sets of cases. These recorded tests proved that, contrary to the expressed opinion of many Indian practitioners, the Australian tiger snake's bite is more rapidly fatal than that of the cobra.

Fatal cases.—A well-known magistrate, Mr. Drummond, witnessed an exhibition of Shires's method of curing snakebite in the Anthropological museum, Melbourne, in the presence of many spectators. He took exception to his treatment, and pronounced the man an impostor. Baring his arm, he defied Shires, remarking excitedly that the fangs were extracted, that the snake was non-venomous, and that his antidote was a mere nostrum. The tiger snake held by Shires bit Drummond's arm about the *flexor profundus digitorum*. Shires implored him to allow him to use his remedy, but he would not. In a short space of time alarming symptoms supervened, and medical assistance was summoned; but it was too late, the magistrate died at Nissen's Café twelve hours after the bite. In order to have counteracted the venom, the antidote, strychnine, should have been injected at once. Underwood, a well-known vendor of a supposed antidote, was bitten in public by one of this species; he died within an hour. This man usually allowed the copper-head snake to bite his arm, which is not so dangerous as the tiger snake, but one day he was induced to try the latter reptile. Cartwright, when exhibiting some of these snakes, was bitten, and also died within an hour. Dr. Casey, of Brighton, Victoria, reported a case of a man being bitten by one of this species, who died within half-an-hour of the bite. Griffiths, when handling some of these snakes as an exhibition at the Port Phillip Club Hotel, Melbourne, was bitten, and died in less than half-an-hour. A boy, nine years of age, near Sydney, was bitten in the little finger of the right hand by this reptile; he died in about eight hours.

Food.—The general food of the tiger snake is composed of frogs, lizards, mice, &c. Professor McCoy, on one occasion, put a live

mouse into a box, in which he had a tiger snake, to be food for the reptile ; he was astonished to find next morning that the mouse had killed the snake by biting the back of its neck, and had eaten some of its flesh. Two or three of these reptiles, when kept in a box, bit each other viciously when stirred up, without the poison-fangs producing any ill effect. A naturalist, who was travelling to the west of Rockhampton, encountered a tiger snake in the act of trying to swallow a dead snake larger than itself. He killed it when it had swallowed about one-third of its prey. When attacked it tried to separate itself, but the head of its prey stuck fast in its throat. In this condition, the oppressor and the oppressed were put into spirits and sent to Europe. The other was a brown tree-snake, quite harmless.

Where found.—This species, which is confined to Australia, inhabits almost every part of it from its southern boundary to the Gulf of Carpentaria. In Tasmania it is popularly called carpet snake—a name which properly belongs to the harmless snake so called on the mainland. This is a misuse of the established popular name of a different and innocuous form. Hence the Tasmanian experiments on the treatment of bites from this highly poisonous species were unintelligible in Europe, as there was a confusion of names. The Melbourne museum has exhibits which were obtained from Moe, Gippsland. In the museum, Sydney, there is a specimen from Tasmania, another from King George's Sound, and a third from another part of Western Australia. There is also a small two-headed snake, about six inches long, which was found in Tasmania.

Remedies.—The danger of the bite appears to depend a good deal on the excitement of the snake, the season of the year, and whether the venom has been exhausted by previous attacks. The poison acts as a direct and powerful sedative, and those who are unfortunately under its influence frequently succumb to its depressing effects. One of the most successful antidotes is strychnine, its restorative power being first noted in Australia ; it prevents the lowering of the vitality until the effects of the venom have passed away. According to the experiments of Dr. Mueller, strychnine, if used in a form of the solution of the nitrate, acts as an antagonist to the snake's poison. It is only after a time that the independent action of the strychnine appears in the shape of slight muscular spasms, and then the injection of the solution under the skin must be discontiuued, unless after a time the snake poison asserts itself. The two poisons being antagonistic, the nitrate of strychnine may be used in quantities which would otherwise be fatal, a grain in some instances being absorbed in the course of an hour. In the north of Australia the blacks knew of no remedy for snakebites, the victim simply laid himself down to die. In New South Wales they squeezed the wound between the thumb nails until the blood flowed. Those on the Clarence River paid particular attention to the scarification and sucking of the wound for some hours and letting it bleed freely.

A recital of the outlines of a remarkable recovery from snake bite, which took place in Oct., 1891, will illustrate the process referred to above. An employee on the Gippsland railway, Victoria, was bitten on the hand by a snake, while he was engaged in oiling the "plunger" of a pump, at one of the stations about 30 miles from the metropolis. The station-master put a couple of ligatures on the sufferer's arm—one at the wrist and the other above the elbow. This man had been bitten by a snake at the same pump a few days before, the second bite being only half an inch from the first one. On the first occasion he scarified and sucked the wound, and though the two fang punctures were distinctly discernible, he felt nothing beyond a general drowsiness, from which he recovered in less than a week. Being in acute pain the man made for the Pakenham station as quickly as possible, and was sent to Berwick, where the local doctor injected strychnine, and then forwarded the patient to Dandenong. Having arrived there, two medical men resolved to adopt the treatment recommended by Dr. Thwaites, of Tallangatta. They first injected one-thirtieth of a grain of strychnine, and then kept the patient walking up and down the street, with the assistance of two strong men. The symptoms being still unfavourable, and the limbs of the sufferer becoming almost as loose as those of an automaton, another 30th of a grain of strychnine and 20 minims of ammonia were injected, and brandy administered. Immediately after this his pulse quickened and his condition appeared better. After an hour and a half the unfortunate man sank again, when the operation was again repeated; it revived him for the third time, but in an hour he collapsed again. Ether having been injected without avail, as a final effort the galvanic battery was brought into use. The most extraordinary feature in the treatment was the astonishing tonic effect of galvanism in relation to the pulse: whenever there was a cessation of current, the patient relapsed to his former stupor, and the pulse failed. The battery was continued with a few intermissions for nine hours. It was applied to the nape of the neck, and at the apex of the heart. The apparently dead man was galvanised into life.

Kiwi—*Apteryx australis.*

Introduction.—The first account of this bird was published in England by Dr. Shaw, in the Naturalists' Miscellany. A specimen had been presented to him by Captain Barclay, of the ship Providence, about 1812. This afterwards passed into the possession of the Earl of Derby, then Lord Stanley. His lordship's being a private collection, and there being no other specimen in England or on the continent, the existence of the species was doubted for upwards of twenty years. Its history remained doubtful till June, 1833, when Mr Yarrell published in the "Transations of the Zoological Society" a paper which fully established this bird among accredited species. Mr. Gould afterwards became acquainted with five additional specimens: two of these being presented to the Zoological Society

by the New Zealand Company, and one by Mr. A. Macleay, of Sydney, and two others were added to the collection of the Earl of Derby, one of which he presented to Mr. Gould.

Description.—The kiwi belongs to the family Struthionidæ, including the ostrich, having two toes, the rhea, emu, &c, having three, but the kiwi has three and a rudimentary fourth, but it differs from the other representatives in the elongated form of the bill, in the shortness of the tarsi, and in the possession of a sharp spur, terminating a posterior rudimentary toe. The face and throat are greenish brown, all the remainder of the plumage, consisting of long lanceolate hair-like feathers, is of a chestnut brown colour, margined on each side with blackish brown. The feathers are lighter on the under surface, and become of a grey tint. The wing of the kiwi little more than rudimentary, agrees with that of the rhea, in having a strongly hooked claw at its extremity ; while in the structure of its feathers it approaches nearest to the cassowary, but unlike that bird they are destitute of the accessory plume, in which it agrees with the rhea. The bill is yellowish horn-colour, its base being beset with numerous long hairs. The feet are yellowish brown.

Habits.—The Struthionidæ, although few in number, are remarkable for their structural peculiarities, each being modified for its own peculiar habits, and in none is this circumstance more remarkable than in the apteryx, which at the same time that it departs farthest in form from the type of the group (the ostrich), also departs the farthest in its mode of life, being in fact adapted to the peculiarities of its own country, and fitted for the particular kind of food there to be obtained. When undisturbed, the head is carried far back in the shoulders, with the bill pointing to the ground ; but when pursued it runs with great swiftness, carrying the head elevated like the ostrich. It is asserted to be almost nocturnal in its habits, and it was by torchlight that it was usually hunted by the natives. The favourite localities of the kiwi are those covered with extensive and dense beds of fern, among which it conceals itself, and when hard pressed by dogs, the usual mode of chasing it, takes refuge in crevices of the rocks, hollow trees, and in the deep holes which it excavates in the ground, in the form of a chamber ; in these latter situations, it is said to construct its nest of dried fern and grasses, and to deposit its eggs. When attacked it defends itself very vigorously, striking rapid and dangerous blows with its powerful feet and sharp spur. The kiwi, the smallest of the struthious birds, lays an egg of extraordinary size, which is creamy white and glossy, and may be compared with a goose's egg, but somewhat compressed near the middle girth.

Food.—Worms, snails, insects, &c. It seizes them with its long bill the instant they make their appearance. It beats the ground with its powerful feet and spur to disturb the worms.

Uses.—The kiwi is sought after by the Maoris with the utmost avidity for their food. The skins, are highly prized, and used for the dresses of the chiefs, indeed, so much are they valued that the natives can rarely be induced to part with them. The feathers

are also employed to construct artificial flies for the capture of fish, precisely after the European manner.

Where found.—The kiwi is a denizen of New Zealand, which still survives by virtue of its nocturnal habits and subterraneous hiding-place, but in fearfully diminished numbers. The *Standard* of the 26th Sept., 1892, says : " The North Island species still finds a home in the wooded heights of the Pirongia, and in the bosky groves of the Upper Wanganui. But from all other districts where formerly numerous it has disappeared. The South Island form is now met with only in widely scattered localities on the west coast, and the small spotted or grey kiwi of which a few years back thousands could have been obtained, has, Lord Onslow states, succumbed to the ravages of the stoat and weasel, the persecution of wild dogs, and the necessities of roving gold-diggers, who would put a couple in their ' billy ' for supper, until it is now hopeless to expect to see many except along the lower wooded ranges of the Southern Alps. Haast's kiwi is one of the rarest of species, whilst apteryx maxima is to be seen in the wooded parts of Stewart's Island alone. The various species of kiwi or apteryx, the diminutive representatives of those gigantic wingless—or rather, short-winged—birds which were, in comparatively recent times, so characteristic of the New Zealand fauna, are also fast passing away.

Species.—There are several species of apteryx. Apteryx owenii —Owen's apteryx, named by Mr. Gould as a just compliment to Professor Owen, who so ably investigated the remains of the extinct birds of New Zealand. It differs in the irregular transverse barring of the entire plumage, which, together with its extreme density and hair-like appearances, gives it more the resemblance of a mammal than of a bird ; it has a shorter, more slender, and more curved bill. This is the little grey kiwi. In the museum of Melbourne there are specimens of the following species :—Grandis, from Collingwood, New Zealand ; haasti, the roa or large grey kiwi from the South Island ; mantelli, from the North Island, and of the kiwi found near Okarito. In the Sydney museum there are also several exhibits, one of which is a rarity, it being an "albino."

Acclimatisation.—In 1859 an apteryx of the species mantelli, which had been sent to England (referred to below), laid an egg. The shell was smooth and of a dirty white colour, its form being an elongated oval, slightly tapering towards the small end. Its length was 4¾ inches and its diameter 2·9 inches. The weight of the egg was 14½ ozs., and that of the living bird was ascertained to be 60 ozs., so that the egg was nearly equal to one-fourth of the weight of the bird. The *Sydney M. Herald*, May, 1894, says : " Baron Walter de Rothschild some months ago presented the museum of Natural History at Paris with an apteryx, one of the few specimens of that rare New Zealand fowl which have reached Europe alive. No care or expense was spared to keep the precious creature from dying. Its cage was delicately warmed and luxuriously equipped. Its diet was chosen by a select committee. In the midst of it all the apteryx ungraciously vanished. A hue and cry was made for it everwyhere,

but in vain. Months passed, and the museum was inconsolable, never hoping to see its apteryx again, when one night the watchman's dog, perceiving something behind a grating in the cellar of some new buildings which were being erected, began barking furiously. A search was made and the truant was discovered. How it had survived the damp and cold, or what it had had to eat but rejected garbage, is still a mystery; but the fact remains that the bird was in the pink of condition, and looked better than it had ever done before. Nevertheless, its cage has now been strengthened."

Incubation.—On this branch in "Gould's Birds" there are some strange stories, mostly derived from the natives of New Zealand, which do not appear to have been verified by any one upon whom reliance could be placed. The following is an account of the incubation of birds in London, as it occurred under the observation of Mr. Bartlett, superintendent of the Zoological Gardens. It is taken from the "Proceedings for 1868," page 329. In 1851 Lieut.-Governor Eyre presented to the society a female apteryx mantelli. In 1859 she laid her first egg, and continued to lay one or two every year for some time: in 1865 a male bird was presented by Mr. H. Slade. Two years later these birds showed symptoms of a desire to pair: this was known by the loud calling of the male, which was answered by the female in a much louder and shorter note. They were particularly noisy during the night, but altogether silent in the daytime. On Jan. 2nd, 1868, the first egg was laid, and for a day or more the female remained on the egg, but as soon as she quitted the nest the male bird took to it, and remained constantly sitting. On Feb. 7th the female taking the nest, the second egg was laid, and she left the nest as soon as the egg was deposited. The two birds now occupied the two opposite corners of the room in which they were kept, the male on the two eggs in the nest under the straw, the female concealed in her corner, also under a bundle of straw placed against the wall. During the time of incubation they ceased to call at night, in fact they were perfectly silent and kept apart. The eggs were in a hollow formed on the ground in the earth and straw, and placed lengthwise side by side. The male bird lay across them, his narrow body appearing not sufficiently broad to cover them in any other way; the ends of the eggs could be seen projecting from the sides of the bird. The male continued to sit in the most persevering manner until April 25th, at which time he was much exhausted and left the nest. On the eggs being examined there were no traces of young birds. Notwithstanding the failure of reproducing, Mr. Bartlett witnessed sufficient to show that the mode of reproduction of the apteryx does not differ essentially from that of the allied forms—the mooruk, cassowary, emu and rhea, in all cases that have come under his observation, the male bird only sits.

Sea-Leopard Seal—*Stenorynchus leptonyx.*

Description.—The sea leopard is sometimes confounded with the "eared seals," which are often exhibited alive in aquariums. They are of another species described elsewhere. The general colouring of the animal above is yellowish light ashy-grey, with numerous, irregular, large spots (hence part of the name, leopard), or small irregular patches of dull yellowish white, with darker grey spots on the sides of the neck and body; there are a few black spots, and a few smaller white spots on the sides of the body. The throat and the underneath portion of the body are dull yellowish white with a few small blackish spots The whiskers are small, wavy and tapering. There are no external ears; the fore feet are triangular, the wrist being very short. This animal is a good example of the group of genera termed "earless seals," from their having no external ear-couch visible. The hind feet are formed of two nearly equal lobes, the three middle toes are small, the claws of the anterior limbs are small, of the posterior ones obsolete. The skull is elongate, the eyes are of moderate size, the irides being blackish-brown. Its fur is close-set, short, of flat tapering hairs; there is no under fur. It was called the sea-leopard by the whalers who visited the southern seas. Two specimens in the Sydney museum afford a striking illustration of the fact that colour and varieties of marking, when considered alone, are but unreliable evidence in distinguishing species. One captured in Lyttleton Harbour, Canterbury, New Zealand, measured 11 feet 8 inches, its girth being 6 feet. It had 32 teeth: 8 incisors, 4 canines, and 20 molars. This species is of a more lengthened or slender form than the sea bear. Its length is ten or eleven feet, and its weight about four hundred pounds. It is the largest seal visiting the Australian coast.

Habits.—It is an amphibious animal, best fitted by nature for aquatic life; in the water, its locomotion is rapid and graceful, on shore, it is laborious and awkward. Unlike the eared seals, the hind limbs are directly backwards, when at rest, nearly in a line with the body, and closely approximated to the tail. They have only a moderate obliquely lateral power of motion; so that, on the land, instead of raising the body clear of the ground, and walking on the four legs, like the eared seals do, the sea-leopard can only progress painfully on the land, by the action of the abdominal muscles, and singularly flexible spine. They are residents of the colder portions of the southern seas. When they leave the Polar Sea they encounter a new enemy, the large sharks. They usually avoid these by reason of their rapid evolutions and fast swimming. Dr. Ludwig Becker, artist and clever observer, who perished in the early stages of the "Burke and Wills" expedition across the Australian continent, noticed that this seal could open its mouth till the jaws formed an angle of nearly eighty degrees, that its spine is very flexible, that it can move rapidly right and left in the water, but slowly on land. The sound it makes is between a roaring and a grunting noise, but not very strong.

Sealing.—Seals abound in countless numbers on the packed ice of the Southern Ocean, as this extract from the *Daily Telegraph*, Aug. 12th, 1893, shows :—"On Sep. 9, 1892, four whaling barques started forth on their quest into the well-nigh unknown regions of the far south. After an absence of about nine months the ships returned to Dundee. Their crews found the seas fairly teeming with seals, some of the floes being dotted black with them, and, failing the whales, a full cargo of oil and sealskins was assured. Having called at Falkland Islands, the vessels proceeded south, and in a few days they sighted the first berg ; it was table-shaped at the top, a form which is characteristic of the southern latitudes ; in the north the bergs are loftier and tower up in pinnacles. By Dec. 19 they fairly made the ice, and steaming onwards they passed immense bergs as high as from 100 ft. to 200 ft., and varying in length from two or three miles to one that was about 30 miles long. It took fully six hours to pass it, steaming at the rate of five knots an hour, when commenced the seal hunting. In the morning six boats started from the ship's side, each manned by five sailors, armed with clubs, and in charge of an officer carrying a Henry 'express' rifle. They rowed across to the floes, which were thickly covered with seals. The animals were quite unsuspicious, and allowed the boats to be attached and the men to approach, without showing any signs of fear ; in the north they have grown wiser, and plunge under on sighting a man. Then the warfare, or rather slaughtering, commenced, and a bullet followed by clubbing laid them low in scores. Our day's hunt generally numbered from 300 to 400 seals, and by the middle of Feb. they had obtained nearly 6000. They came across three varieties of seals—the sea-lions, sea-leopards, and sea-bears, the last of which were the most plentiful. The sea-lions are ferocious looking fellows, black in colour, and measuring from 10 ft. to 11 ft. in length, with large round blue coloured heads. The skins of the sea-leopards are spotted brown and yellow, and their heads are smaller. The sea-bears have fur of a yellowish white colour, and are altogether of a smaller make."

Food.—It is a voracious eater. Being carnivorous, it lives on fish and occasionally marine birds. A large seal now in the museum, Sydney, which was captured in fresh water, was found to have swallowed a full-grown platypus. It was taken in the Shoalhaven River, in Aug. 1859. It was an old male which measured 12 ft.

Where found.—The sea-leopard is not common on the Australian coast ; its habitat is the Antarctic Ocean. It only occurs on these shores as an occasional visitant, strayed from its usual haunts, or as a wanderer, driven by untoward circumstances far away from home. It has been found on the southern portions of this continent, on the coasts of Tasmania and New Zealand, Falkland Islands, on Newcastle beach, this specimen was 7 ft. 10 in. in length, one was found some miles above the salt water in the Shoalhaven River, and a fine one was captured in Lake Illawarra, its skeleton is now exhibited in the Sydney museum. Seals after wandering to these shores frequently ascend rivers to a great distance, and during the

time of floods, may be carried into some lake or lagoon, whence, after the subsidence of the water, retreat is impossible. It is often found far from land, but always goes to the shore at the breeding season. About five years ago, one was captured in Hobson's Bay, near the Yarra; it had evidently strayed into Port Phillip, and was unable to find its way back to the ocean. In the British museum, London, there are specimens from the Antarctic Seas, and from Lord Howe Island, presented by the Lords of the Admiralty, and from New Zealand, presented by Sir George Grey. Mr. Gould surprised a sea-leopard on the beach at Port Arthur, Tasmania, which he secured for his collection. One was captured on the beach at Double Bay, Port Jackson.

The Bunyip.—Twenty-three years ago, it was firmly believed that there was a bunyip in the Midgeon Lagoon, which is situated 16 miles north of Narrandera. The body of this creature, with the exception of the tail, had been fairly observed by several people. A description of its size, dog-like head, hair, rapid movements and noise, so far as casual and momentary glimses would admit, was published in the *Wagga Advertiser* of March, 1872. A reward of £50 was offered for it if captured alive, or £20 if dead. Whether seal or bunyip, this animal was not secured. Doubtless, it was only a sea-leopard, or other species of seal, that had strayed from its ocean home, and having entered the Murray, had wandered up the Murrumbidgee. Its rapid swimming, disappearance below the surface, and formation were just such as would be noted of a seal, if observed under similar circumstances. During the fifties, some of the newspapers in Victoria occasionally referred to a mythical animal, which was said to have been seen in some of the lakes in that colony. The notion of this myth was considerably upset in Victoria in 1859. Early one morning, a seal was found sitting under a tree, not far from Gardiner's Creek Road, Prahran. It had entered the Yarra, passed the falls, and traversed the upper river as far as the Punt Road. It was in an exhausted condition, and was secured for the Melbourne museum, near which it was kept alive for several days.

Australian Megapode—*Megapodius tumulus.*

Description.—The length of the Australian megapode is 17 inches. The first authentic account of its habits was taken from the notes of Mr. Gilbert. He found mounds at Knocker's Bay, which is part of Port Essington Harbour. He was killed by the blacks, but his notes and specimens were preserved by Leichhardt, and sent to England. The head and crest are dark reddish-brown; behind the neck dark grey. The upper surface and wings are deep cinnamon brown; the upper and under tail-coverts are still darker brown. The throat and all the under surface are grey. The tail is blackish-brown. The legs and feet are orange, the claws black, the bill reddish-brown. The *megapodius*, *talegallus*, and *leipoa* are

nearly allied genera, forming part of a great family of birds characterised by their strange mode of dispensing with incubation.

Habits.—It is extremely shy in disposition, and though often heard is seldom seen. It secretes itself among the dense brushes on the slightest alarm. When fairly disturbed, however, it flies to an adjacent tree, and stretching out its neck, watches and listens intently for the intruder, whom it permits to approach no nearer than 80 or 100 yards, when it takes wing. The flight is very heavy and laborious, but it can run with considerable swiftness. Its note is described as something like the cluck of the domestic fowl, with a termination similar to the scream of a peacock. Their noisy cackling at night disturbs sportsmen camped near one of their favourite resorts; and during the day their hoarse note at once betrays their presence. The singular habit of mound-building invests this, and some allied species, with more than ordinary interest. The mounds vary very much in size; those recently made are not above four or five yards in circumference, and above five feet in height, but old ones have been met with many times that size, and as high as fifteen feet with good sized trees growing out of them. The material used in their formation varies with the locality, sand, black soil, shells, &c., with an admixture of vegetable matter, as leaves, grass, small sticks. The feet are very powerful, and well adapted for accomplishing this purpose. The eggs are deposited at a considerable depth in a hole excavated by the old birds, and then covered lightly over and left to themselves, the spontaneous heat of the decaying vegetable matter sufficing to bring them to maturity. When first discovered by the white men it was thought these structures were tumuli of the aborigines, but further inquiry showed that they were fashioned by a bird. A mound was found by Mr. Gilbert in company of a native. The latter said it was jungle-fowl's house or nest as other natives had asserted in regard to similar piles, but they were not believed. This mound was of sand, shells, and a little black soil. It was 20 feet round at the base and five feet high. A young bird was found alive in a hole about two feet deep, lying on a few dry withered leaves. From another mound, which was very large, he obtained two eggs at a depth of six feet from the summit, but only two or three from the side, as the whole slanted. The natives do not agree as to the mode in which the young birds extricate themselves from the mound. Some assert that they find their way out unaided; others, that the old birds, knowing when the young are ready to emerge, scratch down and release them.

Mound-raising (Dr. Ramsay).—I examined several nests in March, and although it was not the regular breeding season, yet fresh eggs were obtained, and newly-hatched young were found singly here and there throughout the denser parts of the brushes. Some of the mounds were very ruthlessly destroyed by the whites, and scattered over the ground; this, however, did not cause the birds to forsake the place, and out of one large mound, which had been very roughly handled, two new ones were formed about ten

yards apart, on the base of the old one, which was so matted and interlaced with roots from the neighbouring trees that it appeared to me a marvel how the birds could burrow into it the great length they did ; and having laid their eggs there, however the young birds found their way out through the maze of roots is still a mystery. Once out, however, and their wings dry, they are able to take care of themselves, but remain about the mounds for a day or so, as if waiting for some of their companions, but in less than a week from the day they are hatched they may frequently be seen at least a quarter of a mile away, and well able to fly about. Upon more occasions than one I saw the birds at their mound or feeding near it, but never saw them burrowing. The largest mound I met with was about 50 feet fn length, 10 in height, 14 in width at the base, and 8 or 10 at the summit. It seemed to be more like several mounds combined : and certainly more than two pairs of birds frequented it. In form the eggs are elongated ovals, being nearly equal at both ends, the normal colour when newly laid being of a pale coffee-brown, but after remaining in the mound a few days they become darker. An egg taken at Cairns was 3·5 x 2 inches.

Food.—Berries, seeds, and insects, especially grasshoppers and beetles of all kinds ; also roots, which its claws enable it to scratch up with the utmost facility.

Where found.—It is confined to the northern coasts of Australia and the islands near it. It is numerous over the whole of the Cobourg Peninsula. It has been met with in the south of New Guinea, immediately opposite to Cape York ; also near Port Denison, Cape York, Rockingham Bay, and Port Essington. It frequents the dense thickets immediately adjacent to the sea-beach. It appears never to go far inland, except along the banks of creeks. This mound-raiser is very plentiful north after passing Port Denison. It is met with in tolerable numbers as far south as the Pioneer River. On the Herbert River it it not much sought after as an article of food either by the natives or whites ; for as its eggs are esteemed a delicacy, the birds themselves are not much molested.

DIAMOND SNAKE—*Morelia spilotes.*

Description.—One of the characteristics, by which harmless rock snakes may be at once distinguished from poisonous serpents, is the large number of scales covering their body. The diamond snake is handsome. It has the body scales in 47 rows, with about 276 to 300 ventral plates, and the scales under the tail divided into 80/80 or 90/90 or more. The sub-caudal plates vary in almost every individual. As the much-used prehensile tail is liable to be injured or broken, it is not reproduced like the tail of lizards. The general colour of the diamond snake is a kind of bluish-black, very glossy when the skin is fresh and the epidermis lately shed, but becoming duller after the wear and tear of a few months, and quite opaque just before the skin-shedding begins. As a rule diamond snakes

have almost every scale of the body marked with a yellow spot in the centre, and often a somewhat indistinct, and frequently interrupted, yellow streak on each side. The abdominal plates are yellow, more or less blotched with black, and many species occur which have a number of diamond-shaped yellow spots upon the body formed by a few of the lighter scales, and hence their name has probably arisen. The head is covered with a number of irregular small scales, which are also more or less marked with yellow, and the last seven scales of the lower jaw forming the line of the mouth are deeply pitted. By these grooved or hollowed scales the harmless character of the reptile may be at once ascertained, as none of the Australian venomous species have scales so marked. The line of the mouth—the gape—is straight as in venomous subjects, but the deep indentations which mark the last lower labial scales, the small irregular head shields, the numerous body scales, the prehensile tail, and the spurs near the anus can leave no doubt on the minds of persons who know these facts as to what kind of reptile they have to deal with should they be bitten by a diamond snake. A diamond snake, measuring eight feet six inches, having the yellow spots very large and with numerous regular cross bands, was sent to the museum from Brisbane Water. One captured near Sydney measured 10¼ feet. Individuals of 11 feet or more are very rare.

Habits.—Though a harmless creature so far as poisonous effects are concerned, when it is irritated its bite is severe, and, though strictly nocturnal, individuals are sometimes met with during the daytime, either basking in the sun and digesting their food or in search of a place of shelter when they have been disturbed. They prefer open stony ridges studded with low trees, and well supplied with water, but frequent the edges of swamps and lagoons where they find a good supply of water-rats, besides young ducks and other water-fowl. They also visit the henroosts of the farmer or surprise the smaller mammals upon the branches of trees. In January or December the female deposits thirty eggs or more, which she incubates. Dr. Bennett permitted a diamond snake about eight feet long to entwine round his arm. He found its pressure, (which it seemed to exercise merely by the muscular power necessary to retain its position), was sufficiently energetic to make his arm ache for some hours afterwards.

Food.—Like the other members of the family *Pythonidæ*, diamond snakes prey upon birds and the smaller mammals; young individuals feed upon insects, frogs, or birds' eggs. In a state of nature they never touch any food except living animals. In captivity a diamond snake, which was kept in a cage, swallowed a rat which had been killed by a tiger snake. A telegram from Mount Victoria to the *Herald*, dated 21st February, 1895, says, "From the abundance of hares, kangaroo rats, &c., in the adjacent Kanimbla Valley, diamond snakes of a phenomenal size are occasionally met with there; one measuring a few inches under 11 feet was killed."

Where found.—The range of this reptile is restricted to a very limited area of country within a radius of 200 or 300 miles from

Sydney, it being found in no other part of Australia than that from Port Macquarie to Jervis Bay or perhaps Cape Howe, and from the coast to the western slopes of the Blue Mountains and the Liverpool Range. In the plains watered by the Lachlan, the Murray, and the Murrumbidgee this species is never found, the carpet snake there taking its place. In Tasmania a highly venomous species (*Hoplocephalus superbus*), which is the large-scaled snake of New South Wales and the copper-head snake of Victoria, has also received the name diamond snake, and it is sometimes the case that persons who have resided in Tasmania describe both species as highly venomous snakes. It is to be hoped that some day there will be a change of name of either the Australian or Tasmanian individual. The museum (N.S.W.) has a reptile from the Manning River, the skin of which is marked in a most extraordinary manner, partaking of the characteristics of both the diamond and the carpet snakes by having the diamond shaped scales and the carpetlike figuring. This blending of marking has led naturalists sometimes to hesitate in describing two distinct species.

Satin Bower-Bird—*Ptilonorhynchus holosericeus*.

Introduction.—The habits of this bird are most extraordinary. One point is of no ordinary interest both to the naturalist and the general admirer of nature, it is the formation of a bowerlike structure by this bird for the purpose of a playing-ground or hall of assembly—a circumstance which adds to the many anomalies connected with the avifauna of Australia. The old black males are exceedingly few in number, as compared with the females and young birds in the green dress, hence it is conjectured that two or three years elapse before they attain the rich satinlike plumage, which, when once assumed, is never again thrown off.

Description.—The adult male has the whole of the plumage of a deep shining blue-black, closely resembling satin, with the exception of the primary wing feathers, which are of a deep velvety black, and the wing-coverts, secondaries and tail-feathers, which are also of a velvety black, tipped with the shining blue-black lustre. The irides are a beautiful light blue, with a circle of red round the pupil. The bill is bluish horn, passing into yellow at the tip. The legs and feet are yellowish white. Besides the loud liquid call peculiar to the male, both sexes frequently utter a harsh, unpleasant, guttural note indicative of surprise or displeasure. Except when feeding this bird is extremely shy and watchful, especially the old males, which not unfrequently perch on the topmost branch or dead limb of the loftiest tree in the forest, whence they can survey all round and watch the movements of the females and young in the brush below. The young males closely resemble the females, but differ in having the under surface of a more greenish-yellow hue, and the crescent-shaped markings more numerous. The males are not very long-lived after the change ; this accounts for their paucity in black. The female has the head and all the

upper surface greyish green ; the wings and tail dark sulphur-brown, the inner webs of the primaries being the darkest. The under surface contains the same tints as the upper, but very much lighter, and with a wash of yellow. Each feather of the upper surface also has a crescent-shaped mark of dark brown near the extremity, giving the whole a scaly appearance. The irides are of a deeper blue than in the male, and with only an indication of the red ring. The bill is of a dark horn-colour. The feet are yellowish white, tinged with olive. In the hilly country to the east of Melbourne, in a flock of about 100 of these birds, it was noticed that there were not more than three or four of black plumage—these were the old males. It has been noted that the feathers do not change from green to black till the bird is some years old.

Habits.—The bowers these birds construct are usually placed under the shelter of the branches of some overhanging tree in the most retired part of the forest. They differ considerably in size, some being from two to three feet long, but others very much smaller. The base consists of an extensive and rather convex platform of sticks firmly interwoven, on the centre of which the bower itself is built. This, like the platform on which it is placed and with which it is interwoven, is formed of sticks and twigs, but of a more slender and flexible description, the tips of the twigs being so arranged as to curve inwards and nearly meet at the top. In the interior of the bower the materials are so placed that the forks of the twigs are always presented outwards, by which arrangement not the slightest obstruction is offered to the passage of the bird. The interest of this curious bower is much enhanced by the manner in which it is decorated, at and near the entrance with the most gaily-coloured articles that can be collected, such as the blue tail-feathers of the Rosehill and Pennantian parrots, bleached bones, the shells of snails, &c. Some of the feathers are stuck in among the twigs, while others with the bones and shells are strewed about near the entrances. The propensity of these birds to pick up and fly off with any attractive object, is so well-known to the natives, that they always search the runs for any small missing article, such as the bowl of a pipe, &c., that may have been accidentally dropped in the bush. Mr. Gould found at the entrance of one of them a small neatly-worked stone tomahawk of an inch and a half in length, together with some slips of blue cotton rags, which the birds had doubtless picked up at a deserted encampment of the natives. For what purpose these curious bowers are made is not yet perhaps fully understood. They are certainly not used as a nest, but as a place of resort for many individuals of both sexes, which, when there assembled, run through and around the bower in a sportive and playful manner, and that so frequently that it is seldom entirely deserted. It is conjectured that the runs are merely resorted to as a rendezvous or playing-ground at the pairing time and during the period of incubation. It was evident from the appearance of a portion of the accumulated mass of sticks, &c., that the same spot had been used as a place of resort for many years. Mr. C. Coxen having

destroyed a bower and secreted himself, saw the birds engaged in the task of reconstructing it, these were females. With much care and trouble Mr. Gould succeeded in taking to England two fine specimens of these bowers, one of which he presented to the British Museum, and the other to the collection at Leyden. Dr. Ramsay states:—"The bower is composed of small sticks, twigs, &c., stuck upright in the ground, surrounded by a platform of sticks, and ornamented with land shells, bones of small animals, feathers, &c. These bowers are usually constructed beneath the lower undergrowth in thickly timbered mountainous parts of the country, and when near the settlers' houses are often ornamented with pieces of broken china, glass, &c."

Nidification.—The nest of the satin bower-bird is built in the fork of a tree some distance away from the bower and not far from the ground. The bird constructs an open nest composed of twigs and sticks, and lined with grass. The eggs vary in proportionate length, but are usually long ovals, seldom even slightly swollen towards the thicker end; the ground colour is of a rich cream or light stone-colour, spotted and blotched with irregular patchy markings, and a few dots of umber and sienna-brown of different tints, in some almost approaching blackish-brown, in others of a yellowish colour. The larger markings are as usual on the thicker end, but a few appear with the small dots on the thin end. Measurements:—1·7 x 1·1 inches.

Food.—It feeds on the berries of plants and shrubs, also on wild figs, which are produced by the enormous fig-trees which flourish in the brushes it inhabits. It plunders any ripening corn it can meet with. It is granivorous and frugivorous, as insects form but a small portion of its diet.

Where found.—In the brushes stretching along the coast of South Australia, Victoria, New South Wales, and Queensland; localities, Rockingham Bay, Port Denison, Wide Bay district, Richmond and Clarence Rivers district, in the cedar brushes of the Liverpool Range, and in most of the gullies of the great mountain-chain separating the colony from the interior. It is fond of the giant fig-trees, towering to the height of 200 feet. There are specimens in the Melbourne Museum from the localities of the Upper Yarra and Goulburn rivers. Living birds have reached England, and some have existed for years in the gardens of the Zoological Society, London.

Tasmanian Tiger—*Thylacinus cynocephalus.*

Description.—The colonists bestowed various names on this marsupial—as tiger, hyæna, zebra-opossum, zebra-wolf, dog-headed opossum. It is the most ferocious and powerful of the indigenous mammals of Australasia. Professor Owen says:—"The marsupial bones, as bones, do not exist in the dog-headed opossum, or hyæna of the Tasmanian colonists. They are represented by two small, oblong, flattended fibro-cartilages. The marsupial bones have been

most commonly supposed to serve for the support of the pouch and young; but this pouch is well developed in the female thylacine, and in one of the specimens which I dissected four well-developed teats, each two inches long, indicated that it had contained four young ones when, or shortly before, the animal was killed. My view of the uses of the marsupial bones is that they relate more immediately to an increase of power in the muscles which wind round them." The general resemblance which the Tasmanian tiger bears to a wolf or a large dog has struck many, and has caused it to be arranged by some among the ordinary carnivora. Its legs, however, are proportionately shorter than in the wolf, and, judging from the structure of its feet, its body must be brought much nearer to the ground in walking than that of the wolf, it being what may be termed a semi-plantigrade animal. The head is like that of a dog; the ears are rather short, very broad at the base, and somewhat pointed at the opposite extremity. They are well clothed with hair, both internally and externally. The eyes are large and full; they are of a black colour, and provided with a nictitant membrane. Long black bristles spring from the upper lip; a few are also observed on the cheeks and above the eye. The fur of the animal is short, somewhat closely applied to the skin, though of a slightly woolly texture. Each of the hairs of which it is composed is waved, and yellow near the points. The general tint of the animal is greyish brown, but faintly suffused with yellow; the hue is paler on the under parts than on the upper. The fur on the back is of a deep brown colour next the skin. On the back there are black bands—zebra like—usually about fourteen in number. They commence immediately behind the shoulders, and are at first narrow and confined to the back, but proceeding towards the tail they become gradually broader, and are more extended in the lateral direction. The bands on the haunches are the longest, and are often forked at the extremities. The large pads at the base of the fore feet are naked and very rough. The claws of the fore and hind feet are nearly equal in size, short, thick, but slightly compressed and solid; they are of a brown colour. The tail is about half as long as the body, thick at the base, where it is covered with somewhat woolly fur, like that on the body. There are three or four black bands at the basal part of the tail above. The female is somewhat smaller than the male. The length of one that lived for some years in the Zoological Gardens, London, was 2ft. 9½in.; the tail was 15in. long. It had 46 teeth—8 incisors above and 6 below, 4 canines and 28 molars, 14 of the latter being in each jaw.

Habits.—It is a nocturnal animal, and hence more difficult for the settlers to guard against. Its destructive habits have roused the enmity of the colonists. The great increase of sheep in all directions obliges the shepherds to destroy the Tasmanian tigers by every possible means. Mr. Harris was the first to make this marsupial known. The specimen from which his description was taken had been caught in a trap baited with kangaroo's flesh, but being injured it did not survive many hours. The thylacine lives

amongst caverns and rocks in the deep and almost impenetrable glens in the vicinity of the highest mountains in Tasmania. In the daytime it is inactive and stupid. Like the owl, it constantly keeps the nictitant membrane of the eye in motion. It is sometimes seen during the day, upon which occasions, perhaps from imperfect vision, its pace is somewhat slow. It inhabits the summits of the western mountains, the altitude of some of which is about 3500ft. There, occasionally, snow falls for some months of the year, and frosts are severe. The number of young is four at a litter ; four have been found in the female's pouch. In confinement it is extremely shy, and on being alarmed dashes and leaps about its cage in the most violent manner, and utters at the same time a short, guttural cry, resembling a bark. When the comparatively small island of Tasmania becomes more densely populated, and its forests are intersected with roads from the east to the west coast, the numbers of this singular animal will speedily diminish, and extermination will have its full sway. Neither the shepherd nor the farmer can be blamed for wishing to rid the island of so troublesome a creature A price is put upon the head of the native tiger, as it is called, but the fastness of the Tasmanian rocky gullies, clothed with impenetrable forests, will for the present preserve it from annihilation—the fate of the wolves in England and Scotland. It is known to be still in existence, as hawkers of skins frequently offer skins of these animals for sale in Hobart. It sometimes attains so large and formidable a size that a number of dogs will not face it. The Tasmanian tiger is sometimes caught by a wire snare, in the form of a noose, which is fixed above its track at such a height as to take the animal's head when passing. One that was sent to the Zoological Gardens, Sydney, had been so cut about the neck in its struggles to escape that there seemed but little chance of its recovery. Several years ago Dr. Grant and Mr. Gunn, of Launceston, forwarded a fine pair to England in the barque "Stirlingshire." This was a valuable and interesting gift, which added one of the rarest and most difficult forms to the series of marsupials exhibited in the Zoological Gardens, London. They had been caught in snares on the upper part of St. Patrick's River, about 30 miles noth-east of Launceston. The female was kept a month in a small unfinished house near where she was captured. She was exceedingly agile, and could spring from the floor to the top of the walls, six to eight feet, and from joist to joist near the roof with the activity of a cat. Mr. Gunn says :—"I have had the female in confinement for upwards of six months. She has become sufficiently tame to permit the head to be touched through the bars of her prison, without showing any anger or irritation." Dr. Grant presented the male which had been in captivity only a month prior to the voyage. On board the vessel in which the animals were shipped twelve fat sheep were put as sea stores for the thylacines, and hay for the sustenance of the sheep. They had been fed exclusively on mutton before the voyage, and preferred the parts containing the bones rather than the heart, liver, &c. These marsupial wolves attracted great attention in London, and the male survived for about four years.

Food.—The thylacine is a flesh-eating animal. In its native state it fed on kangaroos, wallabies, echidnas, but when sheep were introduced it exhibited a decided preference for mutton. It made great havoc of poultry and other domestic animals of the settlers. Although a marsupial mammal, in regard to food it resembles the dingo of New South Wales, by being carnivorous. One in captivity declined to eat wombats, which where plentiful in the locality.

Where found.—In Tasmania. Thylacines are found only in the more remote parts of the colony. In past ages they were denizens of Australia and Patagonia. Fossil remains prove this. It is peculiar to the southern island, and is met with at Woolnooth, St. Patrick's River, Hampshire Hills, &c.

WHITE-BELLIED SEA EAGLE—*Haliaetus leucogaster.*

Description—(Brisbane *Courier*, March, 1895).—White-bellied eagle, white-bellied falcon, sea eagle, sea osprey, and fish-hawk are names also given to this bird. The plumage of both sexes is much alike, but the female is larger than the male. In the adults the head, neck, and all the under surface are white, and the tail feathers, for about one-third of their length, are terminated by the same colour. The primary feathers and the base of the tail feathers are of a blackish brown, the remainder of the plumage being grey. In the eyes the cere and lores and the horny space over the eyes are of a bluish lead colour, slightly tinged with green, and the irides dark brown. The bill is of a bluish horn colour, tipped with black. The legs and feet are yellowish white, and the claws black. The young birds have the head, throat, and back of the neck of a light buff, and the whole of the upper surface of the body and wings of a light chocolate brown, with each feather tipped with buffy white. The chest is brown, each feather being margined with buff, and the abdomen buff with each feather tipped with brown. The tail is of a light buff at the base, passing into a deep brown at the tip, which is white; while the under tail coverts and the under surface of the tail feathers are white Length, 30in. to 32in.; wing, 21in. and 22in.; tail, 10in. to 10½in.; bill, 2¼in. to 2⅜in.; tarsus, 4in.

Habits.—The flight of this eagle is very majestic as it floats smoothly about in the air and performs various aerial gyrations, the tips of its pinions being gracefully curved upwards. It is almost as large and as lordly a bird and quite as rapacious as the bold eagle. It is very wary, and swift in its flight, and hence it is difficult to get within gunshot. It has a remarkably keen and fearless look, which seems born of the sea, whilst its ashy-white plumage corresponds closely to the colour of the ocean surf, in which it principally finds its food.

Nidification.—It builds its nest, a large flat structure of sticks and twigs, on some inaccessible high crag, or in a fork near the summit of some lofty tree, generally a eucalypt or melaleuca growing on the cliffs. A pair of these birds are invariably found together, and their union is evidently that of a lifetime, for they

seem to keep to one particular bay or inlet to the exclusion of others of their species, while their nest is revisited at the period of incubation and regularly repaired. On islands where trees are scarce, it is generally placed on the flat surface of a rock, and composed of small bushy branches and sticks. The sea eagle nests from June to November, and the eggs, two in number, are of a dull white, stained with reddish brown, and measure 2¾in. long by 2¼in. broad. In 1877, Mr. Goldie was fortunate enough to obtain the eggs of this fine sea-eagle from an immense nest composed of about a cartload of sticks,and placed on a rocky islet near the coast of New Guinea.

Food.—Its food consists chiefly of dead cetacea, fish, marine animals, &c., principally those which have been washed upon the shore. At times it will dart down and snatch up some fish, which has ventured too near the surface of the water, with its claws and talons, and not its beak, as is often asserted, but it rarely dives beneath the water. When found frequenting the larger streams of the interior it does not refuse at times to make a meal off a duck, crane, or other waterfowl. Young pigs, lambs, and poultry are not unfrequently carried off by it.

Where found.—It is found frequenting the whole of the Australian coast, and takes the place in the bays and inlets and larger streams that the wedge-tailed species does inland. It is also found inhabiting the sea shores of New Guinea, the Malay Archipelago, and India. It is a fairly common resident of the Queensland coast. It is met with at Lord Howe Island, Tuggerah Lake: also on Houtman's Abrolhos. Eyries are established on Wallaby (Pigeon) island and Pelsart groups.

Spiny Echidna—*Echidna hystrix.*

Introduction.—Among the extraordinary animals furnished to the naturalist in Australia is the echidna, or native porcupine. In 1803 M. Geoffroy Saint-Hilaire proposed the name "monotremata" for the echidna and the platypus, which Shaw had classed with the edentata. In 1817 Cuvier and Oken still kept these animals among the edentata, but used Geoffroy's term—monotremata. In 1823 Meckel discovered mammary glands in these animals, and pointed out that there was little difference between viviparity and oviparity. Geoffroy became convinced that these animals were oviparous. Sir R. Owen wrote in 1834 the marsupialia and monotremata "may be regarded as an aberrant group of mammalia, characterised by an ovo-viviparous generation."

Description.—In size the echidna may be compared with the hedgehog. It is about 14 inches long and of proportionate circumference. The muzzle is covered with a naked purplish-black skin, It has a long snout, with a small opening for the mouth, and a round slender sticky tongue, with which it secures its food. The eyes are small and black. The rather short and stout body is covered with a thick skin, particularly on the back, where it has to support the strong spines. These are of a dirty-white colour, more

or less broadly tipped with black, sharply pointed, and about 1¾ inches in length. They commence on the back part of the head, and extend over the whole upper surface of the body. Their points are directed backwards, and on the back inwards, so that they cross each other in the mesial line. Near the root of the tail they form a large tuft, and hide the small rudimentary tail. The whole of the under surface and the limbs are covered with coarse brownish-black hairs. The legs are short and strong ; the fore feet are short and broad, and armed with large solid and nearly straight nails. The hind feet are narrower and less powerful than the others, the second toe being armed with a large claw sometimes 1½ inches in length, the use of which is to cast away the earth loosened by the fore feet. The heel of the hind legs in the male is armed with a strong spur.

Habits.—The echidna sleeps during the day in its burrow, but runs about and feeds at night. Bass and Flinders state that when they were at Twofold Bay their dogs found a porcupine ant-eater, but that they could make no impression on the animal. It escaped by burrowing in the loose sand—not head foremost, but by sinking itself directly downwards, thus presenting nothing but a prickly back to its adversaries. When attacked it has been known to burrow to a somewhat great depth in a short time (it has penetrated two feet of loose garden soil in two or three minutes). The movements of the echidna are tardy, the principal exertion being made when burrowing. When touched upon the under surface, or uncovered parts of the body, or when attacked by dogs, it rolls, like the hedgehog, into a spherical form, the prickly coat forming a good defence against the canine race, which have a decided aversion from having their noses pricked. This animal, when cleaning itself, uses only the hind claws, lying in different positions, so as to enable it to reach any part of the body. Its walk is slow and heavy. It is of a perfectly harmless disposition. It is terrestrial, fossorial and myrmecophagous. The female lays eggs, hatches them in her pouch, suckles the young, as do other mammals. The pouch is said to be found only when she has eggs or young. It produces its young from July to December. The season varies with the latitude.

Food.—In a state of nature the food of the spiny echidna consists of ants, of which a never failing supply can at all times be procured, since this tribe of insects is probably more numerous in Australia than in any other part of the world. They are procured by means of its protractile, lengthened, slender and flexible tongue, which is constantly kept lubricated with a viscous matter to which the ants adhere. In captivity it may be fed upon milk and eggs, the eggs being boiled hard and chopped up small, with rice.

Where found.—The range of the genus is most extensive, from New Guinea on the north to Tasmania on the south ; and whether as one species or more (which will be discussed hereafter), the echidna is a cosmopolitan of Australasia. It inhabits the sandy and sterile plains, but is nowhere abundant, except in a part of Queensland. It is met with on the Goulburn plains, and on the islands in Bass Strait.

Species.—The animals belonging to this genus have been divided into several species, but a careful consideration of their characters shows that, although the range of variation is very large, yet all the intermediate stages appear to exist between the most widely separated forms. Three geographical races, however, seem to deserve recognition by name—a northern, central and southern; but their distinguishing characters are too slight and too inconstant to justify their specific distinction. The northern is the Port Moresby echidna, its habitat is South East New Guinea, and as yet it is only known from Port Moresby. The central is the common echidna, found in the whole of Australia. In the British museum there are specimens from Queensland; Liverpool Range, Port Stephens, in New South Wales, South Australia and York, in West Australia. The southern is the hairy echidna (*Echidna setosa*), which is found in Tasmania. In the museum in Melbourne, there are exhibits from Queenscliff, King's Island, Tasmania and Portland. By some naturalists two genera have been accepted, viz., echidna and proechidna. Proechidna is only doubtfully distinguishable from echidna, agreeing with it in nearly every essential respect. It has one species, the three-toed echidna, which is found in north-west New Guinea. In the *Zoological Record* of 1888, in reference to echidna and proechidna, the following occurs, one species of these genera is admitted, the last named genus being only adopted with hesitation.

Oviparity.—Mr. W. H. Caldwell, M.A, Balfour student of the University of Cambridge, sojourned in Australia in 1883-5, partly for the purpose of investigating the mode of reproduction of the echidna. The Committee of the Royal Society appointed to administer the Government grant for the endowment of research had given £400 for equipment, and a sub-committee £100, which they held for a similar object. He was honoured with letters of introduction to the colonial secretaries of New South Wales, Queensland, and South Australia, also to the admiral on the Australian station. Mr. Caldwell proceeded to the Burnett River, in Queensland, where he found echidna to be very numerous. He employed blacks to assist him; echidna being their favourite food, their skill in finding them was very remarkable. In July, 1884, they began collecting echidna, but, although he had as many as fifty blacks in his service, he was not so successful as he expected. A skilful black when he was hungry generally brought in one female echidna, together with several males every day. The former seemed much more difficult to find than the latter at this season. Mr. Caldwell, therefore, postponed his researches till the following breeding season, when he employed over 150 natives during July and August, 1885. He paid the blacks half-a-crown for every female, but the price of flour, tea and sugar which he sold them rose with the supply of echidna. The half-crowns were, therefore, just sufficient to buy food enough to keep the lazy blacks hungry. They caught between 1300 and 1400 echidnæ of both sexes, from which a fairly complete series of stages of parturition was obtained. In his first expedition he had obtained

laid eggs from the pouch of the echidna in the third week of August, 1884. When fresh laid the egg is of an opaque white colour, destitute of calcic salts in the shell. As a result Mr. Caldwell came to the conclusion that monotremata are oviparous—this had been before asserted by some naturalists and denied by others, as Sir R. Owen, but never clearly proved. Coincident with this discovery, but in another colony, other evidence was forthcoming. Mr. Haacke found on 25th August, 1884, an egg-shell, the remains of a rotten egg in the pouch of an echidna, and showed it to the Royal Society of South Australia on 2nd Sept. The proceedings of the Royal Society, Tasmania, record that in October, 1888, the horse of Mr. Fletcher, in the Campbell Town district, put its foot into an unseen hole. On the rider dismounting and putting his hand into the hole, he found a porcupine, which he lifted out, when an egg dropped from the animal and was broken in its fall, exhibiting an embryo animal. He presented the broken shell and the partially-developed animal to the museum. This fully corroborated the evidence adduced by Mr. Caldwell.

Fossil remains.—Remains of monotremes were first found in a fossil state by Mr. Krefft. A few bones were found in the Welling valley caves; they are exhibited in the Sydney Museum. The bones are certainly those of a terrestrial and fossorial genus, and probably identical with echidna, but greatly larger than the living species. A portion of a humerus was found in Darling Downs, also indicating the former existence of a gigantic monotreme in Australia.

Rose-breasted Cockatoo—*Cacatua roseicapilla.*

Description.—The crown, occiput and wings are tinged with rose colour, the basal portions of the latter are bright rose colour; the cheeks, a collar surrounding the neck, the throat and chest are bright rose colour, edged with whitish grey; the under surface of the shoulders is rose colour; the wings and the upper part of the back and tail are light grey; the quills and the end of the tail are dark grey; the lower part of the back and the upper tail coverts are whitish; the under tail coverts are light grey. Specimens vary considerably in the depth and richness of the colouring of the breast.

Habits.—Like the common white cockatoo it associates in large flocks, and where agricultural operations are conducted it proves an equally troublesome neighbour. A flight of these birds is a beautiful sight, as their movements are simultaneous—one moment displaying the silvery grey back, and then, by a sudden change, bringing the rich pink of the under surface in view. It possesses great powers of flight. It is very hardy, and will live for many years in a cage. Numbers are captured for the English and European markets, as there is but little difficulty in the transport, this bird bearing the sea voyage better than almost any other.

Where found.—It is very plentiful in the interior and in the north of Australia, particularly in the Maranoa district. It is very common round the Gulf of Carpentaria. In Queensland it is found to the west of the Great Dividing Range. It is met with near Derby, north-west Australia, Port Denison, Port Essington, in New South Wales, Victoria and South Australia. Both Oxley and Sturt found it to the north-west of the Blue Mountains. It is found near Bourke.

Nidification.—Like all the members of this section, the rose cockatoo nests in the hollow branches of large trees, the box being usually preferred for this purpose. It lays its eggs on the débris of decaying wood generally found in such places; the eggs are three in number, white, rather oblong in form, and slightly granular. The breeding season begins in October.

BLACK SNAKE—*Pseudechis porphyriacus.*

Description.—This is one of the most beautiful of snakes, and one of the most deadly in the effects of its bite. In this latter respect, if it is second to any of its congeners, it is subordinate to only the brown-banded snake. The length of the body is about 5 feet, of the tail 6 inches; the head or gape is about 1 inch. The body and tail are moderately elongate and gradually tapering. The head is subquadrate, being flattened above and at the sides; it is obtusely rounded in front, and is a little wider than the neck behind. The scales of the back are flat and smooth, in about 17 rows; the abdominal plates are about 180. The colour of the head, back, and tail is purplish-black or dark-slate colour; the lateral row of body scales on each side and the abdominal plates are rich carmine-lake red, with the hind tips and edges blackish. The under side of the head and the under side of the tail are lighter than the back. Like the other genera of the family *Elapidæ*, the poison-fang in the black snake is grooved on the front face for the duct of the poison-gland, which opens near the point. The bite of this reptile is highly venomous, killing good-sized dogs or goats within an hour. The fangs are scarcely large enough to penetrate common cloth or leather; they do not pierce ordinary bush boots. This has been frequently proved by experiment. As in the family generally, there are a few small harmless solid teeth behind the fangs in the upper jaw, besides two rows on the palate, and the usual row of small hooked solid teeth on the lower jaw. The anterior series of subcaudal scales being in one row, and the posterior ones in two rows, is a character which readily separates the genus from the allied forms.

Habits.—The black snake retires into holes in the ground during the winter months, from May, until the warmth of spring brings it forth again. When irritated, it can flatten and widen the neck by raising some of the anterior ribs. It then raises about two feet of its body off the ground, flattens out the neck like a cobra, and darts at its prey or enemy. Its poison is exceedingly active and virulent.

Some fatal cases of snake-bite in man from this species have been recorded, and a large-sized dog will usually die in an hour from the effects of its bite. The young are coloured like the adult, and are usually about 16 or 18 in number; they are sometimes found under stones. The bite of young poisonous snakes, though producing ill effects, is very seldom fatal, the venom not being potent. This snake has been seen to swim out in a lake or a lagoon to some rock, or to a fallen tree not completely submerged, where it awaits the arrival of small birds and other prey. In Sept., 1893, on a Sunday afternoon, a large black snake, 5 feet 2 inches long, was observed to cross the asphalt of the Harbour Reserve, Manly. Almost immediately chase was given; but, being pressed, the reptile took to the water, and swam towards the wharf. One of the fishermen followed in a boat, and ran the snake ashore, where it was killed. After a thunderstorm it often comes out from its hiding place. Climate, season, and many other circumstances affect the virulence of its bite. When it bites it speedily lets go, and leaves two punctures. It frequents low, marshy places, and is fond of water. It dives and swims well. The young are brought forth in March. On hot days, in the country districts, these reptiles are often encountered, coiled up by the roadside or near an old stump; if disturbed, they make for their hole.

Food.—The chief food of this species is formed of frogs, lizards, mice, and other small mammals, in particular the young of the water-rat; also small birds, as the finch. On one occasion 16 young water-rats were taken out of a specimen, so that reptile must have plundered four nests.

Where found.—The black snake inhabits nearly every part of Australia, and is peculiar to it. It is the most common of the venomous snakes. It is more numerous in New South Wales and the other warmer colonies than in Victoria. In the latter colony it is not uncommon near its northern Murray boundary. It is not found in Tasmania. The reptile known under the name of "black snake" in that island is a dark variety of *Hoplocephalus curtus*, or brown-banded snake, identical with *Hoplocephalus fuscus*. In South Australia it has been met with near the Murray, Lake Alexandrina, Coromandel Valley, and Aldinga. In New South Wales it is abundant at the Collector end of Lake George and near Lake Bathurst. The museum, Sydney, has specimens from Sydney; and Lawson, Blue Mountains. Some very fine ones have been killed near Manly. The Melbourne museum has exhibits from Grafton and the Clarence River district. In Victoria this snake has been found in Studley Park, near Melbourne, and about the bend of the Yarra. The largest specimen in the Adelaide museum was caught by Dr. E. C. Stirling near the Murray; it measured over 5 feet. Lagoons and swamps suit its habits, and produce a plentiful supply of food.

Incidents.—Major Mitchell says:—"The natives considered the black snake very fierce and dangerous, that it never ran away, but always faced or pursued them. One shot while swimming a pond

had the fangs hooked inwards, which the natives particularly pointed out. A smaller snake of the same kind attacked one of our party, and also a native, but the former shook it from his clothes; it then fixed its teeth in the shin of the native, who detached it, but as no blood came from the bite, he seemed to care little about it."

In Nov., 1890, Mrs. Noble, of Fountaindale, near Jamberoo, had occasion to go into the dairy. Whilst there she heard a peculiar noise about her feet; at the same time she felt something touch the lower part of her ankles. On looking to see what it was, to her horror she beheld a large black snake coiled round both her legs. She had the presence of mind to call the best dog for snakes on the premises. On raising her dress sufficiently to display the reptile, the dog at once seized it, bore it away, and killed it.

Mr. James S. Bray, naturalist, of Sydney, narrates:—"A black snake, caught at Botany, was sent to me on the 11th Sept., 1890. The reptile, on my attempting to take it from the box, flattened itself out, and showed so much 'fight' that I closed the box again, intending to leave the snake for a day or two, until it became quieter. I forgot all about it until coming across the box on the 6th Aug. On opening the box, in the full expectation of finding the reptile dead and dried up, the snake darted out quite lively. Strange to relate, the reptile was in grand order. The beautiful red carmine colour of its abdominal plates, together with the glossy black scales of the upper part of the body, made it quite a handsome object. Here and there on its body were detached portions of its shed skin, evidently last season's." A frog of large size was given to this snake, which had been for 329 days without food or water. The snake seized the frog, and held on to it for about half a minute. In four minutes the frog was powerless to move, through the action of the venom; in 17 minutes its limbs were quite limp, and only a few spasmodic jerks of the body gave signs of life; in 43 minutes it was quite dead.

Lumholtz, the Norwegian naturalist, says:—"During my sojourn in Mackay, my dog, a fine Gordon setter, was exposed to great danger at a station near the town. She suddenly stopped in the high grass, when I discovered a splendid specimen of the black snake, whose head had assumed the flat form which is peculiar to venomous snakes when they become excited. The hot weather had made it still more angry. With the head slightly raised from the ground, it lay just ready to give my dog a fatal bite, if the latter made the slightest motion. I hastily called the dog back, and killed the treacherous enemy."

At Binalong, some years ago, a large two-year-old Newfoundland dog died in seven minutes after being bitten on the nose by one of these reptiles. It is to be observed, however, that the day was very hot, no water was near, and the snake was greatly enraged when it bit the dog.

Great Red Kangaroo—*Macropus rufus.*

Introduction.—The red kangaroo is not only the most beautiful member of the family to which it belongs, but it may also be regarded as the finest of the indigenous mammals of Australia yet discovered ; its large size, great elegance of form, rich and conspicuous colouring, all tending to warrant such an opinion. In 1853 a splendid male lived in the gardens of the Zoological Society in Regent's Park, London. It formed an attraction to visitors, who took an interest in the singular mammals of Australia. Prior to the arrival of Mr. Gould's specimens in England, a single skin, and that in the most imperfect condition, was all that had ever reached Europe. This specimen is the original of the figure and description in the zoology of the "Voyage de l' Uranie." The specific term *Macropus laniger* had been applied to it, which seemed to Mr. Gould so unsuitable to his own specimens that he questioned their identity with the one referred to. He, therefore, visited the Museum at Paris and examined the original, when he found to his surprise that the deficiencies of natural hair, on many parts of the skin, had been replaced by finely-cut sheep's wool, whereby the appellation "woolly kangaroo" was rendered more correct than he supposed. The sides and upper surface of the body of those he took to Europe are the only parts of the animal that have any tendency to the woolly character, and the hair on these parts entirely wants that crispness mentioned by Messrs. Quoy and Gaimard. The specimen in the museum of the Jardin des Plantes was presented to the officers of the French expedition by Fraser, the botanist, during their stay at Sydney, and was said to have been from Port Macquarie—in all probability it should have been the Macquarie River, since it is an animal found remote from the coast. In the structure of its hinder feet, the greater length of its arms, the comparative nakedness of its muzzle, and in the much smaller size of the female compared with the females of the true *Macropi*, and in the difference in the colouring of the sexes, it is most intimately allied to the great rock walleroos, to which Mr. Gould gave the generic name *Osphranter*. Hence, he associated it with the members of that genus, and called it *Osphranter rufus*, which latter or specific name has the priority over that of *laniger* assigned to it by M. Gaimard, but neither of these names is generally followed.

Description.—The length of the head and body is about 65 inches, of the tail about 42 inches. The general colour of the male is sandy red slightly tinged with orange, especially on the flanks and rump. The neck, back and shoulders are washed with ashy grey ; the same tint, but somewhat paler, is also observable on the outer side of the thigh. The head is a deep ashy grey, tinged in parts with sandy red ; the sides of the muzzle, as far as the angle of the mouth and the chin, are pure white. The throat, chest and all the under surface are tawny white, tinged with grey. The arms and legs are tawny white ; the hands and toes are blackish brown ; the tail is tawny white, tinged with grey. The male, especially,

when adult, has the red and white more blended into each other; the blue-grey, which distinguishes the female, being rarely if ever perceptible; hence, has arisen the names of red buck and blue doe for the two sexes respectively. The colouring of the fur cannot be preserved after death it exposed to light. Such a difference is produced that the living animal and the mounted specimen might be taken for two different species. The general tint of the female is rather paler, the sandy red on the sides of the body being less distinct. She is particularly attractive from her graceful, slender and elegant form, and from the snowy whiteness of her legs and under surface contrasted with the blue-grey tint of her sides and back. The head and shoulders are of a paler grey. She differs from the male in having a distinct broad white mark extending from the angle of the mouth backwards under the eye, and in having the under parts of the body and limbs pure white. The female is called the flying doe, from her extreme fleetness, for which her whole structure is admirably adapted. Under favourable circumstances she will outstrip the fastest dogs. Occasionally, however, both sexes are run successfully, either from the chase being over soft mouldy soil, or from the female being encumbered by a large and heavy young one, which she has not been able to disengage from the pouch, for she always drops the young one, if possible, when hard pressed.

Where found.—It is found in eastern, south-eastern and south Australia. In New South Wales it frequents the banks of the Murrumbidgee and Darling, also the plains bordering the Namoi. It is generally dispersed over the great river basin of Australia and its eastern parts. It prefers the hard, red stony ridges clothed with box, and open plains, in the midst of which it may frequently be seen in the daytime basking in the sun. Two of Mr. Gould's specimens were obtained in South Australia, and the others on the plains bordering the Namoi Having observed a pair sheltering themselves from the heat of the sun, under a group of myalls near the Namoi, he led a fine dog to within 70 yards of them without being perceived; the dog was so quickly at the heels of the one he ran after, which was carrying a large young one, that her escape was impossible. The large male he secured, which weighed above 200lbs., was caught while the naturalist was making a forced march between the Murray and Adelaide, at a time when his provisions were exhausted. The flesh of this fine kangaroo sustained him and his party for four days. In Victoria the red kangaroo is only found towards the warmer northern boundary of the colony, where it occurs in immense numbers. It is met with near Swan Hill, Victoria. The extensive poisoning of the dingoes by strychnine has tended of late years to increase very greatly the number of the plant-eating animals. Sturt, when exploring the Murrumbidgee recorded in his journal: —"We saw several red kangaroos in the course of the day, and succeeded in killing one. It certainly is a beautiful animal, ranging the wilds in native freedom. The female and the kid are of a light brown colour."

Not long ago the Acclimatisation Society of Victoria had an exhibit quite unique, namely, five pure white kangaroos. Some years ago a white female kangaroo was obtained and the others were her progeny, all of which, strange to say, were females; some of these still survive. The red kangaroo has suspiciousness and shyness inherent in its nature, and it never becomes really tame as some of the other species do.

Native Companion, or Australian Crane—*Grus australasianus*.

Introduction.—The native companion, as it is called by the colonists, represents a distinct species. It was frequently observed by Leichhardt during his overland expedition from Moreton Bay to Port Essington. Captain Sturt states that it was very abundant near the Macquarie. For some time this bird was considered identical with the *Grus antigone* of India; but, as it has been proved to be entirely distinct, it was assigned the specific term *australasianus*, the name being appropriate, as this is the only species of form of *grus* inhabiting the country. This bird is most stately and elegant in all its actions, and adds greatly to the interest of the scenery which is ornamented with its presenee. The Australian crane is a noble bird, and is rightly admired by both aborigines and Europeans.

Description.—The native companion stands about four feet high, but its body is very light. The general plumage is deep silvery-grey; the feathers of the back are dark-brownish grey, with silver grey edges. The smaller wing coverts are dark brown; the primaries are black; the crown of the head and bill are olive-green. The raised fleshy papillæ surrounding the ears and the back of the head are fine coral-red. The legs and the neck of this bird are long and slender. The legs and feet are purplish-black. The sexes are alike in colouring, but may be distinguished by the smaller size of the female. In the old males the gular pouch is very pendulous, and forms a conspicuous appendage. It occupies the space between the two branches of the lower mandible, and joins the upper part of the throat. It is a membranous sac.

Habits.—It is a powerful bird of flight, and performs journeys of vast extent from one part of the country to another. When near the ground the action of the wings is very laboured, but when soaring in a series of circles at such a height in the air as to be almost imperceptible to the human vision, the movement appears to be easy and graceful. While performing these gyrations it frequently utters a hoarse croaking cry. About sunset flocks may be seen moving from the lakes to the swamps and feeding grounds. It is observed at all seasons of the year, sometimes singly or in pairs, and at others in flocks of from thirty to forty in number. It is sometimes captured, and is easily tamed. In the enclosures at the Botanical Gardens, Sydney, there are several native companions,

which have become exceedingly tame. Sturt writes:—"This large-sized crane is common near the waters of the interior; but he is a wary bird, and seldom lets the fowler within shot. When seen in companies, they often stand in a row, as they fly in a line like wild fowl. Their general plumage is slate colour, but they have red ceres or skin on the head." Oxley, Surveyor-General of New South Wales, writing of his exploration of the Lachlan, says "that large species of bittern, known on the east coast by the local name of native companion, from their being always seen in pairs, was observed on the flats, of a very large size, exceeding six feet in height; but they were so shy that we were unable to shoot any." At a meeting of the Linnean Society of New South Wales in 1882 there were exhibited brushes used by the natives of the Northern Territory, which were formed of the crest feathers of Leadbeater's cockatoo inserted in the wing bone of a native companion. One of these birds was tame in the Government domain at Parramatta in 1829. A wild goose used daily to visit it, and remain with it for many hours. Sturt frequently saw them together, and the goose would allow him to approach quite close before it flew.

Nidification.—The breeding season comprises September and the two following months. The native companion deposits its eggs, two in number, in a slight depression of the ground, usually on the plains. The eggs are of a rich cream colour, blotched and spotted all over with light chestnut and purplish-brown markings, the latter colour appearing as if beneath the surface of the shell. The dimensions of two eggs in the Sydney Museum collection are 3·8 by 2·5 inches; 3·8 by 2·4 inches. Two in the Dobroyde collection are elongated in form, and gradually tapering to a nearly sharp point at the smaller apex. The length is 3·9 by 2·2 inches; 3·9 by 2·3 inches. A pair of eggs in Dr. Ramsay's collection, taken by Mr. W. Liscombe near Tumut, are of a dull white, uniformly and sparingly spotted all over with blood-red markings, a few nearly obsolete spots of purplish-brown appearing as if beneath the surface of the shell. The eggs of this species are subject to much variation in the colour and dispositions of the markings, and the shell is minutely pitted over the whole surface. In shape they are very like those of the domestic turkey.

Food.—It feeds on insects, lizards, bulbous roots, and various other vegetable substances. In searching for these it tears up the earth with its powerful bill.

Where found.—It is distributed over the greater portion of Australia, but it does not inhabit Tasmania. New South Wales, Victoria, South Australia, the interior of the continent, North-west Australia, near the Gulf of Carpentaria, Rockingham Bay, Wide Bay district, Dawson River. Oxley, when on his exploration of the Lachlan, noticed great numbers of native companions on the plains to the west of the Blue Mountains.

Large-scaled Snake (Krefft, New South Wales), Copper-head Snake (McCoy, Victoria), Diamond Snake (Tasmania)—*Hoplocephalus superbus.*

Name.—The late G. Krefft describes this reptile under the designation, the large-scaled snake, but he also speaks of it as the broad-scaled snake. In Victoria it is known as the copper-head snake. The popular name "copper-head" was adopted in Victoria from a well-known vendor of a supposed antidote for snakebite, named Underwood. This man used to go about the streets with several specimens of this species in the bosom of his shirt, protruding now and then around his neck. The writer remembers seeing him once in the back yard of the Victoria Hotel, Geelong, in 1860. He had a litt'e knot of spectators before him. His right arm which was bared and upraised had a snake entwined round it like a son of Laocoon experienced; there was another snake round his neck. His arm had been bitten, and he was dashing his antidote upon the punctures from a black bottle with his left hand. People always doubted, and pondered thus: Was the snake venomous? Had its fangs been broken out? Was the antidote efficacious? One day Underwood was induced to cause one of another species—a tiger snake—to bite him to show the value of his antidote. The snake-charmer was dead within an hour. Whatever power his nostrum may have had against the venom of his favourite copper-head, it was powerless against the deadly virus of the tiger snake.

Description—The length of the copper-head snake varies from two feet five inches to three feet eight inches. The tail is from four and a quarter to six and a half inches. The gape is about one inch. The body and tail are moderately thick, and gradually taper. The head is subquadrate, depressed, and rounded in front. The scales are large. The vertex plate is hexagonal; this is between the eyes; it is about twice as long as broad. There are 15 rows of dorsal scales across the middle of the back. There are from 147 to 157 ventral plates. The sub-caudal plates are from 41 to about 50. The colour of the back varies from dark copper-brown to light reddish-brown or nearly black. The tip of each scale is blackish. The top of the head is of a dark-copper blackish-bronze with two diverging darker extensions forming a V-shaped black patch on the neck. The scales on each side have a white patch on the anterior half of each, the tip being blackish. The underside is a very pale yellowish-olive in front, becoming dark grey or blackish on the middle of the tail. The colour of the head is like that of an old copper coin. The blackish examples are frequently mistaken for the black snake, but the scales on the underside of the tail being in only a single row, and there being one instead of two nasal plates, easily distinguish them.

Habits.—Similar to those of the black snake described elsewhere. Its numerous young are brought forth in December and January.

Where found.—This species was long supposed to be confined to Tasmania, and the first announcement by Professor McCoy of its being on the mainland near Melbourne was supposed to be erroneous by subsequent writers on the subject in New South Wales and London. The copper-head snake is very abundant in Tasmania, where it is called the diamond snake—a name which now properly belongs to a harmless snake of New South Wales. This causes confusion in description unless this fact is borne in mind. It is found in Victoria, New South Wales, South Australia, and Western Australia. It is met with about the south-eastern suburbs of Melbourne, the museum of which has specimens from Mulgrave, South Brighton, Prahran, Caulfield, Loutit Bay, and Dandenong-road. It has been met with in the Snowy Mountains, and near Moe, Gippsland. The Macleay museum, Sydney, has a specimen from Moss Vale, being positive proof of its presence in New South Wales. It has been found at the following places in South Australia: Port Lincoln, Mount Lofty Ranges, Kangaroo Island, Marble Ranges, and Aldinga. One was found also on King's Island, and presented to the Tasmanian museum.

Ammonia antidote.—This snake for its size is extremely venomous. Many of the dangerous cases of snakebite near Melbourne are due to it. A stationmaster named Brown on the Hobson's Bay Railway at Elsternwick was bitten by a small individual of this species, which some workmen imagined they had killed, and after carrying it some distance hanging across a stick, threw it upon the platform, when Brown, taking it up, received a small wound in the finger, and shortly showed the usual symptoms of snake-poisoning. The ordinary remedies were applied—excision of the bitten part, rubbing ammonia on the wound, ligatures, and sucking the wound, doses of brandy, galvanism, and the patient walked about by assistants. Two surgeons gave him up, his sight being gone, his legs paralysed, his pupils dilated, neck and face swollen, and coma ensuing from which he could not be roused. The medical attendants, explaining to his friends that they could do no more, and that his death might be looked for in a few minutes, proposed to try what was then considered the dangerous remedy of injecting strong liquor of ammonia into a vein, as advocated by Professor Halford. On this being done by Dr. Halford, who had been sent for, to the astonishment of all present the man instantly recovered consciousness, the pupils of his eyes contracted, and, sitting up, he recognised his wife, child, and friends. The symptoms passed off, and he survived, and after a time was able to resume his duties.

Mallee Hen—*Leipoa ocellata.*

Description.—This beautiful bird ranks among the most interesting which Australia has produced. The mallee hen or ocellated leipoa is a more slender and elegantly formed bird than the wattled talegallus; it differs from that bird in having the head and neck thickly clothed with feathers, and in being adorned with a beautifully variegated style of colouring. The head and crest are blackish brown; the neck and shoulders dark ash grey; the fore-part of the former, from the chin to the breast, being marked by a series of lanceolate feathers, which are black with a white stripe down the centre; the back and wings are conspicuously marked with three distinct bands of greyish white, brown and black near the tip of each feather, the marks assuming an ocellate form, particularly on the tips of the secondaries. All the under surface is light buff, the tips of the flank feathers being barred with black.

Mound-raising (K. H. Bennett).—About the month of October the birds (two only) commence (if new to construct; if old to repair) their huge mound-nests. In the former case they select a slight depression, such as where a stump has been burned out. This they fill with a mass of leaves, fragments of porcupine grass, mallee bark, &c., and in doing this the whole surface of the surrounding ground for many yards is swept perfectly clean. The method of doing this is to go out some distance from the site of the intended nest, and then walking backwards, alternately raking with each of their powerful feet, and, assisted by their wings, sweep everything loose to a common centre. In the case of an old nest, they clean out the sand used for covering the eggs the previous year. Should the weather be moist at the time, the work goes on uninterruptedly, but should it be dry, they wait until a passing shower has damped the mass of vegetable deposit; this they then cover over with 3 or 4 inches of sand, when the female commences the work of depositing her eggs. This she does by laying the egg on the sand covering the leaves, &c., and then leaning backwards grasps the egg in both feet, placing it in an upright position (small end down), then holding it with one foot, she with the other gently rakes some sand around; and changing feet does the same on the other side, until the egg will remain upright. It is then covered as well as the other part of the nest with several inches of sand. And here comes in the immense amount of work the birds have to perform at each subsequent laying, for the whole of the sand down to the level of the first egg (until the first layer or tier is completed) has to be removed, and so on with each successive layer, and as the mound increases ie height, the labour increases in proportion. The removal of the sand is effected by the aid of wings and feet, the bird dragging each small quantity thus obtained a sufficient distance to ensure its not running back.

The circumference of the part of the mound in which the eggs are deposited is about 3 feet, and around the edge of this space the eggs—usually 3, sometimes 4—are placed. This completes the

layer. The whole are then covered with sand to the depth of 4 or 5 inches, which is allowed to remain, and the second layer is commenced. The birds lay about twice a week; thus a long time intervenes between the laying of the first egg and the last, and consequently eggs in all stages, from fresh laid to just on the point of hatching, and young birds, are to be found at the same time. During the period of hatching the parent birds, as a rule, visit the nest morning and evening every day. In the earlier stages this is done to repair the damages caused by native dogs and iguanas, which scratch at the nest in the hope of obtaining the coveted eggs or young, and also to repair the damage often caused by their more destructive biped foes.

As the process of hatching progresses these visits have an additional motive—that of assisting any young bird out of the superincumbent mass by opening the nest; but this is not absolutely necessary, as the chicks can work upwards from the lower layer. They have been found in this position, and almost at the top. The egg is of large size, consequently the chick is large and possessed of considerable strength; and, on emerging from the shell, which is extremely fragile, its natural instincts prompt it to struggle for air and light. Its struggles displace the sand, which runs down beneath the bird, and thus gradually it gets higher and higher.

When at last it reaches the summit of the mound, it is a fully-developed bird, able to fly, run, and take care of itself, which it has to do, for the old bird now totally ignores its presence. This bird leads a solitary life, except at the period of mound-raising. It is very rare that two are seen together. The mounds are of great size; one measured 37 feet in circumference.

Its note, not often uttered, is a most mournful sound, something like that of the bronzewing pigeon, but much louder, and each note more prolonged.

Food.—The food of the mallee hen consists of insects, the seeds and berries of various shrubs, and the tender shoots of plants. In its wild state it is entirely independent of water, but will sometimes drink when domesticated.

Where found.—New South Wales, Victoria, South Australia, west and south-west Australia. This singular bird, as its trivial name implies, is an inhabitant of the arid mallee scrubs that clothe a large area of the western portion of New South Wales, and even larger extents of some of the adjoining colonies.

Brown Snake—*Diemenia superciliosa.*

Description.—This is one of the largest of the poisonous and dangerous snakes. It belongs to the sub-kingdom *vertebrata*, class *reptilia*, order *ophidia*, family *elapidæ*, genus *diemenia*. The body is moderately stout and cylindrical; the head is subquadrate, and the muzzle blunt. The head only moderately exceeds the width of the neck. It is flat above. The sides are nearly vertical, and converge to a narrow, rounded, blunt muzzle. In the upper jaw,

besides the two small fangs, there are six small solid teeth behind the fang on the left side, and seven on the right. There are also 17 small, solid, equal, palatine teeth on the left side, and 18 on the right in the same specimen. There are 17 rows of scales across the middle of the back. They are large, flat, rhombic, and smooth. The ventral plates are from 190 to 216. The subcaudals are from 57 to 73. The anal plate is double. The colour of the head, the upper part of the body, and the tail is nearly uniform olive-brown with a slight bronze reflection. The lower surface is of a lighter tint of pale yellowish-grey, the edges of the scales being darker coloured with a glassy lustre. The anterior part of the abdomen is freckled with pale brownish spots, the hinder part is dotted with grey. In South Australia this snake varies very much in colour and markings. Old specimens vary from light brown to entirely black, young ones show the black marking on the head and neck very distinctly. They are sometimes irregularly black-banded. The eyes are black with a yellow line round the pupil. The skin between the scales is greyish.

Specimens.—The following table shows the number of scales, &c., in seven individuals which are preserved in the Melbourne Museum:—

Locality.	Scales of Back		Plates.		Length.		
	Across middle	Over base of tail.	Abdomen.	Tail.	Total.		Tail.
					ft.	in.	in.
1. S. Brighton (young)... ..	17	15	190	46	1	10	3¼
2. Heidelberg (average) ..	17	14	204	57	4	3	7½
3. Queenscliff...	17	15	197	63	5	6	11
4. Murray Downs	17	14	200	57	3	6	6½
5. Sebastian, Sandhurst ..	17	15	201	73	3	6	7
6. Footscray	17	14	206	60	4	5	9
7. Melbourne	17	15	202	62	5	2	9¼

Habits and Food.—Similar to those of the black snake described elsewhere.

Where found.—The brown snake is more generally distributed than any of the others, being equally common from the south coast of Victoria to the north of Australia. Speaking generally, its habitat is Australia and New Guinea. The Macleay Museum at the Sydney University exhibits one from King George's Sound. It is the most common of the dangerous snakes in South Australia; it is sometimes caught in Adelaide and its suburbs. The largest obtained in that colony was 5½ feet long—the same length as the finest Victorian exhibit. Brown snakes are numerous near Temora, N.S.W. In Jan., 1894, a farmer's son at Red Hill killed four in his bedroom one night, and six near a haystack 30 yards away on the next morning. They were from four to five feet long.

Cases of snakebite.—In the experiments made by Dr. Halford on snake-poisoning, which are tabulated in the Medical Society's Journal for March, 1875, all the people bitten by the brown snake and treated by the injection of ammonia recovered. In one of the cases mentioned in the public journals—the *Bendigo Advertiser*, 27th Oct., 1877—a snake of this species, 3 feet 6 inches long, had bitten Mrs. Ingleby in the hand; she resided at Sebastian, Bendigo, and died from the effects within 50 minutes. The acting coroner, Mr. Strickland, who held the inquest, sent the snake, which had been killed, to the museum, where it is now deposited, and the species has been determined with certainty. This is the fifth snake referred to in the above table of measurements.

A fatal case occurred near Sydney in Jan., 1892. Some boys were gathering ferns near a swamp in the vicinity of Mount Rennie, when they were surprised by a brown snake. One of them, 13 years of age, who was bootless, and before he saw the reptile, was bitten twice on the big toe; he became drowsy, but walked home, and informed his parents, who at once conveyed him to the Prince Alfred Hospital. The medical superintendent, Dr. Purser, found two small punctures on the right foot. The patient who was very drowsy seemed to improve by the application of hypodermic injections, but on the third day he complained of a sore throat and inability to swallow, and succumbed during the ensuing night.

In February, 1892, at Glen Innes there was a fatal case. A boy, aged 10 years, was bitten by a brown snake at Red Range. His father immediately cut out the flesh and sucked the wound, and gave the boy some drops of ammonia in water to drink. He was taken to the hospital on the following afternoon in a comatose state. Although new remedies were tried, and every effort was made by Dr. Wrigley, his patient died in 70 minutes after admission.

The Victorian newspapers record a case somewhat parallel to that instanced above which took place near Sydney, but attended with different results On Nov. 1st, 1892, some youths were gathering ferns at Blackburn, Victoria, when one of them, while crossing a creek on a log, was bitten by a snake. His companions had learnt at a state school the rudimentary treatment for snakebite. They applied a ligature and sucked the wound. Having conveyed the patient to a doctor, although fully an hour had elapsed, their treatment had prepared the way for saving the life of their comrade who recovered.

Flying Fox—*Pteropus poliocephalus.*

Description.—This well-known bat is called by the colonists the flying fox. The entire head is covered with brown hair, grisled with grey; round the neck and advancing on to the back there is a very broad collar of deep rust-red. The upper surface and the clothing of the arms are glossy black, grisled with greyish olive, the olive hue becoming more apparent on the hind quarters. The under surface is brownish black, many of the hairs being pointed with olive-

yellow ; on each flank there is a patch of rufous. The ears and the wing membranes are naked and of a deep purplish black. The wings extend from the fore to the hind legs. They do not consist of feathers as in birds, but of a membraneous skin extending from the neck and sides of the body to the extremity of the fingers of each upper limb and behind to the heels of the feet. The fingers are lengthened and vary in size to suit the expanded condition of the elastic skin, which unites them. The thumb is hooked to enable the creature to cling to a branch. The claws are black, they become horny at the tip. Captain Hunter, in his Historical Journal of the Transactions at Port Jackson, 1791, says:—"The head of this bat resembles that of the fox, and the wings of many of them extend three feet ten inches. Governor Philip saw one which measured upwards of four feet from the tip of each wing. From the numbers which fell into the hole, at Rose Hill, the water was tainted for several days, the natives having fired the country around, it was supposed that more than 20,000 were seen within the space of a mile."

Habits.—The flying fox remains during the day suspended from the branches of the larger trees clothing the gullies and their mountainous sides. Like all other bats it is strictly nocturnal ; at nightfall it sallies forth in search of its food. The diminution of the aboriginals—its natural foes—and the introduction of English trees have tended to increase its numbers. The enormous numbers, that during the heat of the day may be seen sleeping pendent from the trees in the more secluded parts of the forest, are beyond conception. No one of the native animals is more troublesome to the settlers than this huge bat. It resorts to the gardens, orchards and homesteads by night, when it being impossible to protect them from its attacks, great havoc is committed. It has been observed that they congregate in companies and selecting large trees for their resort, suspend themselves by the claws of their hind limbs to the naked branches. They thus pass the greater portion of the day in sleep ; but soon after sunset they gradually quit their hold and pursue their nocturnal flight in quest of food. They direct their course by an unerring instinct to the localities in which fruit is produced. Their flight is slow and steady, pursued in a straight line, and capable of long continuance. It is one of the few indigenous mammals that still appear in the vicinity of the capitals. On summer nights, when moonlight, it may be seen hovering over the parks and gardens of the suburbs. A naturalist residing near Brisbane writes thus :—"Attention is generally attracted to them (just as daylight disappears) by the heavy flapping of their wings, as they fly in great numbers overhead, all in the same direction. These flights often continue to pass for many hours together on the way to their feeding places—these are generally about the banks of rivers, where the tree known as the flooded gum grows, on the leaves of which they feed. Though scattered over a large extent of country at night, they all contrive to assemble again to spend the heat of the day together, and when the flight is large the scene of the congrega-

tion is most extraordinary. He found one of their places of assembly on a small island in Moreton Bay, and another in the scrub about 40 miles inland from the bay. The space occupied by one of these flights was from 400 to 500 yards square, and every tree in this part was more or less loaded with them." After peacefully sleeping all day in some dense, shady brush, the flying fox emerges in the cool of the evening for its meals on the best fruits the grower has cultivated, and it consumes his fruits as if by right, also tasting and thus destroying a dozen or two of unripe ones, and at the same time knocking several to the ground. Its destruction is prospective as well, for it damages the young wood which is to bear next year's crop. Not only the producers but the consumers of fruit also suffer, for the toll, ruthlessly exacted by these midnight robbers on the best samples, diminishes both the quality and the quantity of that sent to market, and thus enhances the selling price. One season, in the Maclean district, this pest made great havoc among the early fruit; in some instances the foxes skinned lemons, which is a new departure hitherto unknown in the locality. W. G. Caporn, Rockhampton, stated at the fruitgrowers' union, Parramatta, that for the last two years he had found the following means most effective in scaring away flying foxes:—"Between the trees a pole is fixed three feet high, from the top of it are drawn four galvanized wires, which hang over the trees, and well up on each wire are one or two necks of glass bottles, these cast a reflection and frighten the foxes." The agricultural association, Gosford, organised parties for the destruction of this pest. For one expedition 4,000 cartridges, besides powder and shot, were conveyed in a waggon some six or seven miles to the haunt of the flying foxes—a valley in a thick scrub near a creek. On the arrival of the sportsmen at the rendezvous of the vampires, some 47 guns opened fire on all sides of the brush, in the tops of which the foxes were congregated in thousands, and very many fell in the first quarter of an hour after the camp had been surprised. Two, three, and sometimes four came to the ground from one shot. Assailed from every direction they were kept continually moving, but they never left the immediate vicinity of their haunt. At times they sought safety in circling like swarming bees out of gunshot, but before long they returned to the treetops, and were once more assailed. A camp was discovered near Maclean which was said to contain fully 100,000; the haunt was about one mile long and half a mile wide; 4,000 were shot in one day.

Food.—The wild fruits and berries peculiar to the brushes, the small wild fig when ripe being a favourite article. Since the occupation of the country and the introduction of fruit trees from Europe, the flying fox has manifested a marked preference for the delicious fruits produced for the table of the white man. It also visits ornamental trees, such as the oak and Moreton Bay fig-tree in search of their products. Were it not for these enemies fruit-growing in Queensland would be more profitable; for it is a fruit-eating bat, very fond of peaches, visiting even a solitary tree

nightly, as long as there are any peaches, proximity to a house being no security from plunder. In November, 1892, it made great havoc of the orchards near Gilgandra.

Where found.—In New South Wales, Victoria, &c., in fact, all Australia; flying foxes are very numerous in the dense and luxuriant brushes which fringe the south-eastern portion of Australia, such as those in the Illawarra district, in the neighbourhood of the Hunter, the Manning, the Clarence and the basin of the Nepean. They are not found in Tasmania. They fly 50, 60 or 80 miles in a night, their hiding place often being many miles from the orchards which they instinctively scent. They have been seen flying over the sea near the coast line from Gosford to Wollongong. Dr. Bennett writes:—"In the year 1858 a number of these animals were observed suspended from the topmost branches of the lofty trees in the Sydney Botanic Gardens, hanging by their hind claws: it was an unusual event, as for several years not a specimen had been seen in that locality." On the coast of Moreton Bay the natives live principally on fish, and the arrival of the flying foxes on the little island of St Helena is hailed by them as a change of diet.

White-breasted Sea Eagle—*Haliastur leucosternus.*

Description (Brisbane *Courier*).—It is also called the white-breasted eagle, white-breasted falcon, white-breasted rufous eagle, rufous sea eagle, sea eagle, and red-backed fish-hawk. The adult sexes are alike in colour. The head, neck, chest, and upper part of the abdomen are pure white, and the back, wings, the lower part of the abdomen, thighs, the upper surface of the tail, and the upper and under tail coverts are of a rich chestnut red. The first six primary feathers are chestnut at the base, tipped with black, and the tail feathers are chestnut on their upper surface, lighter beneath, and the eight central feathers are tipped with greyish white. The irides are of a light reddish yellow, the cere pale yellowish white, and the orbits a smoky grey. The bill is of a yellowish horn colour, frequently tinted with rose on the culmen. The upper mandible is of a light ashy grey hue at the base, passing into sienna yellow, and terminating at the tip in a light horn colour, while the under mandible is of a smoky grey. The legs and feet are light yellow. Length, 22in.; wing, 15in.; tail, 9in.; bill, 1⅝in.; tarsus, 2in.

Habits.—Its flight when near the ground is slow and heavy, but when soaring at a considerable height is buoyant and easy. Its food consists chiefly of fish and crustaceans. In capturing its finny prey it exhibits great activity either in plunging down into the depths and seizing the fish with its claws, or in skimming along close to the surface and dexterously throwing out its strongly armed foot and seizing the fish as it swims near the top. It then flies to some favourite perch, generally a branch overhanging the water, where it devours its captive at leisure, or if disturbed soars on high and eats it on the wing.

Nidification.—The white-breasted sea eagle breeds during the months intervening from July to November, its nest being placed in the fork of some tree, oftentimes not very high up, in some secluded spot not far from the beach. It is composed of sticks lined with fine twigs of coarse grass, and the eggs, generally two in number, though three occur at times, are of a dusky white, finely marked with numerous irregular and angular hairlike streaks, not unlike hieroglyphics, and spotted with minute dots of reddish-brown. They measure 2⅛in. long by 1⅝in. broad. Dr. Ramsay says:—"The nest is by no means so bulky a structure as that of many of its allies, nor is it so large as one would expect from a member of the family to which it belongs. In almost every instance the examples found by Mr. Rainbird were placed near the tops of the larger trees in belts of mangroves, skirting the edges of salt-water swamps and marshes in the neighbourhood of Port Denison. They were composed of twigs and dead branches of mangrove, lined with a finer material. One was lined with tufts of lichen; and in this instance the egg was placed on various fish-bones, shells and claws of crabs, &c.; the edges and sides were beautifully ornamented with long streamers of bleached seaweed, which gave the nest a novel and pleasing appearance."

Where found.—The white-breasted sea eagle is found on the coast, generally frequenting the more secluded rivers and bays of northern and eastern Australia, from about the 130th meridian of east longitude to the 33rd degree of south latitude. It is also found in New Guinea, Timor, Ternate, Moro, Macassar, and Batjan. It is more frequent on the coast of southern Queensland than on that of the north, but is never found further inland than such parts as are under tidal influence.

Tree-Kangaroo – *Dendrolagus lumholtzii.*

Discovery.—Notwithstanding that Australia was visited by several English naturalists during the first half of the present century, it was reserved for a Norseman to be somewhat recently the discoverer of the tree-kangaroo or boongary of the aboriginals. In the year 1880, Carl Lumholtz undertook an expedition to Australia, partly for the object of making collections for the museum of the University of Christiania. His travels, which occupied four years, included expeditions in South Australia, Victoria, New South Wales, and Queensland. He advanced about 800 miles into Western Queensland, but as the results in no wise corresponded to the hardships he had to endure, he returned and selected Northern Queensland as the field of his chief exploration, and he there spent fourteen months in constant travel and study. From Aug., 1882, to July, 1883, he made his head quarters in the valley of the Herbert River. He there lived with the blacks whom he characterised as the lowest of the whole human race. From these associates he obtained information of the existence of the boongary, which seemed to him to be unknown to science, but the more he searched for this

creature the more mythical it seemed to become. One day the blacks showed him traces of boongary on the trunk of a tree—these made him certain that there was such an animal, and he resolved not to give up till he had a specimen in his possession. By bribes, such as tobacco and food, by persuasion, for he knew something of their language, and sometimes by threats, this enthusiastic foreigner induced the blacks to accompany him, but they always deserted him, when he penetrated territory beyond their own tribal bounds, so he had continually to seek fresh boongary hunters. One evening while he and his sable companions were reclining in the shade, there was suddenly a shout from the camp of the natives. His men rose, turned their faces toward the mountain and shouted "Boongary, boongary." A few black men were seen coming out of the woods and down the green slope with rapid steps. One of them had a dark animal on his back, with him was a tall powerful man named Nilgora who was followed by his dingo. The animal was thrown on the ground at the feet of Carl Lumholtz, but none of the blacks spoke a word. They simply stood waiting for presents from him. At last he had a boongary which he had been seeking so long; he at once saw that it was a tree-kangaroo, a fine one but not so large as he had expected to find. He skinned the animal and put some arsenic on the skin, which he laid away to dry in the roof of his hut. To Nilgora he gave a shirt, to the man who had carried the boongary, a handkerchief, and to all food, nor did he omit to distribute tobacco. Tree-kangaroos were known to exist in New Guinea, but none had been obtained on the Australian continent by white men prior to the event recorded above. This handsome marsupial was scientifically named and described by Professor Collett in 1884.

Dismay.—The blacks were to have a dance that night, the tribe that was to give it had their camp furthest away, while the other tribes, who were simply spectators, had made their camps near his. His men had gone to witness the dance, and Lumholtz happy over his day's success decided to go thither and amuse himself; but darkness having already set in, the dancing was postponed until the moon was up. He visited several parts, conversed with the natives and coaxed information out of them. It amused him to make these visits, but his thoughts were chiefly occupied with the great event of the day. In the camp there were several dingoes, and although the boongary skin was carefully put away, he did not feel particularly safe in regard to it. He therefore returned to look after his treasure; on his return imagine his dismay to find that it was gone. He at once called the blacks, among whom the news spread like wildfire. In a short time one of them came running with a torn skin, which he had found outside the camp. The whole head, a part of the tail, and legs were eaten. One of the dingoes had stolen the skin and abused it in this manner. Having no better place to put it, he laid it back again in the same part of the roof, and then, sad and dejected in spirits, sauntered down to the natives again. Every one tried to convince him that it was not *his* dog that was the culprit.

The next morning early he persuaded the natives to get ready for the chase, but they did not want him to go with them. as the dog was afraid of the white man. At sunset Nilgora and his companions returned from the hunt, and, to the great joy of the naturalist, they brought him another boongary. This was somewhat smaller than the one he had lost. On its back it had distinct marks of the dingo's teeth. A third specimen was brought the next day, but still smaller than the others. The naturalist, having carefully preserved the skin, he and his sable companions roasted the flesh on the coals for supper. It had a fine gamey flavour, and did not taste at all like kangaroo meat.

Description.—The tree-kangaroo is a better proportioned animal than the common kangaroo. Its body is about two feet long, and its tail two feet four inches. The arms and legs are nearly equal in length, the former being about eight inches, and the latter ten inches. The head is small, being something like that of the American squirrel; it is only four inches long. The ears are insignificant, and covered with black fur on the exterior and with foxy coloured fur inside. The nose, mouth, and feet are black, and there is a cream-coloured band about three-quarters of an inch wide across the forehead. The upper parts of the body are grey; on the back the hairs are blackish, with pale bases and points, giving these parts a grizzly hue. On the vertex of the back the hairs are almost uniformly black, extending as a broad stripe upwards and covering the ears, as stated above, and the crown of the head. The lower back is clearer yellowish-grey, the blackish hairs being somewhat scarcer, but forming an indistinct dark patch at the root of the tail. The lower parts are pale yellowish, but deeper on the flanks; the throat is whitish. The limbs are covered on the upper surface like the back; the metacarpus and the metatarsus are rusty red, interspersed with numerous black hairs. The tail is pale yellowish grey above, with numerous black hairs, its lower surface being black or blackish. The tip in some specimens is whitish. No portion of the tail is bare, as in the case of the kangaroo, but it is covered with fur having a brush four inches long at the extremity. Its discoverer says that it is the most beautiful animal he has seen in Australia.

Where found.—In Northern Queensland. It is a rare animal in Australia. So far as is known, its Australian habitat is considerably circumscribed. It is peculiar to the Herberton district. Herbert Vale, the basis of the expeditions, is now a deserted cattle-station adjoining the Herbert River, about 15 miles from the coast in a straight line, the nearest town being Cardwell on Rockingham Bay. The range nearest the Herbert River is granitic, its height being from 2000 to 3000 feet. It is covered with dense scrubs. In these extensive mountainous scrubs that commence near Herbert Vale, the tree-kangaroo was found. It is not found in the range south of Herbert River, but is met with to the west and north-west of Cardwell.

Habits.—This new marsupial is nocturnal and arboreal. It is a powerful tree-climber, its strong fore-claws leave almost indelible marks on the trunks of the giant trees of the forest. During the day it sleeps in the trees, and feeds on the leaves. It is able to jump down from a great height, and can run fast on the ground. It lives almost exclusively in one very lofty kind of tree which is common on the coast mountains. During rainy weather the tree-kangaroo prefers the young low trees, and always frequents the most rocky and inaccessible localities. It always remains near the summit of the mountains, and frequently far from water, and hence the natives are of opinion that it never goes down for the purpose of drinking. During the hot season it is much bothered with flies, hence the blacks sometimes discover it from the sound of the blow by which it kills the fly. The blacks say that two or three are sometimes found sleeping in the same tree and that at night they can be heard moving in the trees, when they descend and run about on the ground just as common opossums do.

How captured.—Without the aid of the blacks no collector has any chance of securing this rare mammal. It cost Lumholtz three months' incessant work before he got his first specimen. The natives of the tribe he associated with never think of hunting without a dingo trained for this sport. Dingoes are scarcer in Northern Queensland than they are further south. Those which the natives employ are obtained from hollow trunks of trees when they are puppies. They are trained for kangaroo and other hunting, but as they seldom breed under restraint, they generally run away when they become old enough to pair, and never return. The chase begins early in the morning, while the scent of the boongary's foot-prints is still fresh on the ground. The dog takes his time, stops now and then, and examines the ground carefully with his nose. His master keeps continually urging him on, and addresses him in language having the following meaning:—Smell boongary—smell him—smell—seize him by the legs—smart fellow—smell—smell him, &c. If the dog finds the scent, he will pursue it to the tree which the animal has climbed. Then some of the natives climb the surrounding trees to keep it from escaping, while another person, armed with a stick, ascends the tree where the animal is. He either seizes the tree-kangaroo by the tail and crushes its head with the stick, or compels it to jump down, where the dingo stands ready, and kills it. With this tribe a good dingo is a necessary requisite for a chance of success; it is not easy to obtain such an adjunct, as each tribe possesses only one or two tame dingoes, which they will not readily part with; besides a dingo follows his own master only, hence the services of both dog and black must be secured. This condition materially increased the difficulties of Lumholtz. He had to travel many miles to find a tribe that had a well-trained dingo; then he had to propitiate the owner by allowing him to take meals with himself as long as he remained in that locality. In reference to another tribe, that hunts without a dingo, Mr E. R. Waite says:—"The animals are difficult to procure, as the blacks esteem

them a delicacy and only surrender their captures when compelled. When a mapi, as this tribe calls it, is discovered, a fence five or six feet high and several feet in diameter is built of rattan or lawyer canes and bushes around the tree. Some of the blacks enter the enclosure, ascend the tree, and drive the animal down. It usually jumps to the ground, often from a height of 20 feet. Should it elect to descend the trunk, it does so tail foremost. On reaching the ground the animal is eventually caught by the men surrounding the enclosure, generally by the tail, which member is dragged through the fence, the unfortunate mapi being despatched with blows from a nulla-nulla. The blacks will not venture within the fence on account of the dread in which they hold the powerful claws of the animal."

Specimens.—In the Australian Museum, Sydney, there is a beautiful exhibit of five tree-kangaroos. The collectors obtained these from the Herberton district in 1890. They were got through the medium of the blacks, who having received provisions, feasted on them for days, and returned without any game, saying they were afraid to go The mounted police happening to be in the locality at the time, threatened them, when the blacks departed, and returned in a few days with boongaries. In the museum of Christiania there are five and one incomplete one ; two of the specimens are young, being scarcely half-grown, but they show no essential difference in colour from the others. The British Museum, London, had one about ten years ago ; another was sent by Dr. Ramsay, of Sydney. In July, 1891, Baron Von Muller, of Melbourne, received a specimen from Queensland, which is believed to be the first that had been brought to Victoria.

Death Adder—*Acanthopis antarctica.*

Description.—The popular name seems to be indifferently death adder or deaf adder. Its length is from 2 feet 8 inches to 1 foot 9 inches, the tail is about 4 inches. The head is large, broad, flat, and wider than the neck behind. The tail is short, with a trigonal section at the base, but becoming very slender, and compressed towards the posterior end ; it has a recurved thorn-like spine which is directed obliquely upwards at the extremity. In old age only does the spine at the end of the tail harden ; young and half-grown specimens have it more or less soft and pliable. In the belief of the uninformed, the harmless horny spine at the end of the tail is its most dangerous weapon. The fangs are very large, perforated and fixed, there are two or three small teeth close behind each, but no other teeth in the upper jaw ; there are two long rows of teeth on the palate bones, the solid teeth of the lower jaw are small. The size of the fangs is greater than that usually found in other poisonous reptiles of Australia, but this only corresponds to the great strength of the bones composing the cranium, while the venom gland also appears to be larger both absolutely and in proportion, than is usual in the *Elapidæ*. The body is short, thick and rounded. The scales

on the neck and anterior part of the back are strongly keeled; on the hinder part of the body, they are larger, rounder, and thinner than in front. The tail-scales are in one row. The colour is a dull greyish-brown, with about 40 darker brown transverse bands. In very old snakes these rings disappear or become indistinct. The tip of the tail is dull orange-yellow. There are many varieties in colour, some very pale grey or red, and some quite brick-red, always more or less spotted or mottled with a darker colour. The central plates in all varieties are clouded with black. The eye is very small, the pupil being elliptical and erect; there are very prominent superciliary ridges over the eyes. The short tail is much compressed near the tip, and the last 9 or 10 series of scales surrounding it become, in old subjects, very rigid and hard; the last scale of all is generally curved, and resembles a poison fang. This is the only Australian snake approaching the true viperine venomous snakes, in having the fangs perforated and not grooved; they are, however, not so movable as those of vipers, but are permanently erect, as in the *Elapidæ*. The whole of the characters of the singular genus, acanthophis incline to classifying the reptile in the family *Viperidæ*, rather than with *colubrine* snakes, although it is intermediate between the two groups in many respects. It seems to be a link between the venomous colubrine snakes and the vipers, by its having permanently erect fangs, like the former, but channelled perforated fangs, like the latter. The extreme point of the fang is solid and sharp, the orifice is near it.

Habits.—It frequents sandy localities, and retires under ground from April or May to Sept.; according to the temperature of the district in south-eastern Australia, but later in the warmer latitudes. The *Townsville Bulletin* announces the case of a little boy bitten so late as the month of June, 1895, at Ravenswood Junction. His death ensued just half an hour after being bitten by an adder on which he had trod, as it was lying near a tree. It is rather sluggish in his movements, and is an indifferent climber, when its locomotion is contrasted with the ascending powers of other snakes. When disturbed it does not jump, and certainly never springs backwards. It is slow in getting out of the way; its colour resembling the ground is often a cause of its being unnoticed till approached. When resting it lies very closely coiled in a circle, with the head on about the middle of the body; in this posture it often sleeps under some dwarf-growing or creeping vine. When irritated, it flattens the thick part of the body very greatly, and has a pecular action of snapping to one side and the other alternately with great quickness, when about to strike. From its short, thick, peculiar-coloured body, broad head, and malignant eye, the stranger is warned of danger by its physiognomy, which is, indeed, so hideous as only to be surpassed by the puff adder of the Cape, to which it seems to bear a very close resemblance. Nature has coloured it with such tints as best serve it for concealment, and for escaping observation, although it may be lying on a garden bed or path. Its hues are not only protective, but they enable it to entrap its prey the more readily. From

10 to 15 young ones are produced annually, which, as soon as they have broken the covering, and are scarcely dry, begin to snap, if touched.

Experiments.—This snake is not so venomous as has been represented. The late G. Krefft demonstrated the fact that its bite is not necessarily fatal, which it had popularly been supposed to be. A lizard 7 inches long, that was experimented upon, lived for twelve hours after its bite; a green tree-frog bitten by the same snake survived about as long. A large dog bitten by a captive death adder, in one of the experiments at the Melbourne University, was dead in 18 minutes. Mr. Bray, naturalist, of Sydney, experimented on several rats during the summer of 1892, and found that they died on an average of three minutes, after being bitten.

Cases.—A Chinaman at Waterloo, near Sydney, noticed what he thought was a stick lying on one of the beds of the garden, where he was at work, he was going to remove it; but it proved to be a death adder, which bit him on the arm; and, notwithstanding the best medical aid, and all known remedies, the man died on the following day. There have been records in the press of persons recovering from the bite of this reptile—one from Northern Queensland may be instanced. Here is another:—Some years ago a lady residing near Goulburn, when picking flowers in her garden, was severely bitten on the little finger of the right hand by a mature death adder. The reptile clung to her finger savagely, but being shaken off left two distinct punctures, from which the blood flowed freely. The usual simple remedies, such as were known then, were adopted, and the lady recovered. This case happened before the strychnine remedy was known. The reptile, when killed, proved to be a brown freckled specimen; it measured nearly 29 inches The *Sydney Morning Herald*, Oct. 28, 1893, says:—"While the members of a party were gathering bushes near the Kensington Racecourse, they came across a death adder, but one of the party not knowing what it was was about to pick it up, when he noticed it move. A companion pulled him back. and at the same time smote the reptile with a whiphandle, killing it. The reptile measured 36½in. in length, and was about as thick as a man's wrist." The *Toowoomba Chronicle* recently reported the case of a child, two years old, that was bitten on the finger by a reptile, which, on being killed, was found to be a death adder. The bitten finger was removed, and thus much of the poison was prevented from entering the system, but sufficient had been absorbed to produce alarming symptoms. On the application of the strychnine remedy this child speedily recovered. In Jan., 1892, the *Maitland Mercury* reported a case: A lad 16 years of age was bitten on the finger, by an adder, at More Duval Station, near Yarraman. The strychnine antidote of Dr. Mueller was applied by a medical man, and the youth was restored.

Food.—It feeds on frogs, lizards and small mammals. Australian snakes live for months without food or water, as proved by Mr. Bray.

Where found.—It is confined to Australasia. Its habitat extends over the whole of the Australian colonies, except Tasmania, and the southern parts of Victoria, but it is common in the hot tracts of the latter colony near the Murray, and very common in Queensland. In New South Wales it is most abundant in the coast district. In the early days it was numerous on the sand-hills around Surry Hills, Randwick and Botany. The Museum has specimens from Randwick and Sydney. It has been met with at Narrabeen, to the north of Manly, and in the salt-bush country, near Jerilderie. Dr Gray records specimens from Port Essington and from north-west Australia. Mr. Wallace, the naturalist, observed death adders on some of the islands in the Arafura Sea. In the Macleay Museum of natural history, at the University, there are exhibits from Moore Park, Torres Straits, and Endeavour River. In South Australia it has been found in the sand-hills at Glenelg, Hindmarsh Island, Brighton Beach, Onkaparinga, Torres Island; in that colony also it is found chiefly in sandy localities. When the late Sir W. Macleay visited New Guinea, in 1875, the natives brought him a death adder, the only one he obtained, unfortunately its spine had been broken off. He regarded this snake as being a new species of adder, and described it as such before the Linnean Society, Sydney.

Great Black, or Manna Cicada—*Cicada mœrens.*

Raucis sole sub ardenti resonant arbusta cicadis.—Virgil.

Description.—The cicāda is erroneously called a locust. The head is large, wide, and short. The eyes are round, of moderate size, and very prominent. They are above the anterior edge of the prothorax; there are three small ocelli in a group on the top of the head. The upper surface, the legs, and the veins of the wings are brownish-black, with a few greyish hairs, most numerous on the sides of the abdominal segments. The under side of the abdomen is light-yellowish brown. The eyes are orange, the ocelli red. It has two pairs of wings, the inner pair being the smaller. The sexes are nearly alike in size and colour, but are easily distinguishable by the male having the two large, subtrigonal, dark-brown covers to the sound organs, on the under sides of the junction of the thorax and the abdomen; while the female wants the sound organs. The length of the body is 1 inch 5½ lines. The beak is hard and horny; it constitutes an apparatus for perforating the bark and sucking the juices. It is remarkable for the loud song, or chirping whir, of the males in the heat of the summer; numbers of them on the hottest days produce an almost deafening sound. One might almost say with Virgil, *Et cantu querulæ rumpent arbusta cicadæ*, only to burst the Australian bush would be rather too much for even their distracting powers.

Habits.—After the singing has drawn attention to the perfect insect having emerged from the pupa skin, the females may be seen

ascending the trees until some dry twig is reached, in which they cut grooves with the cylindrical borer at the hinder extremity of the abdomen; and in each groove they deposit a few eggs. The young, at first, resemble fleas in size and shape; they quickly reach the ground, into which they burrow, and whence they may be dug out at the roots of trees any time during the larval and pupa states. The larva is white, and seems to feed on underground roots. The pupæ, which might be mistaken for a kind of beetle of a dull brown colour, ultimately come out of the ground by aid of strong claws on the fore legs, and crawl up a few feet on the trunk of the nearest gum-tree in the night prior to transformation; and then, splitting along the back, the surprisingly larger, winged, perfect insect creeps out, leaving the empty pupa skin clinging to the tree quite perfect, even to the smallest hair or other part, and in the position of life. The abandoned pupa skin shows the form of the eyes, six legs, and the antennæ; but chiefly differs from the perfect insect in colour, and in having the impress of only rudimentary wings at the sides of the body. The cicada piercing the young twigs of the peppermint gum-tree causes an abundant exudation of sap, which, drying in the hot, parched air, leaves the sugary solid remains in a gradually increasing lump, which ultimately falls off, covering the ground with a sort of white sweet manna in little irregular masses. This is the "Melitose" of chemists, and contains the peculiar material "Eucalin," known only in the sap of eucalypti; it is an unfermentable sugar. Both sexes of cicadæ have short lives in the perfect state, and may be seen lying about the ground under the trees, dead or dying, in abundance after their noisiest days. The nankeen kestrel and other small hawks devour them on the wing in great numbers in their season, and even sparrows attack them. Cicadæ appear in myriads about Feb., the black species being far more numerous than the green. By March these insects are materially diminished in numbers, and by the end of that month all the year's generation have passed away.

Food.—The sap of trees, particularly that of the peppermint gum, which the perfect insect chiefly frequents, probably from the remarkable sweetness of the sap.

Where found.—Australia is particularly rich in cicadidæ; it probably possesses a greater number of that family than any other division of the globe. The cicada is met with throughout New South Wales, Queensland, and Victoria, and extending south to Tasmania. A writer on Australia remarks:—"In the tree-tops the cicadas vociferously chanted the praises of summer." Near Sydney the first cicada is heard about the 28th of Oct., and before the end of November they are numerous.

Black Swan—*Cygnus atratus.*

Rara avis in terris nigroque simillima cycno.—Juvenal.

Introduction.—Strzelecki states that the black swan was discovered in 1697 by Vlaming. The first notice on record respecting its existence occurs in a letter written by Mr. Witsen to Dr M. Lister about the year 1698, in which he says :—"Here is returned a ship, which by our East India Company was sent to the south land called Hollandia Nova ;" and adds that black swans were found there. In 1726 two were brought alive to Batavia, having been procured on the west coast of Australia, near Dirk Hartog's Bay. Captain Cook observed it on several parts of the coast, and from that time to the present it has attracted the attention of every traveller in Australia.

Description.—The whole of the plumage is brownish-black, the under surface being paler than the upper. The feathers of the back are tipped with greyish brown ; the primaries and the secondaries pure white ; the bill beautiful pinky scarlet, crossed near the tip with a broad band of white. The extremities of both mandibles are also white, the irides scarlet, the eyelashes and the lores pinky scarlet, the feet black.

Habits.—In disposition, unless molested or its precincts intruded upon, it is as tame, gentle and harmless as it is graceful and ornamental in appearance, and as it readily becomes domesticated, many of the avaries of Europe are adorned with its presence. In Oct., 1894, a pair of Australian black swans on the lake at Stamford Park, near Ashton-under-Lyne, Lancashire, England, hatched a nest of cygnets. This was the second brood of the season by the same birds, which succeeded in hatching two out of four eggs in the spring. This time half-a-dozen dusky little swimmers were produced. The double brood is a somewhat phenomenal occurrence, and can only be accounted for by the fact that the birds have recognised the breeding seasons of their adopted, as well as their native, country, Oct. being the Australian breeding season. When flying it forms a most conspicuous object, the white of the wings offering a strong contrast to the black colouring of its body and the green herbage bounding the scene in which it is disporting. In some localities it occurs in such numbers that flocks of many hundreds may be seen together, particularly on those arms of the sea which, after passing the beach-line of the coast, expand into great sheets of shallow water, on which the birds are seldom disturbed either by the force of boisterous winds or the intrusion of the natives.

Nidification.—It breeds from Sept. to Jan., and constructs a large nest of reeds and other aquatic herbage. It lays from five to nine eggs of a pale green, the shell of which is rather rough, and stained with brown. The average dimensions of four eggs taken from a swamp near the Lachlan is 4 x 2·6 in. The time of incubation in London was 35 days.

Where found.—This bird is found over the eastern and southern portions of the Australian continent, and likewise the greater part of Tasmania; also on the south coast of New Guinea. It is particularly plentiful on the southern coast of Victoria, where it resorts to breed in the numerous inlets and bays; also on the islands adjacent to the mainland. Capital sport is to be had during the moulting season by chasing down and capturing these birds by means of a fast sailing yacht. It is still found in large numbers in the south-west of Western Australia—a locality which took its original name, "Swan River Settlement," from these birds. The black swan frequents the rivers, estuaries of the sea, lakes, lagoons, and pools of water of any extent. In the white man, however, wherever the country has been brought under his dominion, the black swan finds an enemy so deadly that in many parts where it was formerly numerous, it has become almost, if not entirely, extirpated; this has been particularly the case on some of the large rivers of Tasmania.

Carpet Snake—*Morelia variegata.*

Description.—This is one of the largest snakes found in Australia. The common size usually met with is 7 or 8 feet long, but individuals from 10 to 12 feet have been obtained in some localities. Its skin is of a ground colour, which is nearly uniform pale brown, having a tinge of greenish grey, with an irregular darker carpet-like pattern, usually of a long narrow dark streak, surmounted by one of light ground colour of the same width, forming a double band along each side from the head to near the base of the tail. The back is marked out into three or four rows of irregular lozenge-shaped patches of the pale ground colour, usually with a blackish-brown blotch in the middle, and margined by a broad blackish-brown outline. The pattern of the colouring is very variable; it has some resemblance to some of the commoner sorts of Kidderminster carpets, as suggested by the popular name of carpet snake, which has been applied to it for many years. The upper part of the head is of the pale ground colour, with one longitudinal streak from the nostril through the eye to the lateral angle of the head. The belly is pale-yellowish. The abdominal and subcaudal plates are irregularly marked with blackish-brown blotches. The under part of the head and the neck is pale without spots. All the teeth are small and solid, without groove or canal; no poison gland is developed. The teeth are curved backwards. There are two on the intermaxillaries in front of the mouth, eleven on each of the upper jaws, and twelve on each palate bone, of which the three anterior are the largest; the first is one-sixth of an inch long. In the lower jaw there are from fifteen to seventeen teeth. Mr. G. Krefft, writing in 1869, remarks: "Whether the carpet snake is only a variety of the diamond snake, or whether it deserves to be classed as a separate kind, has not been satisfactorily proved, but as both snakes are totally distinct in colour, and restricted in their

habitat, it will perhaps be better to speak of them as two species. The general structure of the scales of the head and body is precisely alike in both reptiles, but they vary much in colouration." The name carpet snake is, unfortunately, ascribed to the poisonous tiger or brown-banded snake in Tasmania; this produces some confusion, which can only be obviated by clearly understanding that the same name designates two kinds of snakes—a non-poisonous one on the mainland, but a death-dealing one on the island.

Habits.—Like the family Pythonidæ, or rock snakes, it is perfectly harmless to human beings; by this it is understood that its teeth, though capable of inflicting scratches and punctures, do not emit any poisonous fluid. It kills its prey by crushing it in its coils in the same manner as the American boa constrictor does; and like this snake, it can hang by the short prehensile tail coiled round a branch with the two little leg-like spurs acting in opposition to effect a grasp or firm hold. It hibernates in holes in the ground. One of the staff of the Melbourne museum relates that an elderly gentleman called, one day, at the office, and stated that he had discovered an antidote for the bite of the carpet snake. He had proved its efficacy often by applying it to dogs and goats which he had caused to be bitten by this reptile. They had recovered in every instance. He asked a sum of money for disclosing the ingredients. To his mortal chagrin he was informed that the carpet snake is not poisonous.

Sir George Grey writes in his Journal of Discovery in north-west Australia: "The attention of Mr. Lushington was drawn to a curious misshapen mass which came advancing from some bushes with a novel and uncouth motion—he fired, and it fell; on going up to it he found that it was a small kangaroo enveloped in the folds of a large snake, a species of boa. The kangaroo was not quite dead, although flattened from the pressure of the snake, which being surprised at the disturbance it met with, was beginning to uncoil itself, when Mr. Lushington drew out a pistol and shot it through the head. It was of a brownish colour, and eight feet six inches long."

Eyre writes of a reptile which he calls the python: "This snake is considered by the natives a great delicacy, and by their account resembles mutton in flavour, being also remarkably fat." He requested the natives to let him taste the specimen from which his drawing was made, but they devoured every atom, pretending they did not understand him.

Food.—The carpet snake feeds on small quadrupeds, birds and poultry when it can procure such. It catches birds at night and crushes them to death by winding itself round them. They are thus flattened and then swallowed. It lies in wait near scrubs for the species of wallaby popularly known as "pademelon," which it crushes in its coils when captured, and swallows whole. In the Ballina district, one night, a large carpet snake was killed in a hen-roost, the noice of the fowls having aroused the owner. On the authority of Dr. Bennett, one that was shot had swallowed an

opossum which was so little injured that its skin was stuffed, also that of its destroyer, and both were exhibited in the Australian museum. The reptile was 15 feet in length.

Where found.—The late Sir W. Macleay remarks: "This species seems to have a wide range. It is common over the whole interior of New South Wales, and there seems to be no part of Queensland or North Australia in which it is not found. My 'Chevert' specimens are from Sue Island, Darley Island, and Hall Sound." He found it in New Guinea in his expedition of 1875. It has been found at Swan River and Houtman's Abrolhos, Western Australia. In Victoria it is by far the largest snake in that colony; it is not met with in the cooler southern parts, but it is becoming common towards the northern Murray boundary. Its increase is due to the destruction of the aboriginals, by whom it is prized as an article of food. In South Australia it is numerous in the Murray scrub. In N. S. Wales it is less abundant in the coast district. It seems to take the place of the diamond snake in the tropical Queensland brushes, and in the arid deserts of Central Australia. Some years ago the Zoological Society, London, obtained a living specimen by purchase from a dealer. In the reptile house of the Society, Melbourne, there are several carpet snakes from New South Wales and the north-west of Victoria. The Macleay museum at the University has specimens from King George's Sound, Murrumbidgee, Port Darwin, Richmond River, Sue Islands in Torres Strait, Endeavour River. The Melbourne museum exhibits carpet snakes from these localities:—Echuca, 5 feet 9 inches long; the banks of the Murray, 5 feet long; Swan Hill, a young one, 2 feet 4 inches long; the banks of the Murray, 6 feet 6 inches long. In the districts of the Manning and the Richmond specimens measure nearly 12 feet. It is found near Port Darwin and generally throughout Australia, except Southern Victoria. Mr. Gilbert met with it at Port Essington, and Sir G. Grey at Boston Island, South Australia.

Brush Turkey—*Talegallus lathami.*

Introduction.—The wattled tallegallus, known to the colonists as the brush turkey, is one of the extraordinary birds called mound-raisers. It has often been asserted that Australia abounds in anomalies, and in no instance is the truth of this proposition more fully exemplified than in the history of this singular bird. It was first described by Dr. Latham in his "General History of Birds" under the name of the New Holland Vulture, but subsequently he conceived himself in error in classing it with the Vulturidæ, and he placed it among the Gallinaceæ.

Description.—In size it may be compared with a small turkey hen. The female, which is about a fourth less than the male in size, is similar in plumage; she also possesses the wattle, but not to so great an extent. The adults have the whole of the upper surface, wings and tail blackish brown; the feathers of the under surface are blackish brown at the base, becoming silvery grey at the tip. The

skin of the head and the neck is deep pink red, thinly sprinkled with short hair-like blackish brown feathers. The wattle is bright yellow, tinged with red, where it unites with the red of the neck. The bill is black ; the irides and the feet are brown. There are eighteen feathers in the tail.

Habits.—It is a gregarious bird, generally moving about in small companies ; it is very shy and distrustful, resorting to the branches of trees as a shelter from the mid-day sun. When disturbed it readily eludes pursuit by the facility with which it runs through the tangled brush. If hard pressed or when rushed upon by the dingo, the whole company spring upon a bough of a tree, and by a succession of leaps gain the top, and either perch there or fly off to another part of the brush. The wattled talegalla does not hatch its eggs by incubation. They collect an immense heap of decaying vegetable matter as a depository for the eggs. The heap is collected by the birds during several weeks previous to the period of laying. Several birds unite in raising the mound : in collecting the materials the bird never uses its bill, but grasping a leaf or a twig with its foot, it throws it back to a common centre.

Mound-raising (Dr. Ramsay).—I found that two or more females visited the same mound to lay their eggs in ; and when this is the case the mound is often twice as large as an ordinary mound. It seems probable that several individuals assist in scratching the mound together, when a space often fifty yards in diameter (on level ground) is cleared of almost every fallen leaf and twig. The mounds are often 6 feet in height, and 12 to 14 yards wide at the base ; sometimes they are more conical. The central portion consists of decayed leaves mixed with fine débris, the next of coarser and less rotted materials ; and the outside is a mass of recently-gathered leaves, sticks and twigs not showing signs of decay. In opening the nest these are easily removed, and must be carefully pushed backwards over the sides, beginning at the top. Having cleared these, and obtained plenty of room, remove the semi-decayed strata, and below it where the fermentation has begun, in a mass of light fine leaf-mould will be found the eggs placed with the thin end downwards, often in a circle, with three or four in the centre, about 6 inches apart. At one side where the eggs have been first laid they will probably be found more or less developed, but in the centre where the eggs are placed, quite fresh ; and if only one pair of birds have laid in the mound, about 12 to 18 eggs will be the complement, and will be found arranged as described above. On the other hand, if several females resort to the same nest the regularity will be greatly interfered with, and 2 or 3 eggs in different stages of development will be found close to one another, some quite fresh, others within a few days of being hatched. There are usually 10 eggs in the first layer, 5 or 6 in the second, 3 or 4 in the centre. I found that the females return every second day to lay, but never succeeded in ascertaining which of the parent birds opens the nest. The aborigines said that the male bird always performs this office ; and I usually found my black boys very correct

in their statements of this kind. After robbing a nest it is necessary to replace the different layers as they were found, or the birds will invariably forsake the mound. These birds frequently bring the débris from a considerable distance ; on the Richmond River I noticed a place where about a cartload had been scratched through a shallow part of a creek 3 or 4 inches deep in water, and up the other side of the bank to the mound, which was over 40 yards distant. The débris is always thrown behind them. The greatest number of eggs taken from one mound at a time was 36 ; this was a very old mound and resorted to by several individuals. The eggs vary much in size, and in shape from almost round to a long oval, or pointed at the thin end; their usual form is an oval slightly smaller at one end. The shell is very thin, minutely granulated, and snow-white. Size, 3·5 x 2·4 inches.

In the spring and summer of 1859 a pair of talegallas, kept in the Gardens of the Zoological Society, London, formed a large mound composed of leaves, grass, earth and other materials. Within this mound the female deposited 20 eggs. On the morning of the 26th August a young talegallus crept out of the mound, and, quite regardless of its parent, ran about searching for worms and other insects, upon which it fed with as much adroitness and apparent knowledge as the chick of a common fowl would exhibit at a month old. Towards night it flew to a branch about six feet from the ground and settled there, the female taking no notice whatever of her offspring. On the superintendent looking into the mound two days afterwards, he observed a second young bird moving about and busily engaged cleaning its feathers with its bill. This young bird remained in the mound about 24 hours after it had escaped from the shell, during this time the wing and other feathers were freed from their covering, so that it could fly on quitting the mound. The two young birds took no notice of each other or of the old female. They were full grown in three months.

Food.—They feed on seeds, berries and insects ; their stomach is extremely muscular.

Where found.—Its habitat is New South Wales and Queensland. It is found near Cape York and Rockingham Bay, Port Denison, Wide Bay. It is nearly extinct in the Maitland and Illawarra brushes, but is met with in the dense and little-trodden brushes of the Manning and the Clarence, also on the Brezi Range to the north of Liverpool Plains, and in all the hills on either side of the Namoi. It is becoming scarce near Rockingham Bay.

Eggs used by the Blacks.—Mr. Macgillivray, the naturalist to the expedition undertaken by H M.S. Rattlesnake, says : "Many brush turkeys (Talegalla lathami) were shot by our sportsmen, and scarcely a day passed on which the natives did not procure for us some of the eggs. The mode in which these and other eggs are cooked by the blacks is to roll them up in two or three large leaves, and roast them in the ashes ; the eggs burst, of course, but the leaves prevent the contents from escaping. Both bird and eggs are

excellent eating. The laying bird carefully effaces any mark she may have made in scooping out a place for the eggs, but the keen eye of a native quickly detects the slightest sign of recent disturbance of the mound, and he seldom fails to hit upon the eggs.

WHITE POINTER OR WHITE SHARK—*Carcharodon rondeletii.*

Description.—This gigantic shark is by far the largest and most formidable of those approaching the Australian coast. Its length is from 15 to 16 feet, this is the measurement of some specimens caught in Port Phillip Bay. It is the same as the terrible White Shark, sometimes found on the English coasts, and more common in the West Indies. Its form is elongate and fusiform; the snout is subtriangular and rounded at the point. The nostrils are large and midway between the tip of the snout and the mouth, rather nearer to the eye. It has two spiracles, that is minute pores, one on each side, level with the general surface, a little below the eye and behind the mouth. The gill-openings are very large. The first dorsal fin is over the space between the pectoral and ventral fins; the second dorsal fin and the anal fin are nearly equal; both are very small; they are almost opposite, the anal fin being a little nearer the tail. There are five fins on the under-surface, two pectoral, which are very large, and two ventral—these are in pairs; also the anal fin, referred to above. There is a strong keel on each side of the tail; the caudal is large and crescentic, the lower lobe being pointed like the upper lobe and almost equally large. The teeth are very large, broad and triangular, with a thin-edged hollow base; they are coarsely serrated on the sides. The teeth are disposed in several rows, one posterior to the other, slightly movable and inclined backwards. By this arrangement the prey, when once seized, is effectually prevented from escaping without severe laceration. The body of a man killed, while bathing in the Parramatta River, was fearfully torn. The teeth vary in length from one inch to one and a half inches. The colour of its skin is ashy brownish-grey above, but paler below.

Habits.—At sea and in the harbours, in company with a shark, it is usual to find a faithful attendant, the pilot-fish *(Naucrates ductor).* If several sharks swim together, the pilot-fishes are generally absent: whereas on a solitary shark being seen, it is equally rare to find it unaccompanied by one or more of these reputed guides. It never injures its faithful companion. The shark's fearful armature of the mouth, which has rows of great triangular serrated teeth, renders any wound fatal. The serratures of the teeth are about ten in half-an-inch, they are closer near the point and slightly irregular. The size of the fish, even in Australian waters, is often so great that a man could be swallowed whole with ease, as Captain King mentions in his "Survey of Australia." Bluembach, the famous anatomist, who was a perfectly trustworthy authority, mentions a whole horse being found in one of this species. This of all sharks is the most dreaded by sailors, on account of its

great size, strength, and ferocity ; it exceeds 16 feet in length in other seas, some having been captured 36 feet long, according to the late Sir W. Macleay. The elongate body, generally terminating in a more or less pointed snout, and passing into a powerful and flexible tail at the other extremity, produces a most extraordinary power of swimming. When fishermen are drawing their nets full of fish this shark will swim along, giving every now and then a half-turn, biting out a large mouthful of fishes and net, and swallowing them together. It was from representations by fishermen and their friends, as to the damage done to their nets and the destruction of fish, as well as danger to bathers, when this species and the great bull shark or shovel-nosed shark appeared, as it is called in Victoria, but grey nurse in New South Wales, that the Government of Victoria was induced to place large sums on the estimates for the destruction of these monsters. In the expenditure of this money, there was either mistake or abuse, as hundreds of the harmless blunt-toothed smooth hound, picked dog-fish, and other small sharks were paid for, as being the young of the blue shark.

Where found.—Not only in Australian waters, but in all seas except the Polar. It is almost a cosmopolitan. This and other species of sharks, are far more numerous in the inlets of Port Jackson at the present time than in the early days of the colony. Fishermen note that sharks are most abundant near Sydney, towards the end of March and during April.

Food.—Fish or flesh, whether of man or dog, &c. The shark is omnivorous with respect to diet ; like the ostrich, it seems to digest almost anything, from tin-pots, canvas and clothing, to fat pork and delicate fish. When satiated with food, it swims very deep, and will not take a proffered bait.

How captured.—The two specimens in the Melbourne museum were caught in Hobson's Bay, near Brighton. The larger had been observed for several days swimming round the ladies' baths. Their lengths are 16 feet 2 in. and 13 feet 9 in. respectively. A strong hook and chain were obtained, which had been made so as to keep the rope out of the reach of its teeth, the bait used being a large piece of pork, which the shark swallowed greedily. When the monster was got on shore, and opened, it was found to contain a large Newfoundland dog, with his collar on, which identified him as one lost the day before. Sometimes when a large shark evinces unusual shyness, it is captured by harpooning ; when struck, ropes are passed under the animal, and it is hauled aboard, or dragged ashore, if its captors are in a boat. In Oct., 1890, three sharks, measuring respectively 14 feet, 11 feet, and 11 feet in length, were captured in the harbour off Manly. During the preceding fortnight they had frequently been seen near the jetty ; at times they had come close up to the steps of the landing stages, and they had been a cause of alarm to bathers. The largest of the trio, a tiger shark, was found to have swallowed half of a retriever dog ; it had a wound upon its back, which had been inflicted by a boat-hook, some days previously. In the ensuing Nov., during one afternoon, several

people on the rocks at Coogee Bay noticed a shoal of tiger sharks disporting themselves in the water a short distance from the shore. Some of the Aquarium employees set lines, and in the course of a few hours three of these monsters were hooked. Several young men went from Townsville in the summer of 1891 on a fishing excursion to Cape Marlow. While they were in the water with a drag-net, about 100 yards from the beach, the water being about 4 feet deep, they noticed two large sharks making for them. All made for the shore, and got out of danger except one, who, being at the end of the net towards the open sea, was unable to escape. He, however, with great presence of mind, dodged round the net, and eluded one of the monsters, which entangled itself in the net. The second shark came within 3 yards of him, but swam off again. They were of the hammer-headed species. The one, which became enveloped in the net, was unable to escape, though it struggled till it was half-dead. In this state, it was hauled to the shore; it measured 13 feet. An old bullet was found lodged in its body.

Species of sharks which frequent or occasionally visit Australian seas:—1. The white shark, found in Port Jackson and Port Phillip, 2. The hammer-headed shark (*Zygæna malleus*); it is met with along the coasts of Queensland and near Sydney, it is identical with that of the Mediterranean. 3. The thresher, or long-tailed shark (*Alopecias vulpes*). The name thresher arises from the habit this fish has of giving loud-sounding blows to whales, and other large bodies in the sea, with its long slender tail, as a thresher does with his flail. The *Newcastle Herald*, July, 1895, says:—"Those on board the Saxonia witnessed a most interesting encounter between a thresher and an enormous whale, off Bird Island. The steamer ran up close to the scene, but the combatants were too much engaged to make off till the vessel was almost up to them. Then the whale started off in a north-easterly direction, followed by the thresher. Encounters between these enemies of the deep are frequently seen off the coast and are watched with great interest. The upper lobe of its tail, which is entirely of cartilage, about equals the whole body in length. It is one of the rare sharks of the Australian waters. Specimens have occasionally been caught on the New Zealand coast. In England it is commonly called the fox shark. In April, 1891, a thresher was caught by some fishermen, in Spring Cove, Manly. It became entangled in the meshes of their net On being hauled to land, it was found to measure 14 feet, the tail being 7 feet, it was purchased by the Curator of the Sydney museum. In 1879 one was shot near the Heads, it measured 8 feet. 4. The basking shark (*Cetorhinus maximus*); it was supposed to be confined to the northern hemisphere till one was found entangled in the nets of some fishermen. Having wrapped the nets round itself by rolling and struggling it had become exhausted. This specimen, which was 30½ feet long, was caught in 1883 off the coast of Portland, in Victoria. It is quite harmless. 5. The spinous shark (*Echinorhinus spinosus*); it is a sluggish ground shark; none, as yet, have been found near Sydney; the one in the museum was

obtained from the Mediterranean The first example recorded in Australian waters was also caught off Portland in 1886. 6. The Port Jackson sharks (*Heterodontus phillipi and H. galeatus*). These are small sharks varying in length from 3 feet 8 in. to 2 feet 9 in. *H. galeatus* is easily known by its having two prominent ridges helmet-like on the top of its head, one being near each eye and slightly inclining over it. Victorians call these bull-dog sharks ; they are common in Port Phillip, as well as in Port Jackson. Fishermen frequently exhibit it in their shops. 7. The carpet shark (*Crossorhinus barbatus*) ; its length attains 7 feet 10 in. ; its skin is beautifully clouded and spotted. The popular name is the wobbigong, so called by the natives It is common near Sydney, Tasmania, South Australia, also in Hobson's Bay, it is erroneously styled the tiger shark. 8. The seven-gilled shark (*Notidanus indicus*) ; its length is 8 feet ; it has only one dorsal fin. It is somewhat rare ; the Sydney museum has one from Broken Bay. It is met with in Jervis Bay and Port Jackson. 9. The grey nurse of the Sydney fishermen (*Odontaspis taurus*) ; its length is about 10 feet. This is a most ferocious shark ; it drives shoals of fish before it in terror as it darts along. It will occasionally leap partly out of the water at a piece of meat, the oar of a boat, a man's arm or leg. It is found near Tasmania, South Australia, and in Port Jackson, being an object of terror to bathers. Its teeth are one inch long, and set in three or four rows on the under jaw, and two rows on the upper, making a fearful armature of spikes which inflicts wounds generally proving fatal. 10. The tiger shark (*Galeocerdo rayneri*) ; this species is numerous near Sydney ; it also frequents the coasts of Japan. It is very ferocious. The round parabolic form of the head, the form of the tail, and the shape of the teeth, will at once distinguish this species from all others known at present in these waters. The colour is bluish-grey above, silvery-white below. The Macleay museum, at the Sydney University, has a specimen. It is a sea shark ; the teeth are in eleven rows. The length of the largest obtained for many years, was 12 feet, but in 1883 the museum obtained a specimen 18 feet in length. 11. The blue pointer (*Lamna glauca*); the colour of the upper half of the body is blue, of the lower white ; the line of demarcation between the two colours being distinctly marked, and exactly in the middle of the sides. Fishermen know it as the blue pointer ; its length at maturity is about 12 feet. It is found off the coast of New South Wales.

Common Opossum—*Phalangista vulpina.*

Description.—The length of the common opossum is about 18 in., that of the tail being 13 in. The fur is long, loose and moderately soft ; its general colour is grey, the visible portions of the hairs being partly black and partly white. The fur of the back is of a somewhat deeper hue than on the sides, owing to a plentiful interspersion of long black hairs ; the muzzle and the chin are blackish, the former is pale near the tip and the naked muffle is of a whitish

flesh-colour. The eyes are encircled with blackish hairs; the skin of the inner surface of the ears is brownish-pink, with a few scattered pale-coloured hairs. The outer surface of the ear, excepting near the point and a narrow space along the anterior margin, is clothed with a dense and moderately long fur, which is white at the posterior angle and towards the apex, but black elsewhere. The hairs of the moustaches are long, numerous and black, and there are a few long bristly black hairs springing from above the eyes. The throat, the under surface of the body, and the inner side of the limbs are pale buffy-yellow, with a large oblong patch of deep rust-coloured hairs along the chest. The feet are yellowish-white, suffused with brown on the toes, the naked parts are flesh-coloured; the claws dusky; the tail is clothed at the root like the body; beyond, the fur is more bushy, of a harsher character, and black, the last inch or so being in some instances white; the extreme point of the tail and the apical half of the under surface are naked.

Habits.—The common opossum is strictly nocturnal in its habits. It lives in the hollow spouts and holes of the large gum trees during the day, and ascends the branches during the night. It sometimes descends to the ground, where it finds herbs to its taste. It is extremely agile, and can leap from branch to branch when gamboling in a tree, or eluding a climbing enemy. On moonlight nights opossums may be seen frisking on the ground, and running from tree to tree. Their frequent ascents wear a track in the bark of some of the giant gum trees by their holding on to the rough bark with their powerful curved claws. "While climbing," says Mr. Waterhouse, "its prehensile tail assists it to maintain a firm hold of the branches. I have noticed that in captivity this opossum in descending from one perch of its cage to another, or to the floor, invariably encircled with its tail the perch it was quitting, until the animal was again securely lodged Numerous specimens have from time to time formed part of the Zoological Society's living collection in London, and, from my own observations, they appeared to be by no means intelligent animals. During the daytime they were usually asleep, but towards evening they became active and on the alert for their food." Opossums sometimes construct a beautifully covered nest among the slender branches of high trees, probably to be out of the way of the tiger cats, they being no match for these ferocious brutes. They have seldom more than two young ones at a time, which are nurtured in their well-developed pouch. They are easily tamed and become pets.

Food.—The buds, leaves and fruit of gum trees, opossums will eat birds and their eggs, also tender grass. In captivity, bread and milk and various vegetable substances, including fruits. They evince an evident fondness for a dead bird. They take whatever eatable is given to them by the hands and hold it between them, in the manner a squirrel holds a nut. When man encroaches on their domain, his crops and fruit are sure to suffer.

Uses.—This animal constitutes a considerable part of the food of the natives, who diligently search for it, and, having discovered a

tree in which it is secreted, ascend it with surprising agility. The position of the animal being ascertained, a hole is cut with their little axes sufficiently large to admit the naked arm. The opossum is then seized by the tail, the chopping and jarring of the tree not inducing it to leave its retreat, and before it has time to bite or use its powerful claws it is deprived of life by a blow against the side of the tree and thrown to the ground ; its captor then proceeds to his encampment with a dinner in prospective, which he roasts in the ashes of his camp fire. Europeans now hunt opossums to obtain their skins, which, when tanned, are made into the well-known "opossum rugs." Numbers of these are exported to England and New Zealand. Fur rugs of beautiful softness, close and warm, and of elegant appearance, are made of their skins. These are used in the colonies not only as carriage wraps, but also instead of blankets by many people whose business leads them to sleep in the open air. As shooting opossums perforates the skin and destroys its value, hunters catch them in traps, or capture them in their hiding place during the day. Among the colonists the younger generation are very zealous opossum hunters. Boys search for them in the day-time after the fashion of the blacks, ascending the trees by stepping them with a tomahawk. They also hunt them by moonlight with dogs, which scent their tracks to a tree, or they detect them among the branches by the aid of the moon, when the opossum is either shot or driven down from the tree, and killed by the dogs. Major Mitchell relates that the Wollondilly natives had a song referring to their power of climbing, which may be translated thus :—

"On road the white man walks with creaking shoes,
He cannot walk up trees, nor his *feet fingers* use."

Leichhardt, in his work on his overland expedition from Moreton Bay to Port Essington, writes :—"The well-know tracks of black-fellows are everywhere visible—such as fresh steps cut in the trees to climb for opossums." Mitchell says "the blacks of the Bogan tribe subsisted on the opossum, kangaroo and emu rather than on the fish of the river." In the Herberton district the most common material used by the blacks for making ornaments is the so-called opossum yarn—that is, hairs pulled out of opossum skin and twisted into threads by rubbing them on the thigh with the flat hand. From this yarn the blacks make a little apron for the waist. Opossum yarn is also worn in bunches on various parts of the body, as round the loins or over one shoulder. Sometimes a "band" of this sort is thrown over each shoulder, in such a way that they form a cross on the breast and on the back. Frequently five or six threads of opossum yarn are twisted together to form a plain ornament for the wrist or neck. Opossum skins are also sewn together and used partly as articles of clothing, partly as mats. Also in Western Australia the blacks make string from opossums' wool for girdles and headbands. Oxley, when exploring the Lachlan, one day met eight natives covered with cloaks of opossum skins. He also noticed in the bags of the gins, near the Macquarie River, thread formed of the sinews of opossums' tails for sewing their cloaks.

Eyre, when exploring South Australia, observed that the blacks made water-bags of the skins thus :—An incision being made in the skin near the head of the opossum, they pulled the whole body through the opening. The skin being thus inverted, they tied up the openings with tendons where the feet and tail had been cut off and used it for carrying water. In the Museum, Sydney, there are specimens of these primitive water bags.

Where found.—Its habitat is all Australia, except the Cape York district. Kennedy, the ill-fated explorer, when wasting away from starvation in York Peninsula, promised the aboriginal Jacky Jacky five shillings a week if he would look for an opossum for him, which the black searched for all the way from Shelbourne Bay to Escape River, where Kennedy was speared by the blacks. No mammal is more frequently presented to the notice of travellers in the bush ; at night he hears it running about the trees, and, if the moon gives sufficient light, he sees it running on the ground or feeding in the branches of trees. It often visits the shepherd's hut and runs about on the roof. Captain Grey noticed in the north-west of Australia that many a hollow tree bore witness of its having been smoked, in order to drive forth to certain death the trembling opossum which had taken refuge in it. At Herbert Vale they are scarce in summer ; the blacks assert that they disappear at that period and do not return before the rainy season, when they are abundant. To test this Lumholtz caused his blacks to climb the high gum trees, but they did not succeed in discovering a single opossum at summer time. Sturt, enumerating the animals he met with in Central Australia, writes :—"There was only one opossum killed, or, indeed, seen to the westward of the Barrier Range, nor do they appear to inhabit the interior in any numbers, since there were no signs of the trees having been ascended by the natives in search of them."

Sir G. Grey's description of opossum-hunting by the blacks.—The savage carelessly walks up to some massive trunk which he thinks bears a suspicious appearance, his hands are placed thoughtlessly behind his back, whilst his dark eye glances over the bark ; suddenly it is for one moment stationary, and he looks eagerly at the tree, for he has detected the holes made by the nails of an opossum in its ascent He now seeks for one of these foot-marks, which has a little sand attached to it and gently blows the sand, but it sticks together, and does not easily move away—this is a proof that the animal has climbed the tree the same morning, for otherwise the sand would have been dried up by the heat of the sun, and not being held together by dampness would have been readily swept away before his breath. Having by this examination of signs, which an unskilled European in vain strains his eyes to detect, convinced himself that the opossum is in some hole of the tree, the native pulls his hatchet from his girdle and, cutting a small notch in the bark about four feet from the ground, he places the great toe of his right foot in it, throws his right arm round the tree, and with his left hand sticks the point handle of the hatchet into the bark as high up as he can

reach, and thus forms a stay to drag himself up with ; having made good this step he cuts another for his left foot, and thus proceeds until he has ascended to the hole where the opossum is hid, which is then compelled by smoke, or by being poked out, to quit its hiding place, when the native catching hold of its tail dashes it down on the ground, and quietly descends after it. As the opossum gives a very severe and painful bite, the natives are careful to lay hold of it in such a manner as to run the least possible danger of being seized by its teeth.

Moa (extinct)—*Genus Dinornis.*

Owen's opinion.—In 1839 Professor Owen announced the conclusions he had come to in reference to a piece of bone sent him from New Zealand. The fragment is the shaft of a femur, with both extremities broken off ; the length of it is 6 inches, and its smallest circumference is 5½ inches. The exterior surface of the bone is not perfectly smooth, but is sculptured with very shallow reticulate indentations ; it also presents several intermuscular ridges. The texture of the bone, which affords the chief evidence of its ornithic character, presents an extremely dense exterior crust, varying from one to two lines in thickness. A coarse cancellated structure is continued through the whole length of the fragment, and immediately bounds the medullary cavity of the bone. There is no bone of similar size which presents a cancellous structure, so closely resembling that of the present bone as does the femur of the ostrich, but this structure is interrupted in the ostrich at the middle of the shaft where the parietes of the medullary, or rather air cavity, are smooth and unbroken. From this difference Professor Owen concluded that the struthious bird indicated by the fragment had been of a heavier and more sluggish species than the ostrich, its femur and probably its whole leg had been shorter and thicker. It was only in the ostrich's femur that he had observed superficial reticulate impressions similar to those on the fragment in question. In shape the bone approached nearer to the femur of the emu, but it was of a larger type. It did not present the characters of a true fossil ; it was by no means mineralised ; it had probably been on or in the ground for some time, but it still retained most of its animal matter. So far as a judgment can be formed of a single fragment, it seems probable that the extinct bird, if it proves to be extinct, presented proportions more nearly resembling those of the dodo than any of the existing Struthionidæ. So far as his skill in interpreting an osseous fragment may be credited, he was willing to risk the reputation for it on the statement that there has existed, if there does not now exist, in New Zealand, a struthious bird nearly, if not quite, equal in size to the ostrich. His reasons, published at the time, proved to be sound in spite of adverse criticism in a work on osteology.

Confirmation.—The first letter received by him from New Zealand confirming this announcement and acquainting him with the

existence of specimens of other bones was published in 1843. In the previous year Dr. Buckland received a letter from the Rev. W. Williams, of Poverty Bay. It runs thus :—"About three years ago, on paying a visit to the coast, south of the East Cape, the natives showed me some fragments of bone taken out of the beds of rivers, which they said belonged to an extraordinary monster they had seen, to which they gave the name of "Moa" Again I heard the same story a little enlarged, that it is guarded by a reptile of the lizard species. I offered a large reward for the bird or its protector. At length a bone was brought from a river. It was of large size, but the extremities were so much worn away, that I could not determine anything as to its proper relationship. About two months ago, a single bone of smaller size was brought from a freshwater stream in this bay. A reward induced the natives to turn up the mud at the banks and in the bed of the same river, and soon a large number of bones was brought. On a comparison with the bones of a fowl, I immediately perceived that they belonged to a bird of a gigantic size." Two cases of these bones were sent to England in two vessels, to make sure of one, if not both, being received. The following observations were also transmitted :—(1.) None of these bones were found on dry land ; they are all from the bed and banks of fresh-water rivers. (2.) This bird was in existence here at no very distant time, though not in the memory of any of the inhabitants. (3) They existed in considerable numbers. I have received perfect and imperfect bones of thirty different birds. (4.) It may be inferred that this bird was long lived, and that it was many years before it attained its full size. (5.) The greatest height of the bird was probably not less than 14 or 16 feet. The leg-bones now sent give the height of 6 feet from the root of the tail. It will be seen from this letter that Mr. Williams confirmed the traditional statement of the natives of New Zealand. He has, therefore, a just claim to share in the honour of the discovery of the moa, since, while collecting and comparing its osseous remains, he was wholly unaware that its more immediate affinities had already been determined in England. By means of the specimens first transmitted by Mr. Williams to Dr. Buckland, and generously confided to Sir R. Owen, the professor was enabled to define the generic characters of the moa, and by his obtaining the second consignment of bones, and three specimens sent by Dr. Richardson, of Haslar Hospital, evidence was obtained of six different species of the genus, ascending respectively from the size of the great bustard to that of the dodo, of the emu, of the ostrich, and finally attaining a stature far surpassing that of the once-deemed most gigantic birds.

Wings.—The question of the moa having had wings was answered in the negative by Sir R. Owen, after the examination of the first fragment of that bird's bone. The cancellous texture of the shaft of the thigh-bone was the index of the presence or absence of wings. Had the negative been premature and unfounded, a guess rather than a demonstration, its fallacy might have been exposed by the very next bone of a moa transmitted from New Zealand, but no

trace of any part of the osseous framework of a wing was discovered. Again, in the bones there was a smaller proportion of air-cells than in those of the emu, and, therefore, the body had not been rendered specifically lighter for the purpose of flight, as in the swallow and other flying birds The wings of this extinct species were more rudimentary than those of the emu, but not quite so minute in proportion to the body as in the apteryx. The height of the Dinornis giganteus was estimated to have been 10 feet 6 inches, the other species being smaller, as this name applies.

Extinction.—It is probable that moas were in existence when the Polynesian colony first set foot on the island, and, if so, such bulky and probably stupid birds, at first without the instinct and always without adequate means of escape and defence, would soon fall a prey to the progenitors of the present Maoris. In the absence of any other large wild animals, the whole art and practice of the chase must have been concentrated on these unfortunate cursorial birds. The gigantic Dinornis would be the first exterminated; the strength of its kick would less avail than its great bulk would prejudice its safety by making its concealment difficult, at all events, the most recent looking bones are those of the smaller species. When the source of animal food from terrestrial species was reduced by the extirpation of the moas to this low point, then may have arisen those cannibal practices which, until lately, formed the opprobrium of a race of men in all other respects much superior to the aborigines of Australia.

Species.—No less than 18 species have been described, varying in height from 3 to 10 feet. The Maori ovens were extensively searched by the Hon. Walter Mantell and the late Sir Julius von Haast, and, from the bones exhumed, the birds must have formed a favourite article of diet. In Aug., 1891, large quantities of bones of extinct New Zealand birds were found at Enfield, near Oamaru. They include 120 thigh-bones of moas.

Feathers.—In 1864, a remarkably fresh skeleton was sent from New Zealand to the York museum, it being the first instance in which any part of the integument or ligaments still remained attached to the skeleton. It enabled Mr. Dallas, keeper of the museum, to describe a part of the structure of the feathery covering of the moa. The fresh condition of a part of the skeleton would warrant the supposition that not very many years had elapsed since the bird to which it belonged had wandered over the hills of Otago, but no conclusions could be drawn as to the time of its death, from the fact that other portions of the skeleton are in such a state of decay that many years of exposure to the weather must have elapsed for its production. The portion of the skin which bore the remains of feathers covered the flat back of the pelvis, immediately above the commencement of the tail. The skin itself was rather thick and coarse. The feathers were all very imperfect, consisting only of the basal portions of the shaft and accessory shaft, with here and there some traces of barbs; it was impossible to form any opinion as to their original length. The moa having possessed an accessory plume

added another proof of its relationship to the green-egged emus and cossowaries of Australia.

Moa's Egg.—The moa, whose eggs are still occasionally found, and whose name is preserved in the Maori legends, is entirely gone; the apteryx is its only living relative. On Nov. 14th, 1865, Mr. S. Stevens exhibited to the Zoological Society, London, a nearly perfect egg of a moa and read an extract from a Wellington newspaper, thus:—Information was obtained from Captain Davidson, of the schooner "Ruby," which then traded between Wellington and the Kai Koras, that a man employed at the latter place was digging the foundation of a house, when, on the side of a small mound, he suddenly came upon the egg in question, and the skeleton of a man, supposed to have been a Maori. The body had evidently been buried in a sitting posture, and the egg placed in the hands, as when found the arms were extended in such a manner as to bring it immediately opposite his mouth. This, it is assumed, was in accordance with the Maori custom, and was done for the purpose of giving the individual who was buried an opportunity of sustaining himself if he thought proper, or if, in the course of things he required sustenance. Between the legs of the skeleton were found numerous tools, cut from greenstone, including a spear, axe and several implements, which would lead to the belief that the man, whose bones these were, must have been, in some way or other, connected with the wood trade. All the bones were in excellent preservation, one arm and hand being entirely without blemish. The skull bore evidence of its proprietor having, at some time or other, received hard knocks, probably in the battle-field. Unfortunately, before the man who was digging discovered the natural treasure, the implement he was using came in contact with the shell and broke a small piece out of the side of it, but the fragments were carefully preserved, so as to be readily fitted in the aperture. The egg is about 10 in. x 7 in., the shell being of a dirty brownish colour, and rather thicker than a shilling. The inside was perfectly free from all traces of decayed matter. Fragments of moas' eggs are frequently found in various localities, and Mr. Mantell satisfied himself that the egg must have been used as food by the natives. He inferred this from finding that the fragments towards one end of the shell were scorched, when they were found in the native cooking ovens, which correspond to the "kitchen-middens" of Europe. His inference receives confirmation from the manner in which the above mentioned egg was found. (P.Z.S., 1865.)

Tasmanian Devil—*Sarcophilus ursinus.*

Description.—This animal is called by the colonist "the devil" or "native devil" from its black colouring, and unsightly appearance—a name which is likely to convey an erroneous impression of its nature. The fur with which the Tasmanian devil is covered, is coarse, of moderate length, and black, excepting on the head, tail, and under parts of the body, where it is brown-black. A broad

white band usually crosses the chest, and extends backwards on either side, more or less over the base of the fore leg ; and a second band crosses the back, near the root of the tail. In size it is about equal to a badger, its length from the tip of the nose to the root of the tail is about two feet, and of the tail eleven inches. The tail is clothed with tolerably long, coarse hairs. The ears are rather short, but very broad. The white markings noticed, vary in extent in different individuals, and sometimes both sides of the same animal are not similarly marked. The nose, the ears and the soles of the feet are of a fleshy pink. Of three in the British museum, London, one is entirely black, with the exception of a white spot on the chest ; the second is also black, with the exception of a white mark on the chest, and a white patch behind the base of the fore leg ; the third has the white chest band entire, and running back over the base of the legs on to the sides of the body and has also a transverse white band on the hinder part of the back.

Habits.—The Tasmanian devil was very common near Hobart in the early days of settlement. When captured, it furnished the convicts with a meal of fresh meat ; the taste of the flesh was said to have been not unlike that of veal. It was caught in traps baited with raw flesh, and set in the most unfrequented parts of the bush. As population increased and the ground was cleared, this animal was driven from its haunts near the town to the deeper recesses of the forests yet unexplored. The colonists became its dire enemies because it was very destructive to their poultry, and committed great havoc among the sheep. In a state of confinement it is untameably savage, it bites severely, and utters at the same time a low yelling growl. Notwithstanding its comparatively small size, it is so fierce and bites so severely, that it is a match for any ordinary dog. Its hollow barking is not unlike that of a dog. The Sarcophilus ursinus may be compared with a bear, in the general proportion of its body and limbs, as well as in the texture of its fur, also in many of its actions in and its gait. The tail, however, is long when so compared. The muscles of the jaws are very strong, which enable it to crack the largest bones asunder with ease. A fine living specimen was sent to the menagerie of the Zoological Society, London, but it did not live very long after its arrival. The Sydney museum exhibits several Tasmanian mammals, among which the one under notice figures prominently.

Food.—The Sarcophilus ursinus, as the name implies, is a lover of flesh. It preys upon the smaller species of the kangaroo family, which it devours voraciously. Since the introduction of sheep and poultry by the white man, it has assailed these new comers whenever an opportunity occurred. Its tracks are frequently seen in the sands of the seashore, where it searches for dead fish and blubber.

Where found.—In Tasmania among the rocky gullies and vast forests on the western side of the island. During one winter at a station near Swan Port, no less than 143 devils were caught in a single pitfall.

Prehistoric existence.—Although this animal is now found in Tasmania only, there is proof that ages ago it existed in Australia, since fossil remains of a species nearly allied to it have been found on the mainland. These remains were discovered in the caves of Wellington Valley. Professor McCoy found some fossil bones of a similar species near Dunolly in Victoria, thus proving that the Sarcophilus ursinus at one time existed on the mainland. The number of teeth belonging to these creatures collected at the Wellington caves, amounts to several hundreds, other remains (skulls and jaws) are as plentiful, and many of their owners must have died at a ripe old age, because their canine teeth are often found worn level with the rest of the series. It has been conjectured that the early denizens of the continent were extirpated by the dingoes —foes which were not encountered in the island home.

Crested Cockatoo—*Cacatua galerita.*

Introduction.—It is also known as the great sulphur-crested cockatoo. As may be readily imagined, the cockatoo is not upon favourable terms with the agriculturalist, upon whose fields of newly-sown grain, also ripening wheat and maize it commits great devastation. It is constantly hunted and shot down wherever it appears, a circumstance which tends much to lessen its numbers ; it is still, however, very numerous. These birds move about in large flocks. Sir Thomas Mitchell, in describing a district which he explored, writes that "amidst the umbrageous foliage, forming dense masses of shade, the white cockatoos sported like spirits of light."

Description.—All the plumage is white, with the exception of the elongated occipital crest, which is deep sulphur-yellow. The ear-coverts, the centre of the under surface of the wings, and the basal portion of the inner webs of the tail-feathers are pale sulphur-yellow. The irides and the bill are black ; the orbits are white, and the feet greyish brown. The bill is curved and very powerful ; the claws are sharp and strong. The upper mandible of the Tasmanian bird is somewhat lengthened and not so rounded ; this fits the bird for searching in the ground for small bulbs. Its size and form are well known to all Australians and those who have visited this continent.

Habits.—It is a gregarious bird. Except when feeding, or reposing on the trees after a repast, the presence of a flock, if not seen, is certain to be indicated by their horrid screaming notes, the discordance of which may be slightly conceived by those who have heard the peculiarly loud, piercing, grating scream of the bird in captivity, and imagine the immense increase of the din occasioned by a large number of birds emitting their disagreeable notes at the same moment. Their snowy forms and sprightly actions impart life to the dense and never-varying green of the Australian forest. It is a climbing bird. When a flock alights in a wheat field or among a crop of maize, a few birds remain in the tops of the nearest trees ; if any intruder approaches, these sentinels raise the alarm by their

loud screeches, and away go the whole flock. It lives a number of years in an aviary or in a cage, and is fond of being noticed. It may be taught to say a few words which it hears often repeated. It utters them in a harsh tone.

Cockatoos and the Blacks.—Sir Geo. Grey, in the account of his explorations in north-west Australia, when relating the dangers he experienced from the blacks, wrote thus:—"A large flock of cockatoos which lay between us and the natives flew off. Their departure was a serious loss to us, as they played somewhat the same part that the geese once did in the Capitol (of Rome), for whenever our sable neighbours made the slightest movement, the watchful sentinels of the cockatoos instantly detected it, and by stretching out their crests, screaming, standing on their toes on the highest trees, with their wings spread abroad to support them, and peering eagerly in the direction where the movement was made, they gave us a faithful intimation of every movement of the hostile blacks." Dr. Bennett says:—"I saw one of the Yass blacks throw his boomerang at a cockatoo perched upon a tree at a considerable distance; it struck the bird and killed it." He states that they drive the bird towards a spot clear of trees, where the men are waiting. When the cockatoos are flying over this, the boomerang sweeps wildly and uncertainly through the air, and so eccentric are its motions, that it requires but a slight stretch of the imagination to fancy it endowed with life. With fell swoops it is in pursuit of the birds, some of which are certain to be brought screaming to the earth. They throw several boomerangs among a flock. A writer on Queensland, describing the warriors of a tribe, says:—"Their heads were covered with the elegant yellow and white topknots of the white cockatoos. Each man wore at least forty of these, which were fastened in his hair with beeswax, and gave the head the appearance of a large aster."

Nidification.—It resorts to the hollow branches or boles of trees to nest and deposit its eggs, which are two in number; they are laid on the decaying wood usually found in such places. The eggs are pure white, and vary in form from oval to pointed oval. August and the three following months constitute the breeding season of this species. The egg is 1·65 inches long, and 1·21 inches broad.

Food.—Cockatoos feed on seeds, grain, native bread, small tuberous and bulbous roots. In Queensland they dig up with their beaks roots of a grass, of which they are very fond.

Where found.—The cockatoo is an inhabitant of the whole of Australia and Tasmania.

Great Grey Kangaroo—*Macropus major.*

Discovery.—The great kangaroo was discovered, in 1770, during Cook's first voyage, whilst that celebrated navigator was stationed at Endeavour River to repair his vessel, which was in a very dangerous condition, having struck on a rock, and, indeed, was only saved by a portion of the rock which broke off, and in a great

measure filled the hole it had made. The kangaroo was first seen by a party sent out to procure food for the sick. "On Friday, June 22nd," says Captain Cook, "a party who were engaged in shooting pigeons for the sick of the ship saw an animal which they described to be as large as a greyhound, of a slender make, of a mouse colour and extremely swift." Referring to the next day, Cook adds:—"This day almost everybody saw the animal which the pigeon-shooters had brought an account of the day before." On the following day Cook himself had the pleasure of beholding this extraordinary animal. He speaks of it thus: "As I was walking this morning at a little distance from the ship, I saw myself one of the animals which had been so often described. It was of a light mouse colour, and in size and shape very much resembling a greyhound; it had a long tail also, which it carried like a greyhound, and I should have taken it for a wild dog, if instead of running, it had not leapt like a hare or deer; its legs were said to be very slender, and the print of its foot to be like that of a goat, but where I saw it the grass was so high that the legs were concealed, and the ground was too hard to receive the track. Mr. Banks (afterwards Sir Joseph) had an imperfect view of this animal, and was of opinion that its species was hitherto unknown." On July 14th Mr. Gore, who went out with his gun, had the good fortune to kill one of the animals which had been so much the subject of speculation. This was the first specimen obtained by Europeans, and from it, in all probability, the notes were made and the figure drawn, which were published in Dr. Hawkesworth's account of the voyage, London, 1773. On July 17th Mr. Banks, accompanied by a small party, went out at dawn of day in quest of discoveries in natural history, and in a walk of many miles, at length saw four of these animals, two of which were chased by his greyhound, but readily outstripped their pursuer, and threw him out at a great distance by leaping over the long grass, which prevented the dog from running to advantage. All that could then be distinctly observed was that the animal in some degree resembled the Jerboa, in its manner of springing forwards on the hind legs instead of running in the manner of other quadrupeds. On July 27th Mr. Gore shot another kangaroo, these animals and turtles (captured in the harbour), which Cook named Endeavor River, supplied the circumnavigators with fresh food.

Description.—All the fur on the upper surface is uniform greyish-brown above, passing into grisly-grey on the arm and under surface. There is a faint line of greyish-white above the upper lip and along the sides of the face. A slight variation is found to exist in specimens from different localities, some being much darker and others of a foxy-red. The hands, feet and tip of the tail are black. An extraordinary difference is observable in the size of the sexes of this species, the female being not more than half the size of the male. The length of the male, from the nose to the extremity of the tail, is about 7 ft. 10 in., of the female, 5 ft. 11 in.

Habits.—Strictly speaking, it is not a gregarious animal. Sometimes six or eight may be seen together, but it is more frequently

met with singly or in pairs. Mr. R. C. Gunn states that "although from the circumstance of its food being abundant on certain spots, as on recently burnt land, it may be seen in flocks; it is not gregarious; their food brings them to one spot, but on no occasion have I ever known them in flocks, owning a leader and proceeding *en masse* as all other wild animals do." Mr. Gilbert, speaking of Western Australia, says:—"Mr. Gunn's remarks will not at all apply to the kangaroos of this country, for I have seen hundreds of instances, in which the whole herd has followed the leading one *en masse* unless divided by the dogs." The does take the lead, the males from their greater weight being unable to keep up with them, the latter often bring up the rear. In Tasmania the kangaroos lodge during the heat of the day among high ferns, high grass and in underwood, commonly called scrub, and on the margin of streams. The senses of smelling and hearing are so exquisite that it is extremely difficult of approach without detection, and to effect this it is always necessary to advance against the wind. The kangaroo is hunted and frequently killed by the dingo, but its most formidable antagonist was the aboriginal till the foundation of the colonies. The blacks employ several modes of obtaining it. Sometimes they steal upon it with the utmost caution under covert of the trees and bushes until it is within the range of the spear, which is generally thrown with unerring aim. At other times the natives having discovered their retreat, unite in a party, and, forming a circle, gradually close in upon them with shouts and yells, by which the animals are so terrified and confused that they easily become victims to the boomerangs, clubs and spears which are directed against them from all sides. Destructive as the aboriginal may have been, the kangaroo finds at the present time a far greater foe in the white man, who, independently of fire-arms, brings to his aid dogs of superior breed, and of so savage a nature that it has but little chance when opposed to them. These dogs, which run by sight, partake of the nature of the greyhound and deerhound, and from their great strength and fleetness are so well adapted for the duties to which they are trained that the escape of the kangaroo, when this occurs, is owing perhaps to the oppressive heat of the day, or the nature of the ground On rough places the females, in particular, will frequently outstrip the fleetest dogs; but on soft ground heavy old males are easily overtaken. Three or four dogs are generally employed—one of superior fleetness to "pull" the kangaroo, while the others rush in and kill it. The finest specimens are styled "boomers;" a tolerably good one will give a run of from six to ten miles; these often leap straight away, but the weaker ones travel a large ring back to the place where they were found. The length of the jump of a boomer, which had gone on a beach, and left footprints in the sand, was found to be just fifteen feet.

Uses.—The skin is tanned into excellent leather. What is known as the enamelled kangaroo leather for children's and women's boots, &c., was first introduced in the Sydney markets. The first consignment of selected and pickled skins to the markets of London, Paris,

and Germany for glove and bootmaking purposes resulted in loss to the exporters, because the value of the skins was not then understood. At the present time the best skins are worth more than live sheep in full wool. The only part of the flesh that is used occasionally by Europeans is the tail, from which a fine soup is produced. Sportsmen hunt this animal just as deer are hunted in England. Near Kelso, in Aug , 1892, two sportsmen shot 42 in three hours with sporting rifles. One was a very peculiar specimen, being a piebald ; its skin was preserved, it being conjectured that it was the only one of the kind in the colony. Dr. Shaw, writing so soon after the occupation as 1800, observes :—"The kangaroo may now be considered as in a great degree naturalised in England, several having been kept for some years in the royal domain at Richmond, which have during their residence there produced young." The following is a description of a hunt in Central Queensland :—"There were several of us in the company, all on horseback. Towards sunset we set out, for the animals at that time go out to feed, and it was not long before we caught sight of one of them. Our dogs, which were all fine kangaroo hounds, were now let loose, and we galloped after them as fast as our horses could carry us. The kangaroo jumps as fast as a horse gallops, but usually it gets tired soon, especially if it is an 'old man,' as the colonists call an aged male. He then places himself with his back against the trunk of a tree and seeks to protect himself from the dogs to the last. Woe be to the dog that comes within reach of his paws. He seizes it with his arms, and rips its abdomen open with the long and strong central claws of the hind feet. Trained dogs take good care not to go too near. Sometimes the kangaroo takes refuge in a pool of water, and, if a dog is too intrusive, the kangaroo instinctively ducks it under the water and holds it there till it is dead. The hunt proceeded as rapidly as our fast horses could gallop, but it did not take long before the kangaroo turned on the dogs in the manner I have described. One of the huntsmen came up, dismounted, and one or two powerful blows from his club put an end to the animal. We killed six of them in this manner" (Lumholtz). During the visit of the Archduke of Austro-Hungary, in 1893, he was accompanied by the Hon. F. B. Suttor to Mr. Mack's property, near Narramine, on which the distinguished visitor took part in a kangaroo hunt. Greyhounds were provided from Bathurst, and 20 horsemen were present to drive the game. A number of kangaroos were shot, and others were caught by the dogs. At the first drive his Imperial Highness succeeded in shooting, with great rapidity, five kangaroos.

Food.—It browses upon various kinds of grasses, herbs, and low shrubs, a kind of food which renders its flesh well-tasted and nutritive. The early dawn and evening are the periods at which it feeds.

Where found.—The country which appears most suitable to its nature consists of low grassy hills and plains, skirted by thin open forests of brushwood. As the kangaroo in Western Australia (*Macropus ocydromus*) is merely a local variety, its range is all

Australia, except the extreme north. In Tasmania it is replaced by the variety, *fulginosus*. In April, 1893, the Government of South Australia proclaimed an extensive kangaroo district, in which kangaroos must not be destroyed for three years from that date. The district comprises the lands of five counties on the west coast.

Australian Sea Bear—*Otaria cinerea*.

Introduction.—Collins, in 1798, when his account of New South Wales was published, mentions that "The rocks towards the sea were covered with fur-seals of great beauty, of a species which seemed to approach nearest to that known to naturalists as the Falkland Island seal." Professor McCoy having thought it desirable to visit the locality, where the French voyagers with Quoy and Gaimard during the voyage of the Astrolabe," found the type specimen of this species, still in the Paris museum, went in a small steamer from Phillip Island to the smaller island on which these seals abound in the breeding season. On approaching the rocky coast, he could make out with a binocular, that the greater number of what looked like brown, bare, rounded rocks on the island were really seals. On the steam whistle being blown, they all started up and plunged into the sea, except a few large males, which stood their ground, well raised up on their bent fin-like legs, with their broad breast to the foe, and head raised, threateningly showing their teeth, and erecting the hair of the neck, like a short mane. After a little while, scores of the females and the younger males came swimming out to the vessel to look at it, raising their kind, intelligent, good-humoured, dog-like heads, with beautiful large, brown, soft eyes, looking like large retriever dogs with the pleased friendly expression, they wear, when approaching their masters. The services of an old sealer, who lived on Phillip Island, had been secured ; the company landed on the small island, on the first calm evening. All the seals at once took to the water, the party passed the night in one of the caves found there. The seals came back to the island at night to rest ; the sealers having emerged quietly from their place of concealment, before daylight, and being armed with heavy rifles, shot a fine old male, one adult female, and a young one. These having been skinned, were stuffed and mounted in Melbourne by taxidermists, in the attitude of life, as when surprised on the island, and placed in the National museum.

Description.—The length of an adult male is about 7 feet, of a female 5½ feet. They are known by the remarkable appearance of small external ears, in which respect they are unlike the sea leopard. They differ also from the true seals in the forward direction of the hind limbs, when at rest, and in their raising themselves clear of the ground on them, and the anterior limbs, when walking on land. Dr. Gray, of the British museum, says "It is the character of the eared seals to have a very close under fur between the roots of the longer or more rigid hairs." They are therefore called fur-seals by

the sealers, and are hunted for their skin as well as for their oil. Some members of the family have so little under-fur, when they arrive at the adult age, that their skins are of no value in the market for making articles of seal-skin, they are therefore called hair-seals by the sealers. The sea bear, so called from its gait, is covered with moderately coarse hair, it is about 1½ inches long on the back of the neck of the male, and rather more than ¾ of an inch on the back. The colour of an adult is greyish dark-brown, somewhat lighter on the sides and smooth, of a darker rich chestnut hue on the abdomen; the tail, limbs and edge of the upper lip are the darkest. The under-fur is scanty, it is of a rich rusty chestnut; it is soft and beautiful, when properly dressed, and is of good quality, but old individuals have no under-fur. The anterior limbs have 4 or 5 rudimentary nails; the hind limbs are bent forwards, when resting or walking, they have long nails on the three middle toes, and very small ones on the two outer. The body is tapering and the tail short. The naked margin of both pairs of limbs and the nose are jet black. The young are blackish on the upper surface, and of a rich rusty chocolate below; they are darker than the adults, and look black, when wet. Dr. Gray observed that the under fur is entirely absent in the half-grown specimen in the British museum collection.

Habits.—Seals go to the rocks on parts of the Australian coast, about the beginning of Oct., and remain there during the breeding season; they have young before the middle of Dec. They do not breed till they are three years old. The female generally has one pup, but sometimes two. They select flat rocks, inaccessible to man, or, if not disturbed, a green sward a little inland. The males are very fat, when they first take to the rocks; if the females quarrel and fight, they restore order. Seals keep good watch, and care affectionately for their offspring; they circle round them in rough stormy weather, and protect them from any wash or sea, that may come over the rocks. If the young are washed off the rocks, the females follow them and bring them back in a rapid manner. A female has been seen to take a pup in her mouth, which had been washed off the rocks, and throw it ten feet high up to a rock, without hurting it. Out of the breeding season, seals go into the sea in the morning, and return to their resting place at night. When fighting, they strike each other like the boar; their teeth are about 1½ inches long, and cut terribly, making wounds from one to ten inches in length. If they smell man, they are off at once. In the water, they are as quick in their movements as any fish that swims: this power enables them to capture their prey, or escape their enemies—the sharks. The unwilling young, when full grown, are taught to swim by the female. The noise made by the females is like that of a cow, the male's noise is guttural. His voice when angry sounds like "oough, ough," and "yah, yah," when trying to pacify the females. The pup bleats like a lamb.

Food.—Seals live on fish; they eat leather-jackets, parrot fish, squid, &c. A sealer found a backbone in one 2¼ feet long, it was

like that of a barracouta. They destroy young sharks, bones of small ones having been found in them.

Where found.—The Australian sea bear is found on the coast of New South Wales. It is most numerous at Seal Rocks, near Port Stephens; on the Seal Rocks, off the Nobbies, Western Port; and along the coast of Victoria from Phillip Island to Wilson's Promontory; at Julia Percy Island, off Portland; also on many of the islands in Bass Strait. It exists in fewer localities than formerly and in diminished numbers. Bass found the rocks of Cape Barren Island, off the north-east of Tasmania covered with fur seals of great beauty. Cook, in his first voyage found them at Dusky Bay, at the south-east corner of the Middle Island. The Royal Society of Tasmania, in 1888, complained that seals were becoming the victims of poachers from New Zealand. At one time, as many as 1,000 could be counted on Clarke Island in a day, but they were rapidly being killed and would become extinct unless protected. It is also met with at Rivoli, South Australia; Falkland Islands. Houtman's Abrolhos, a group of rocks about 30 miles from the west coast of Australia, where Captain Pelsart's man-of-war was wrecked, are tenanted by the Australian sea lion, which is found principally on the Eastern and Pelsart groups, but like its congener it is becoming somewhat scarce Sir G. Grey wrote of the Abrolhos —"These islets appear to be a favourite resort of seals, many of which we saw, but of the sort called hair seals. The sailors knocked many of them upon the head with clubs, as they lay sleeping on the shores. The natives catch seals by surprising them upon the beach or in the surf, or when they can, they swim off to some of the small rocky islands, which are connected with the mainland by reefs, and kill the seals with their weapons. They are fond of the sport." In two years, 1814 and 1815, as many as 400,000 were captured by sealers on Antipodes Island. Captains of coasting steamers occasionally notice seals resting on large clumps of floating seaweed, in various parts of the route from Mackay to Adelaide. In the autumn of 1891, a sailing boat which had been on an extended tour, among the islands off the coast of Western Australia, returned to Albany with 520 skins: this shows that seals are still plentiful near the west coast of the continent.

Uses.—For their skins and the oil extracted from their fat. Their skins are much inferior to those of the fur seals killed on the Pribylov Islands, off the coast of Alaska, North America. The Hon. David Moore states that years ago there was considerable trade in seals at Sydney. The males were entered in the invoices as "Wigs," the females as "Klapmatches," and the young as "Pups." A male will yield from 5 to 10 gallons of oil. The females were seldom killed, as they had very little fat The trade has now entirely ceased in the south-eastern colonies, partly from the animals being scared away by the steamers and other vessels, and partly from the cost of labour rendering the work unprofitable. The young are very easily tamed; one was kept for some time in the kitchen at Phillip Island. It moved about somewhat like a lame

dog, following the housekeeper with affectionate pertinacity, or playing with a young kangaroo and some other tame animals about the house with all the fun of a kitten or a puppy. It would come, when called, like a dog and obviously liked to have its head stroked with the hand. By reason of its docility, this species is the most suitable for exhibiting at aquariums in the seal-pond, an excavation, which being bricked and cemented, has pipes connected with the sea, for the ingress and egress of their native element. Rocks are placed round the pond, and perhaps a miniature cave is constructed, to give an idea of the natural home of the seals. They are generally only half-grown and do not live long in captivity. Seals may be taught to jump from a height into the pond, and at the same time seize a fish, which swings to and fro at the end of a line like a pendulum: to follow the attendant among the visitors, to roll themselves on a barrel, and climb upon a chair.

Emu—*Dromaius novæ hollandiæ.*

Historical notices.—Judge-Advocate Collins, writing of March, 1788, says:—"The curiosity of the camp was excited and gratified for a day or two by the sight of an emu, which was shot by the Governor's gamekiller. It was remarkable by every stem having two feathers proceeding from it. Its height was 7 feet 2 inches, and the flesh was very well flavoured." There is a figure of an emu in Phillip's Voyage with this remark—"The one from which the plate was taken was shot within two miles of Sydney Cove. The skin being sent to England in spirits, was put into attitude, and is now the property of Sir Joseph Banks, to whom it was presented by Lord Sydney, It was called the New Holland cassowary." Leichhardt, writing of his expedition to Port Essington says:—"As we were sitting at our dinner, a half-grown emu walked slowly up to us, as if curious to know what business we had in its lonely haunts. Unfortunately for us, the bark of our little terrier frightened it away."

Description.—Mr. Bennett published the first accurate description of this bird. The emu is from 5 to 6 feet in height; in form it closely resembles the ostrich, but is lower on the legs, shorter in the neck, and of a more thick-set and clumsy form. In size it ranks next to the African ostrich. The female is smaller than the male, and somewhat different in colour. The emu differs from its congener, the cassowary, for which it was at first mistaken in having the head completely feathered and in having no casque. Its plumage is of a dull brown colour, mottled with dirty grey in some parts. At a distance the feathers have more the appearance of coarse hair than the usual plumes of birds; the barbs are all loose and separate, each feather appearing to be double from the elongation of the accessory plume—that is there are two plumes on each quill. The head and neck are thinly covered with short feathers, displaying the purplish skin around the throat and ears. The wings are so short that,

when applied to the surface of the body, they are invisible; they are useless for flying. The wings are clothed with feathers, exactly similar to those of the back, which divide from a middle line and fall gracefully over on either side. The bill is straight, very much depressed towards the sides, slightly keeled along the middle, and rounded at the extremity; the nostrils are large. The bill and legs are dusky black. This bird possesses great keenness of vision; it is tailless. There are three toes on each foot, directed forwards, the nails being short and robust.

Habits.—The female utters a low-booming or pumping noise. She produces this note by alternately expanding and contracting a large membraneous bag, which surrounds an oblong opening through the rings of the trachea. The length of the emu's legs and the muscularity of its thighs enable it to run with great swiftness. It depends on its speed to escape from its enemies—whether stockmen, blacks or dogs. Mr. Cunningham, the botanist, noticed that all dogs will not attack it, on account of some peculiar odour of its flesh which they dislike The best time to hunt it is the early morning, when it is cropping the grass. Dogs not accustomed to hunt it are often injured through catching it by the flanks or the legs, for it kicks sideways like a cow It is not overtaken till quite tired out. Trained dogs catch it by the neck, when it is overthrown and killed. Major T. Mitchell, writing of his exploration of the course of the Darling states:—"As we crossed a plain the dogs set off after three emus, the whole disappearing in the woods. Some time after, while passing through a scrub, we came upon the two dogs standing quietly beside a dead emu, the first they had killed to our knowledge." Forrest, describing his search for Leichhardt, 1869 observes:—"Yesterday morning the dogs caught an emu, off which we made a first-rate breakfast." Emus travel many miles in the night for water, if needed. Sturt remarks—"A pack of thirteen came to Depôt Creek one night, which had been seen twelve miles to the north on the evening before." The are good swimmers. Sturt, when exploring the Murrumbidgee in a boat, and "being just about to land to prepare dinner, saw two emus swim across the river."

Nidification.—The breeding season commences as early as June, and continues till the end of September. Mr. K. H. Bennett states that the nests vary in different situations. On the plains the eggs are deposited on the bare ground, and if amongst the low polygonum, so common on large areas, the eggs are surrounded by a ring of short broken pieces of the stem of this plant, apparently for the purpose of keeping them in position and preventing them from rolling away. At other times they are placed on a thin layer of grass, and without any protecting ring; whilst in the timbered country, and particularly where "Leopard" trees abound, a low flat mound some three inches high is formed by scraping together the scales of bark, thrown off by the above mentioned trees, on which the eggs are placed. Eggs from seven to ten in number form a sitting. They are usually oval in form, and in some instances slightly pointed at each end, in others

at the smaller apex only. The colour varies in all shades of dark green, and occasionally one egg in a sitting is found of a very pale green. The shell is pitted and granulated all over, closely resembling shagreen in appearance. The dimensions of an egg are about 5·5 x 3·5 inches. Dr. Bennett was mistaken, when stating in "The Wanderings of a Naturalist in New South Wales," that the emu always lays an odd number of eggs, 7, 9, 11 or 13; perhaps he always found an odd number. Not only writers since his time, but those anterior to him, furnish contrary evidence. Oxley found an emu's nest in one of the brushes, which contained 10 eggs. Captain Hunter wrote in his Historical Journal of the transactions at Port Jackson:—"Sept., 1791, a number of emus have been seen lately, and this appears to be the season in which they breed, as a nest was found at the head of the harbour, containing 14 eggs. The nest was composed of fern, but it had more the appearance of a quantity of fern collected for a person to sit on than a nest."

Food.—The emu feeds on grass, cropping the herbage like a cow or a horse, also on wild fruit as the quandong or native peach. It will eat almost any vegetables; it swallows pieces of hard substances which assist in grinding the food. Oxley, in the account of his explorations, refers to it thus:—"For the last 50 miles we have not seen a stone or a pebble of any kind save two, and they were taken out of the maws of two emus."

Where found.—The emu is found all over Australia, except the north-west portion; it frequents the plains and the open forest country. It was once plentiful in the coast districts—now the abode of man, by whom it has been ruthlessly hunted and shot down, on account of the damage done by the birds to the wire fences of the squatters, and the quantity of grass consumed by them. Not only are the birds destroyed, but men are employed to search for the eggs and break them. On a station in the Riverina district, during the breeding season of 1881, no less than 1,500 were destroyed; and in the Cobar district in 1887, more than that number were broken. The *Sydney Morning Herald*, of Oct. 15th, 1888, chronicles that 10,000 emus were destroyed in the Wilcannia district during the first nine months of that year. Collins, writing of his time, says emus were plentiful about Rose Hill, near Parramatta; they were seen in flocks of about twelve. On one occasion two wandered into the camp there, and getting mixed up with the women and children the men were afraid to fire, so they escaped. Leichhardt, when exploring around the Gulf of Carpentaria, met with emus almost daily. He saw about 100 in the course of eight miles, in flocks of 3, 5 or 10. Both Flinders and Péron stated that they were numerous on Kangaroo and King's Island. In May, 1893, the Archduke Franz Ferdinand d' Este, of Austro-Hungary, visited New South Wales, and was taken on a shooting expedition by the Hon. F. B. Suttor, then Minister of Public Instruction, the locality being 50 miles beyond Narramine, and about 350 miles west of Sydney. Here a flock of emus was driven past the Archduke, who succeeded

with the rifle in killing a very fine specimen, and wounding another, which was afterwards secured.

Uses.—The blacks eat the flesh with the skin upon it, regarding it as a highly luscious treat; the young men and the boys are not allowed to feed upon it. The flesh, which is mostly on the hinder quarters, has been compared to coarse beef, which it resembles; nothing is more delicate than the flesh of the young birds. Dr. Leichhardt and his companions used it during their overland route from Moreton Bay to Port Essington. He extracted oil from the skin, which he used for oiling the locks of his firearms. First the feathers were plucked, then the skin was cut into pieces and boiled. A large skin would yield 6 or 7 quarts of oil. It is clear, and of a bright yellow or golden colour. Stockkeepers use it for sprains in the legs of horses or cattle. The eggs are used for ornaments, being sometimes cut and mounted in silver as milk-jugs or sugar-basins. The blacks use the fibulæ as ornaments, and sew their cloaks and bags with the tendons of the muscles of the legs. In Western Australia they use bunches of feathers as ornaments, cemented together with grass-tree gum, bunches being tied round the arms and on the hip under the waistband. A representation of this bird marks the two-penny postage stamp. It is also used as an emblem for Australia sometimes in conjunction with the kangaroo.

Acclimatisation.—Years ago some emus were sent to England, and placed on the estate of the late Duke of Newcastle. They browsed in Clumber Park with his cattle; being hardy they withstood the cold of winter, and here it was clearly proved that emus breed under restraint, and that the young are produced by incubation. In 1868 the hen laid 27 eggs, seven being left in the nest. The cock sat on them for 8 days, when, being disturbed by the hen, he left the nest for 8 days, during which the eggs were exposed to the cold of Feb. He then began a second incubation, which lasted 62 days, during which he left the nest but three times, and refused the food that was offered. Of the seven eggs one was rotten, two young ones died in the shell, and four were hatched. But one being accidentally killed by the male bird, the other three were taken away and brought up by hand. In the Zoological Society's Gardens, London, emus have on several occasions reared their young, the period of incubation being 56 days; also in France, in the Royal Park, near Madrid, and at Vienna.

Blood-stained Cockatoo—*Cacatua sanguinea.*

Description.—The crest, under and upper surface, wings and tail are white; the feathers next the bill and underneath the eye are spotted with blood red; the bases of the inner webs of the primaries, secondaries and tail feathers are sulphur yellow; the feet are mealy brown, and the irides dark brown. The sexes are alike. The length of the bird is 14 inches, of the wing, 10 inches, of the tail 5½ inches, of the bill 1¼ inches.

Habits. — It frequents swampy situations, and although numerous, is wary and not easy of approach. Sturt met with it in thousands on Evelyn's Plains, near the Depôt, where it was observed feeding voraciously on the seeds of a species of kidney-bean, and making a deafening noise, its voice being very harsh and disagreeable. It is often seen feeding in company with the well-known sulphur-crested species.

Where found.—This species is a denizen of the north and central portions of the Australian continent; it does not seem to occur on the open land near Cape York, and is probably limited in its eastern range to the 140th meridian of longitude. It is very common near Port Essington and the Alligator River. It is found in New South Wales at its north-western extremity.

Nidification.—Its mode of breeding is the same as that of other members of this extensive family.

Specimens of four species are exhibited in a group at the Macleay museum, Sydney, the first three being from the Murrumbidgee district. There is also the long-billed cockatoo (*Licmetis nasicus*) from the same locality. The last is met with near Narrandera, and generally in New South Wales, Victoria, South Australia, the interior, also near the Gulf of Carpentaria, thus occupying the eastern half of the continent. The long-billed cockatoo usually exercises great care in placing its nest out of the way of human enemies, choosing one of the most inaccessible trees, in the dead branch of which it deposits its eggs. They are white and three in number, oval, and rather pointed at the smaller end; the shell is inclined to be rough. An average specimen measures 1·4 x 1·1 inches. The breeding season commences in August and lasts during the two following months.

Wild Turkey, or Australian Bustard—*Otis australasianus.*

Introduction.—During the first fifty years of the existence of New South Wales no specimens of this fine bird were transmitted to Europe with the vast collections of Australian birds that had been sent thither. A single specimen had for a long time formed part of the collection of the Linnean Society, but nothing whatever was known of its history. In size this species exceeds the European bustard, standing higher upon its legs and having a longer neck; and when seen at freedom slowly stalking over its native plains, no Australian bird, except the cassowary and emu, is so majestic or assumes in its carriage so great an air of independence. Mr. Gould in 1838 found the native turkey to be one of the most abundant, and one of the most widely and generally dispersed of the larger birds inhabiting *terra Australis.*

Description.—It is larger and heavier than the domestic turkey. The plumage of the crown of the head and the back of it is black;

the sides of the head, the neck and breast are greyish white. Each feather is crossed by numerous fine zig-zag bands of brown. The wing coverts are black largely tipped with white. All the upper surface, the wings and the upper tail coverts, are brown, very minutely freckled with reddish brown ; some of the feathers towards the hinder parts of the body are tinged with grey. The tail is grey, crossed near the centre by an interrupted band of white, minutely freckled with white, margined with brown, and slightly tipped with white. The chest is crossed by an irregular band of black, beyond which the under surface is white. The neck and breast have a freckled appearance. The under tail coverts are greyish black tipped with white. The irides are greenish white; the eyelash is pale olive yellow; the bill straw-white, with olive and black culmen; the legs and feet straw-yellow. The male is capable of great distention of the neck during the breeding season. This is known among naturalists as "showing off." One having died in the Zoological Gardens, London, in May, 1874, the prosector demonstrated that there was neither gular pouch nor sublingual orifice. The male, the weight of which is from thirteen to sixteen pounds, considerably exceeds the female in size ; the plumes of the neck and the back of the head are longer, which give him a more stately appearance.

Habits.—In the populated districts, from the wild or native turkey being so much sought after, it has become shy. It has been persistently persecuted near the abode of man, because its flesh, as an article of food is delicate and well-flavoured and in every respect equals that of the species known in Europe (Otis tarda). It flies heavily with its long neck stretched out to the utmost; but is capable of sustaining flight for a considerable distance. It is difficult to approach on foot, before it takes wing, which it readily does by running quickly a few yards, thereby gaining an impetus which enables it to rise. On the plains of the interior, where it is free from the assaults of civilised man, it is much less wary. Sturt says—"This fine and erectly walking bird is common over the whole of the interior, migrating from the north in Sept. and Oct. Several flocks of these birds were seen by us, migrating southwards, passing over our heads at a considerable elevation, as if they intended to be long on the wing. I have know this Otis weigh 28 lbs. Its flesh is dark and varied in shade; the flavour is game and the meat is tender." The natives used formerly to capture wild turkeys in an ingenious manner by means of a snare; they approached their intended victim against the wind under cover of a large bush grasped in the left hand, while in the right hand was held a long slender stick, to the end of which was fastened a large fluttering moth, and immediately below a running noose; while the bird, unconscious of danger, was eyeing and pecking at the moth, the noose was dexterously slipped over its head by the cunning black, and the astonished bird at once paid the penalty of its curiosity with its life. When Hovell and Hume, the explorers, in their journey to Port Phillip in 1824, were approaching the bay, not far from the present site of Geelong, they noticed several flocks of native turkeys in the

open country. On the plains of the interior it is more abundant and less shy than in the settled districts.

Nidification.—The Australian bustard breeds during Sept., Oct. and Nov., and lays but two eggs, on the ground without any nest—a small bare spot being selected among the trees on the hill-side ; a few small sticks and blades of grass are sometimes found gathered round the eggs. The eggs vary both in shape and size, some are thickest at an equal distance from each end ; others are more elongated, and widest an inch from the thicker end. In length they are from 3 to 3·3 inches, and from 2·1 to 2·3 inches in breadth. The ground colour varies from light olive-green to olive-brown, having longitudinal smears, spots, and dashes of olive-brown, equally dispersed over the surface. In the collection of Mr. J. Ramsay, of Nanama, there are seven eggs of bustards : one very fine is of a light olive-green sparingly marked with reddish olive-brown. The bustard has but one brood in the season. The nest of this bird, if worthy of the name of a nest, is often found with only a single egg. In the Dobroyde collection, there are 24 eggs, of these 8 sets were found in pairs. Mr. K. H. Bennett usually found nests with one egg. Mr. E. Ramsay, in 1887, found two nests at "Kerriegundah," near Louth, N. S. Wales, each of which contained but a single egg. During 1868, however, Mr. J. Ramsay found no less than four nests containing two eggs each, at Nanama, N. S. Wales. Eggs of this bird are occasionally found of a pale sky-blue tint. The wild turkey has bred in the Zoological Gardens, Melbourne, producing one young one. The Director, in describing the bustard's enclosure, which is of considerable size, containing trees and shrubs, says—"The hen bird lays only *one* egg, depositing it on the bare ground." Perhaps it was Mr. Le Souef's experience to find "only one egg" as Mr. K. H. Bennett usually did, but Dr. Ramsay has adduced evidence to show that, in New South Wales the bustard sometimes lays two eggs.

How shot.—In the early days of colonization, the Australian bustard was easily obtained ; but as it became more wary of man and his firearms, various devices had to be resorted to such as :—the sportsman advancing beside a horse and concealed as much as possible by it, driving or riding round a bird or birds and gradually reducing the circle till within shot, several sportsmen acting in concert. This is done on the plains near Gunnedah, thus : The party divides, when a bird is discovered, or perhaps a pair, for they are not numerous ; the shooters lie in ambush among the long grass, the others advance upon the game in such a way as to drive the birds towards the shooters, or make them fly over the concealed men, who then spring up and fire at them on the wing. As the wild turkey is threatened with extinction in Victoria, the *Age* says its sale in that colony is prohibited ; it is permitted in New South Wales. When the Archduke of Austro-Hungary visited Sydney in 1893, he was escorted by the Hon. F. B. Suttor to Mullengudgery, the squatters of the stations near at hand having placed their properties at the Archduke's disposal for the time. The feature of the

day's sport was the wild turkey shooting. The birds were numerous but rather shy, nevertheless a good number were obtained, some specimens of which were added to the fine collection of his Highness —the result of his own shooting in various parts of the world.

Food.—It feeds on insects, lizards, bulbous roots and various other vegetable substances. The plains produce its food. It is fond of grass paddocks that have been formerly cultivated.

Where found.—In New South Wales, Victoria, South Australia, Queensland, the interior of the continent, West Australia. Specimens have been obtained on the plains near the Lower Namoi and the Upper Hunter ; on the downs near Scone ; from the flats in the neighbourhood of Aberdeen ; and the plains near Lake Bathurst. Captain Grey when exploring West Australia between Swan River and Shark Bay noticed these birds. Dr. Bennett found them on Yass Plains. Sturt wrote that "wild turkeys abounded near the Murrumbidgee" when he explored it ; he also found them in the desert interior. Both Dr. Leichhardt and Mr. Gould observed them in the tropical portion of Australia ; Mr. Gilbert met with them in Western Australia. Specimens from Swan River present no material differences from those found on the east coast. In Victoria native turkeys are still abundant on the western plains and on the open saltbush country of the Lower Murray. Formerly they were numerous in the neighbourhood of Melbourne, but they were destroyed or driven further inland. They are still met with near Colac.

PLATYPUS—*Ornithorhynchus anatinus.*

Discovery.—It was in the year 1799 that a description of this singular quadruped first appeared in the Naturalists' Miscellany of Dr. Shaw. About this time also the kangaroo, emu, lyre-bird, wombat, koala, and black swan were made known. These important discoveries gave an extraordinary impulse to the study of natural history, and set the whole scientific community of Europe wondering at the paradoxical creatures of the distant country, known as Australia. The most remarkable and anomalous of these animals was the ornithorhynchus, and, even at the present time, we are not fully acquainted with its habits and reproduction. It is as a connecting link between the mammals, birds and reptiles having features common to all. When first a preserved skin was sent to England, it excited great distrust, being considered a fraud upon the naturalist (like Barnum's mermaid), as it seemed to be an animal, compounded of an old mole's skin, to which a duck's mandibles were attached ; but, subsequent specimens arriving, the creature was found to be real and unexampled in its formation.

Description.—The size varies, and the males are slightly larger than the opposite sex. The length of the head and body of the male is about eighteen inches, of the female fourteen. The marsupial bones are present, but the pouch is wanting. The body is covered

with fine, long and thick hair, underneath which is a finer, short and very soft fur, resembling the two distinct kinds of fur found on the seal and the otter. On the abdomen, breast and throat the fur and hair are of a much finer quality and of a more silky nature ; but on the upper surface of the tail the hair is longer and coarser. The general colour of the upper surface is a light black, the under short fur being greyish ; the whole of the under surface is ferruginous. The legs are short, pentadactyle, and the feet webbed. On the fore feet the webs extend a short distance beyond the claws ; they are loose and fall back, when the animal burrows. The fore feet seem to have the greatest muscular power, they are in principal use for burrowing and swimming. The hind feet are short, being turned backwards ; and, when the animal is at rest, they have, like those of the seal, some resemblance to a fin The head is rather flat, from it project two flat lips or mandibles, resembling the beak of a shoveller duck, the lower of which is shorter and narrower than the upper, and has its internal edges channeled with numerous striæ somewhat like those seen in the bill of a duck. It has eight horny teeth. The colour of the superior mandible is of a dull, dirty, greyish black, interspersed with innumerable minute dots. At the base of both mandibles is a transverse loose fold or flap of integument similar in colour to the skin, that is, dull greyish-black above and white or mottled below. In the upper mandible this flap is continued to the eyes and affords protection to those organs when the animal is burrowing, or seeking food in the mud. The eyes are very small but brilliant, and of a light brown. The males have a spur on the internal part of the hind leg, some distance above the claws. Both Mr. Gould and Dr. Bennett were of opinion that there was no poisonous gland connected with the spur, although they had had some hearsay evidence to the contrary. Dr. Bennett tried the effect of the spur on his bare arm. In May, 1894, Professor Anderson Stuart, in his address to the Royal Society of Sydney, stated :—"The poisonous action of the secretion of the gland connected with the spur has been alternately asserted and denied, but I have no doubt whatever that it is, at least at certain seasons, a powerful poison."

Habits.—The platypus is subaqueous and fossorial. It climbs stumps of trees near the water and snags which lie prostrate in the beds of rivers. It is seen in the early morning and in the evening, but during the daytime in only lowery weather. It swims with great ease, but remains only one or two minutes playing and paddling on the surface ; it then dives and reappears again a short distance off. In swimming the body of the animal is sometimes partly raised beaverlike above the surface ; while in still pools every part is submerged, except the upper surface of the bill and nostrils, these being but sufficiently elevated above the water to enable the animal to breathe. On seeing it the observer must remain perfectly still, as the slightest noise or movement on his part would cause its instant disappearance, so acute is its sight and hearing. When disturbed it dives instantly with an audible splash, caused by

the hasty flap of its broad tail, and seldom reappears. The *Gundagai Times* of April, 1895, announces that two travellers who were fishing near Jugiong, having set some night lines for fish, found in the morning a platypus attached to a hook partly swallowed. Some years ago Mr. Jefferies, of Wagga, caught one similarly, his bait being a prawn.

Burrows.—The platypus makes its nest in the bank adjoining a stream, on which long grass and herbaceous plants abound. The entrance to it is about a foot from the water's edge ; the burrow made varies in length from 20 to 50 feet, extending in a serpentine direction up the bank into dry ground. Besides the entrance near the water's edge, there is also another opening under the water, which communicates with the upper aperture and the main burrow. No doubt by this subaqueous orifice the animal seeks refuge when it is seen to dive, but does not rise again. The termination of the burrow is broader than any other part, thus forming a little chamber nearly oval in form, the base of which is strewed by the platypi with dry river-weeds and leaves ; these form a warm and comfortable nest for their offspring. The number of young, which are very helpless at first, rarely exceeds two. At the extremity of a burrow, 35 feet long, in the bank of the Wollondilly River (the burrow having been dug out) two full-furred young ones were found—a male and a female—coiled up asleep ; they growled exceedingly at being exposed to the light of day. They measured 10 inches from the extremity of the beak to that of the tail. The object of the animal in burrowing upward is to have its nest above water level should the river rise. It has been noted that a nest was 22 feet above the summer level of a stream. The object of the lateral chambers cannot be comprehended. The breeding season in Queensland comprises Sept., Oct. and Nov., but it is later in the south of the continent and in Tasmania. Dr Bennett says :—"Our black zoological collector pointed out to me in the course of his peripatetic lecture, or rather demonstration of the whole art of capturing them, the distinct marks of the hind and fore feet of one of these animals on the moist clay near the river ; and, afterwards inserting his hand up the burrow, brought from thence some lumps of clay taken from the under surface. These he regarded closely, and placing them in my hands pointed out recent impressions of the fore feet of the Mullangong tribe, which were certainly distinctly visible. He then removed some other pieces from the interior of the burrow, on which there were further proof impressions of the animal's recent presence, and it was therefore declared to be an inhabited one." On 27th of Oct., 1876, at Lockyer Creek, which is an eastern water flowing into the Bremer River, Queensland, a waterhole, bordered on one side by rocks, but on the other side by a high sandy bank, was examined and a burrow found on the sandy side. It was four inches by three, running upwards in a serpentine direction. After digging five feet a chamber on the right-hand side was found ; it was 12 in. long, 6 high, 8 broad, the burrow still continuing to the left. Five feet further on a second chamber was opened similar in size

and also on the right, the burrow still continuing to the left. On excavating 10 feet more a chamber was found measuring 18 in. long, 10 high and 8 broad, which contained a nest, formed of dried grass, reeds and gum leaves, evidently from their blackened appearance, taken from under the water. In the nest were two young platypi, about a month old ; they were rolled up like a ball, with the tail lying flat on the beak. They were very fat and plump, but without fur, of a greyish colour, and had a velvety appearance when the sun was shining upon them ; their eyes were not fully opened ; the mother was not with them. The two chambers on the right bore indications of having been occupied, but they did not appear to have been used as a nest, as no signs of grass of any description were found in them. In the following Nov. other burrows, near the same stream, were opened, but only one was found which had a recess on the left, but it had also two on the right.

Food.—Small water insects, shrimps, larvæ, vegetable particles, very small shell-fish, beetles, which, in Tasmania, have a hard, black epidermis ; these are comminuted and mingled with some mud or gravel. The young are suckled at first, but when strong enough they are fed with insects mingled with mud.

Where found —The platypus is found in New South Wales, Victoria, South Australia, Tasmania, and in Queensland, south of the eighteenth parallel of latitude. In New South Wales it is common in the streams and rivers flowing from the mountain ranges to the sea, as well as in those descending towards the interior. It used to be plentiful in the Hawkesbury and the Hunter. At one time it was abundant in the Yass river, in the tranquil parts called ponds ; so also in the Nepean, where several were captured in nets fixed for that purpose.

Uses.—This animal, when stuffed and properly mounted, is in itself an ornament. In the British Museum, London, there are specimens from the Namoi and the Shoalhaven, in New South Wales ; from Coranderrk, the aboriginal station, Victoria ; from South Australia, and from New Norfolk, Tasmania. Its skin is used for making slippers, pouches, &c. In some districts the young are eaten by the natives.

How captured by the blacks.—They sit upon the banks of rivers armed with small wooden spears and watch these animals every time they rise to the surface, till they get an opportunity of striking them. If the platypus does not come in the direction of the aboriginal, the latter noiselessly advances when it is below the water. Governor Hunter saw a native watch one for above an hour before he attempted to spear it, which he did through the neck and fore leg.

Does the platypus lay eggs ?—This question puzzled Mr. Gould and Dr. Bennett, although they both spent some time in the investigation of its habits in its native haunts. Evidence was sought by both from the blacks, but, as they generally answer so as to please the interrogator, nothing reliable was obtained from them. Thus the Yass natives at first asserted that this animal lays eggs, but

afterwards contradicted themselves. The Tumut blacks said "no egg tumble down ; pickaninny make tumble down." Dr. Bennett obtained several specimens in the Yass, Murrumbidgee, and Tumut districts. These were dissected by him, and in some he found imperfectly formed eggs ; but, although he discovered and dug out several burrows, he never met with the slightest trace of an egg. In one burrow, in the banks of the Murrumbidgee in Dec., there were some very young ornithorhynchi, but no appearance of anything like shells about the nest. He was inclined to consider all the facts that he had been able to ascertain, as militating against an assertion or a theory that the platypus lays eggs. Mr. Gould also answered this question in the negative ; he was of opinion that its young are brought forth in an imperfectly formed state, like those of the kangaroo. He writes that on his return from Australia, the venerable Geoffroy St. Hilaire put the following question to him :—"Does the ornithorhynchus lay eggs?" When he answered in the negative, that fine old gentleman and eminent naturalist appeared somewhat disconcerted.

Oviparity.—So far back as 1832, a statement bearing on this subject was published in the Proceedings of the Committee of Science and Correspondence of the Zoological Society, London. Lieutenant Mole wrote to Dr. Weatherhead, that he had tried to discover the grounds for the generally accepted belief—that the ornithorhynchus lays eggs and suckles its young, that he had found in females "eggs of the size of a musket-ball, but without the hard outer shell, and in the nest, young ones and remains of a substance resembling egg-shell." This is the first direct and, perhaps, the only evidence of anything "resembling egg-shell" having been found in a nest. In 1864, Mr. George Rumby, a gold receiver in Australia, obtained from some miners a female platypus This animal, when shut up in a gin-case, laid two eggs, which were white, soft, and without shell, easily compressible, and about the size of a crow's egg. Mr. Rumby wrote a statement of this to Sir R. Owen, suggesting in his letter that the eggs might have been prematurely produced through fear. These eggs were also seen by Dr. Nicholson, who wrote directly to Owen. Sir R Owen accepted the suggestion made by Mr. Rumby, and published the correspondence in 1865. He was of opinion that the platypus is ovoviviparous, that is, it hatches the eggs within the body as some fish and reptiles do. Mr. Krefft, writing in 1871, remarks :—"Dr. Bennett discovered the young of a platypus thirty years ago, but very few, if any specimens have since been obtained ; and no further progress has been made towards the solution of the still pending and highly interesting physiological question—Does the platypus lay eggs?" In the Melbourne museum there are two eggs preserved in spirits. They were presented by Mr. V. W. Black, of Seymour, but obtained from the animal when dead. In 1882, Professor F. M. Balfour suggested that Mr. W. H. Caldwell, M.A., should undertake the study of the development of the peculiar Australian mammalia and ceratodus. In 1883 he decided to carry out this suggestion, and was elected to

the travelling studentship founded in Balfour's memory He arrived in Australia in Sept., 1883, and made Sydney his headquarters. He lost some time in ascertaining the best locality for his investigations. Towards the middle of April, 1884, he went to the Burnett River, Queensland, where he found ornithorhynchus very numerous, so he decided to remain in the district till the breeding season was over. He obtained the assistance of the blacks, without whose services he would have had little chance of success. On Aug. 24th he shot a platypus, whose first egg had been laid, at least so he concluded; her second egg was in a perfectly dilated *os uteri*. This egg of similar appearance, though slightly larger than that of echidna, was at a stage equal to a 36-hour chick. On the 29th he sent the following message to Professor Liversidge, of Sydney University :— "Monotremes oviparous, ovum meroblastic," the last word meaning that only a small part of the yolk goes to form the young, while the greater part is used to nourish it. Mr. Caldwell requested that this intelligence should be forwarded to the British Association at Montreal. The young scientist's black retainers increased to upwards of fifty; but it was only occasionally and with great difficulty that he could persuade them to dig for platypi; not only the blacks but also their dogs refused to eat them. This, his first expedition lasted from April to Dec., during which he obtained many of his Monotreme stages, but he found that his camp had not been organised on a sufficiently large scale. Mr. Caldwell's second expedition began in June, 1885, he having lost the two previous months from the effects of a fever, contracted in the swamps of the Burnett River. During July and Aug. he employed over 150 natives. In Sept. he transferred the camp to the colder river Mole, further south, where he hoped to dig out the latter stages of ornithorhynchus from their nests. He employed some white navvies, who opened up a large number, but the renewed exposure in Queensland brought on his fever again, he having been previously ill on the Burnett River, as mentioned above. This seriously interfered with the completion of the ornithorhynchus series. Mr. Caldwell's proof that the platypus lays eggs and "hatches them out by the warmth of its body in the same manner as birds do," as Mr. Ogilby in his "Catalogue of Australian Mammals" boldly puts it was arrived at by a scientific demonstration. How long the supposed period of incubation lasts no naturalist has attempted to define. Is it days, hours, minutes or seconds? If eggs are laid and all signs of them vanish beyond the detection of a scientist, the period of incubation must be very brief, and the difference between oviparous and ovoviviparous cannot be much.

Leadbeater's Cockatoo—*Cacatua leadbeateri.*

Description.—The upper surface of the body, the wings and tail are white; the forehead, front and sides of the neck, the chest down to the centre of the abdomen are light rose-colour; the under surface of the wings and the basal portions of the inner webs of the

tail feathers are rich salmon colour, The crest of the male is scarlet tipped with white; the crest of the female is scarlet, blending into yellow in the centre. The bill is horn colour, the feet dark brown. The length of the bird is 15 inches, of the wing, 10½, of the tail, 6½.

Habits.—This species is much less noisy than the common white cockatoo; it is also quieter in its disposition. The river courses bordered by huge eucalypti are its favourite haunts, and the pine forests near Gawler Town are resorted to for the purpose of breeding. It thrives well in a cage, and is far the most ornamental of the genus to which it belongs.

Where found.—This elegant bird is diffused throughout the southern portion of the continent in New South Wales, Victoria, South Australia, and Western Australia; it is also a denizen of the interior. Major Mitchell, in the account of his exploration of the Darling, incidentally remarks that one day "a flock of cockatoos of the Darling, with scarlet and yellow top-knots, flew over our heads." Professor Tate, of South Australia, remarks that at Bunda Plateau, near the head of the Great Australian Bight, this species "would seem to be almost a straggler, as only one flock was seen by a party, and singularly at about the same place that Eyre had met with the bird."

Nidification.—Mr. K. H. Bennett found this handsome bird breeding plentifully in the interior of New South Wales, between the Lachlan and the Darling rivers. Like all other members of this genus, it breeds in the hollow limbs of trees, usually in lofty eucalypti. The eggs are three in number for a sitting, oval in shape, and white. A set taken on Sept. 5th, 1884, ranged as to the length of each egg about 1·38 inches, breadth 1·1 inches.

WOMBAT—*Phascolomys.*

Introduction.—The wombat was originally described and figured in the history of the colony for the month of Jan , 1799, by Collins. It was upon this description that Geoffroy founded the genus *Vombatus* in 1803. The account of its dentition given in Collins' work is however very obscure and erroneous; hence when Geoffroy subsequently had an opportunity of examining the animal in question, specimens having been brought alive to England by Capt. Baudin, not finding it to agree with the published description, he regarded the living specimen as constituting the type of a new genus, which he characterised under the name *Phascolomys.*

Description.—The length of its body is about 3 feet; it stands low on the legs. It has 15 ribs, other marsupials have from 12 to 13. The wombat may be regarded as one of the most curious of the Australasian animals, ranking, as it does, in respect to its structure, with the koala and platypus. It is covered with fur, which is tolerably long and very coarse; its general hue is grey-brown next the skin, the hairs on the upper parts of the body are of a dusky-

brown colour, and each hair of the ordinary fur has the exposed portion chiefly of a dirty white colour ; but the longer and coarser hairs are black at the point. On the under parts of the body the hairs are for the most part of a dirty white colour, but dusky at the root. The naked muffle is black, the ears small, pointed, and well clothed with hairs. The wombat has 24 teeth, all being rootless ; there are two incisors or cutting teeth in each jaw. The legs are short and strong, and the feet broad, naked beneath, and covered with minute fleshy tubercles. The claws are strong, those of the fore feet are solid, but slightly curved ; those of the hind feet are curved and concave beneath. The short, broad and solid nails of the fore feet fit it for burrowing ; the inner toe of the hind foot is small, it not being required for grasping, as the animal does not climb. The hairs of the moustaches are numerous, strong, and of a black colour, so are some bristly hairs which spring from the cheeks. The tail is a mere tubercle and is hidden by the fur. Most of the specimens sent to England were black, brown, or greyish-brown, but one sent from Victoria was of a light sandy-buff or isabelline colour. Those that lived generally evinced a gentle disposition.

Habits.—It is a burrowing, nocturnal and fossorial animal, living during the day in deep stony burrows excavated by itself, and emerging on the approach of evening, but seldom trusting itself far from its stronghold, into which it runs if an intruder appears. It is difficult to dig it out, on account of the depth of the burrow ; and it is hard to obtain by reason of its great timidity. The natives make a screen of boughs in the vicinity of the haunts of the wombat, behind which they conceal themselves. On the animal appearing they hurl their spears and clubs at it. Unless it is killed on the spot it scrambles to its hole, whence it is impossible for them to dislodge it. It is by no means active, and has a hobbling or shuffling gait somewhat like that of a bear. Mr. Brown, the eminent botanist attached to Flinder's voyage, took a wombat to England, he obtained it on one of the islands in Bass' Straits. It lived as a domestic pet for two years. It burrowed in the ground whenever it had an opportunity, and covered itself in the earth with surprising quickness. It was very quiet during the day, but constantly in motion in the night ; it was very sensible to cold, and devoured all kinds of vegetables, but was particularly fond of new hay, which it ate stalk by stalk, taking into its mouth small bits at a time, like a beaver. The blacks near the Murray describe two kinds of wombats : one they speak of as " big yellow fellow," the other as being smaller and dark. They also say that the impressions of their feet, in the sand tracks leading to their burrows, bear a striking resemblance to the footprints of a child. The flesh, they say, is like pork and good eating.

Food.—In its native state its food consists chiefly of roots and grass. When tamed it is very fond of lettuces. One in the Adelaide Botanical Gardens, obtained near the Gawler River, fed on bran and weeds. In the Zoological Gardens, Melbourne, there is a wombat cave, which is divided into three compartments, for the

Victorian, Tasmanian, and South Australian specimens. These are supplied with a bed of clean straw, and are fed on biscuits and sorghum.

Where found.—In New South Wales, South Australia, Victoria, Tasmania, as well as on some of the islands of Bass' Strait. The Tasmanian wombat, in certain districts, is extremely common; it has been found in the neighbourhood of Port Arthur and in the sterile districts behind Mount Wellington, also near St. Patrick's River. In the Melbourne museum there are specimens of the black variety from the north of Victoria, and the brown from Yea, and others from Colac. The Sydney museum has specimens from Port Lincoln, in South Australia. Governor Hunter sent the first specimen to England from Preservation Island. It still exists in the museum at Newcastle-upon-Tyne.

Species.—Until about the year 1860 there was only one species known to zoologists—*Phascolomys*—wombat. This is now known to be confined to Tasmania and the other islands lying south of the Australian continent. It is specifically distinguishable with ease and certainty from the wombats of the mainland, by the characters of the skull and skin. Of the continental species two were defined and named by Professor Owen, from skulls only, (1) as the *Phascolomys latifrons*, on account of the great breadth of its head. It is identical with *P. lasiorhinus*, which was proposed by Mr. Gould. It has a hairy instead of naked muffle. And (2) the *Phascolomys platyrhinus*; the skulls had been sent to him from South Australia. The most common Victorian wombat, the large brown continental species, is now proved to be the same as the *P. platyrhinus* of Owen. *P. setosus* is found near Adelaide; the light, ashy, yellowish brown colour, and the harsh fur with numerous coarse blackish bristles scattered through it, obviously distinguish it from other species. The *P. niger* of Gould is only a variety of *P. platyrhinus*. It is a black wombat obtained from the Goulburn River, Victoria. There is a fossil species which stood at least four feet high when alive; Dr. Ramsay named it *Sceparnodon*. Sir Thomas Mitchell discovered some bones in the Wellington caves. On their being submitted to Professor Owen he pronounced them to have belonged to a wombat of a distinct species, and larger than those now in existence, which he named *P. mitchellii* after the discoverer. According to Sir Frederick McCoy there are four species:—1. Tasmanian wombat; 2. *Lasiorhinus*; 3 *Platyrhinus*; 4. *Setosus*. The hairy-nosed wombat is found near Port Lincoln and Gawler Range, 30 miles to the north of Adelaide. The Tasmanian species is the oldest known of the group. It presents a remarkable exception to the usual rule of size in Tasmanian animals, these being generally larger instead of smaller than their continental allies. Professor Tate records that the black variety is numerous on Bunda Plateau, at the head of the Great Australian Bight. It lives in burrows 7 or 8 feet deep, and forms the principal animal food of the wild aboriginal.

DUGONG.—*Halicore australis.*

Introduction.—(*Town and Country Journal*:) Many years ago, when the brig *Lady Denison*, of Sydney, was engaged in the beche-de-mer fishery on the coast of northern Queensland, one of her hands, a white sailor new to the work and to that part of our coast, was one day seen running along the beach to the boats in a state of great excitement. Imagining that the man was being pursued by some of the ferocious Cape Melville blacks, the officer in charge of the boats, followed by his men, went to his rescue. For some minutes the excited seaman could not speak, but at last he managed to tell him that about half a mile away, lying among some sea grass, he had seen a "party of mermaids!" They were, he said, rolling about and disporting themselves, and one of them had raised her head and shoulders out of the water and looked at him. He was so terrified at this that he fled along the beach as fast as his legs could carry him. "Why," said the officer, "have you never seen any dugongs before?" It is said that the dugong mother constantly holds fast to her young with her pectorals, and in ancient times this gave rise to the traditions about sirens or mermaids.

Description.—The dugong is referred to a distinct herbivorous order of the mammalia, known as the Sirenia. In aspect it somewhat resembles a porpoise or other cetacean, having a smooth, sub-cylindrical body, a broadly flattened tail, two anterior flippers, which are short, thick and fleshy, and atrophied hind limbs. No dorsal fin, however, distinguishes it, while the head, unlike the sharp-pointed head of the porpoise, has a distinctly rounded muzzle, and the mouth of the male is armed with projecting tusk-like incisors. The skin is thick and smooth, having a few scattered hairs; its colour above being slaty or brownish-black, below lighter. The total length of the adult is from 8 to 10 feet, but it occasionally attains as much as 12 feet.

Habits.—The dugong or Australian sea-cow is a more strictly marine animal than the manatee. Its habits are essentially social, the animals assembling in herds of from half a dozen to thirty or forty, or more, individuals, the females being always much more numerous than the males. The young are produced singly at varying periods of the year. The mother dugong, when nursing her young, is in the habit of raising herself, and at such times presents a remote resemblance to a human being. Probably the "mermaid" that had so terrified the sailor belonging to the *Lady Denison* was engaged in fulfilling her maternal functions, when he happened to catch her looking at him.

Food.—For many years an idea was prevalent that dugongs were able to go on shore at will, to browse on grasses and other terrestrial plants, but a cursory examination of their weak fore-limbs, coupled with the total absence of even the internal rudiments of hind limbs, should have been sufficient to have at once dispelled a view so incompatible with the structure of the animal. The food

of the Australian dugong is, therefore, chiefly restricted to sea-water algæ, and consists almost exclusively of the zostera-like marine grass (Possidonia australis), which is developed in great abundance throughout the reef-flats of the inter-tropical coast line, and vast areas of which are met with in Princess Charlotte Bay in particular.

Where found.—The habitat of the dugong on the east coast of Australia extends from as far south as Moreton Bay to Cape York. In some localities, such as Weary Bay, Bathurst Bay, and Princess Charlotte Bay, it is met with in great abundance. It is not often found south of Brisbane; but in Oct., 1893, a young one was captured in a net off Port Stephens and brought to Sydney. It also frequents the New Guinea coast.

How captured.—The capture of the dugong is conducted on distinct principles in different parts of the Queensland coast line. In Moreton and Wide Bays nets of great strength, having a mesh a yard wide when measured diagonally from knot to knot, or 18in. on the square, are stretched at night across the tracks the herds are wont to follow to their pasture grounds. A little further north, at Repulse Bay, just above Mackay, a systematic dugong fishery is prosecuted by a European with the exclusive aid of the mainland aborigines. The natives pursue the animals, moonlight nights being most favourable, in their bark canoes with heavy dugong harpoons, to which long lines are attached. Two men are included in one canoe, the business of one being to keep a lookout for the dugong, while the other bails the cranky boat with the bailing shell. The endeavour in the first instance is to spear the animal through its fleshy tail, whereupon it is apt to twist itself up and get entangled in the line. A second spear is then thrust through its muzzle, which stops its breathing, and thus the animal is speedily suffocated and dispatched. The dugong spear used in Torres Strait is a formidable weapon, a pole from twelve to fifteen feet or more in length, with the butt-end club-shaped and hollowed for the reception of a loose-fitting barbed dart, to which a long line is attached. The opposite end of the shaft is usually perforated, and decorated with tufts of cassowary feathers, ovula-shells, or rattling seed-pods. Prof. Haddon, in his "Ethnography of the Western Tribes of Torres Strait," writes thus of boat-use: "When close enough, the man bearing the spear jumps into the water, at the same time harpooning the dugong as it is in the act of breathing. The latter immediately dives down, and runs out the rope which is fastened to the dart, the man having to be careful not to get his head entangled in the loops of the rope, as deaths have occurred through this accident. The man returns with the spear shaft to the canoe. Other men immediately dive into the water, and, when the dugong once more rises to breathe, they tie a second rope round its tail, and then, whenever it attempts to rise, the men, by diving at the same time, pull it down with the rope, and in a very short time suffocate the unwieldy animal. So far as I know, death always occurs through asphyxia. Owing to the thickness of the skin and blubber, and the shortness of its point, the dart can never penetrate to a vital organ,

unless it should happen to pierce the spinal cord. At the present time the dugong is almost invariably speared from luggers, as these vessels are so much more convenient to handle than canoes.

Uses.—Numbers of dugongs are killed by the coast blacks, by whom their flesh is highly relished. Indeed, all along the shores of the bays may be seen at intervals piles of dugong bones symmetrically arranged on the beaches, the number and size of these curious-looking mounds indicating the abundance of the animal in their vicinity. The blacks employed by the beche-de-mer fishers on the Barrier Reef also play havoc among the herds of dugong ; and their meat, with that of turtle, forms the principal food for the aboriginal crews of the boats and schooners engaged in the fishery. In the more northern districts of the Barrier and in Torres Strait, the dugong does not form the subject of systematic hunting with a view to export trade in its hide and oil, but is killed almost exclusively by the natives for food. It is commonly speared from a canoe, or, in Torres Strait more particularly, from a light wooden staging that is temporarily erected where the animals have been observed to repair to feed. The stage or "neet" is only employed on moonlight nights. A man walks the reef at low tide in day time to watch for traces of dugong. When he finds a patch of "dugong grass" which has been partially browsed, he erects the staging there, knowing that the dugong repairs nightly to the same spot until the fodder is exhausted. The stage is constructed of six bamboo poles lashed together, surmounted by the steering-board of the canoe ; and on this the rope is coiled, and the spear put in readiness, and all night the men perch on this board to await the arrival of the dugong. When it approaches sufficiently near it is speared. Usually a wooden or stone image of a dugong is slung on the "neet," to serve as a charm to ensure the approach of the animal. At present the dugong is of some existing value, and certainly possesses a very considerable prospective commercial value, when a better knowledge is obtained of its habits and a systematic method is adopted of catching it, curing the flesh, and refining the oil. The danger that was threatened of the animal becoming exterminated in the districts of Moreton and Wide Bays has been averted, the Queensland Government having taken the precaution to institute a prolonged close season, whenever it appears from the reports of the fisheries inspectors, that the herds are becoming sensibly diminished. The chief value of the dugong is associated with the oil it yields. A few years ago, it obtained for medical purposes a first-hand price of £1 per gallon ; recently it has receded as low as 12s., and the hunting is, in consequence, not nearly so remunerative. The flesh is much appreciated by many Europeans, especially at the outlying Barrier and Torres Strait fishing stations, where it is commonly cured and used as "bacon." The price or value in goods paid by the station proprietor to the natives for each dugong captured is 5s. ; but of these the purchaser only requires the oil-producing livers, and the hides, bones, and teeth, leaving the natives the carcasses to feast upon. The hides, if well cured, realise a price of 4½d. per lb., the

large tusks of the male about 2s. 6d. per pair, while the bones make the best charcoal for sugar-refining. The price for oil varies from 12s. to 20s. per gl. After many years' experience it has been found at the Repulse Bay station that the old cows yield the most oil, the quantity being sometimes as much as from 8 to 10 gls., but on the average only 4 or 5 gls. The winter months, with respect to the amount of oil obtained, are the most profitable time.

Species.—Dugongs have been divided into three species, the basis being apparently geographical and without valid characters to distinguish the forms, viz. : H. tabernaculi from African (east coast and Mauritius) ; H. dugong from Indian (Malaysia and the southern shores of Asia to the Red Sea) ; and H. australis from Australian seas.

Spotted Bower-bird.—*Chlamydera maculata.*

Introduction.—This species, which is nearly allied to the satin bower-bird, is especially interesting, as being the constructor of a bower even more extraordinary than that of the latter, in which the decorative propensity is carried to a far greater extent. From the extreme shyness of its disposition this bird is seldom seen by ordinary travellers, and it must be under very peculiar circumstances that it can be approached sufficiently close to observe its colours. Mr. Gould, being secluded near a small waterhole—a basin in a rock on a remote mountain, to which he had been guided by an aboriginal—during a dry season, writes of the result thus :—" My presence was evidently regarded with suspicion by the visitants to the spot ; but while I remained lying on the ground perfectly motionless, though close to the water, their thirst overpowering fear they would dash down past me and eagerly take their fill, although a black snake was lying coiled up on a piece of wood near the edge of the pool." Six or eight spotted bower-birds displaying their beautiful necks were often perched within a few feet of him. They were by far the shyest of the whole of the assemblage there congregated. Honey-suckers and parrots were constantly assembling throughout the day in this lonely spot, which presented no attractions to any person but a naturalist.

Description.—The length of a full-sized bird is 11¼ in. ; wing, 6 in. ; tail, 4¾ in. ; bill, 1¼ in. The crown of the head, the ear-coverts and throat are rich brown, each feather being surrounded by a narrow line of black ; the feathers on the crown are small and tipped with silvery grey. A beautiful band of elongated feathers of light rose-pink crosses the back of the neck, forming a broad fan-like occipital crest. All the upper surface, wings and tail, are of a deep brown ; every feather of the back, rump, scapularies and secondaries is tipped with a large round spot of rich buff ; the primaries are slightly tipped with white ; all the tail feathers are terminated with buffy white. The under surface is greyish-white. The feathers of

the flanks are marked with faint, transverse, zigzag lines of light brown. The bill and feet are dusky brown.

Habits.—These are most extraordinary. Mr. Sharpe, observes, of all the acts performed by birds, that of building themselves beautiful bowers, variously decorated with shells, bleached bones, glittering stones, and gaudily coloured feathers, must ever be ranked amongst the most interesting traits in connection with ornithology. Australasia is the only division of the globe where these playing-places or halls of assembly are constructed. Sir G. Grey, when exploring the Glenelg River in north-west Australia, met with the bowers of a bird which Mr. Gould named Chlamydera nuchalis, but the explorer had no idea that they had been constructed by a bird, he being under the impression that these curious structures were nests of the kangaroo-rat. He found near them a number of shells and water-worn stones of some fruit—these had evidently been carried from the sea-shore. Mr. Gould discovered several bowers during his journey inland, the finest of which he took to England; it is now in the British Museum. In some of the larger bowers which had been resorted to for many years, half a bushel of bones, shells, &c., was found at each of the entrances. The shells and bones are collected for ornament. It is only those that have been bleached perfectly white in the sun, or such as have been roasted by the natives, and thus whitened, that attract their attention. Several birds frequent the same bower. The one exhibited in the Zoological Gardens, Melbourne, was found in the neighbourhood of Lake Albacutya, in the Wimmera country, and it is shown exactly as it appeared in the mallee. The spotted bower-bird has a harsh, grating, scolding note, which is generally uttered when its haunts are intruded on, by which means its presence is detected when it would otherwise escape observation; when disturbed it takes to the topmost branches of the loftiest trees and frequently flies off to another locality. Mr. Diggles (Queensland) writes:—"The structure is an archway of fine grass, with the heads nearly adjoining; this constitutes the lining, and is outwardly strengthened with twigs, the whole being kept securely in their places with small stones or pebbles, so disposed as to form a paving to the interior and some distance around, small paths leading to the bower being left bare. The front and back of the bower are similarly arranged. A heap of various materials is piled together opposite each entrance, consisting of shells, small pebbles, bones of small animals, bits of broken crockery, &c. The bower is repaired from year to year and is resorted to as a playground by numerous individuals, who delight in disporting themselves, engaging in various curious and frantic evolutions and in chasing one another through the avenue."

Nidification.—The nest is an open structure placed in a low tree; it is saucer or bowl-shaped, composed of sticks and lined with grass; the inside dimensions are:—diameter, about 5 in.; depth, 3 in.; outward height, 4 in. A nest was found by Mr. Coxen at Jourdaryan; it was cup-shaped, constructed of dried sticks, and lined with fine grass and feathers. It contained only young birds, so to

his great regret he was unable to describe the eggs. In 1875 Mr. James Ramsay obtained several specimens of both birds and eggs from Tyndarie, and others were received from the Clarence River district. Since then the eggs have become less rare, and are to be found in many collections. A set of eggs taken by Mr. John Macgillivray, near Grafton, on 7th Sep. 1864, measured 1·4 x 1·0 in. A set taken by Mr. James Ramsay at Tyndarie in 1879, measured 1·5 x 1·1 in. The eggs of the spotted bower-bird vary considerably in the extent of their markings and sometimes in the tints of colouring. Dr. Ramsay remarks, "One I have from the Dawson River district is slightly smaller than usual, and has the ground colour a faint greenish-grey, covered all over with a fine network of light brownish linear markings, close together near the thicker end; others have their markings confined altogether to the larger end of the egg.

Food.—Seeds, berrries and insects. These birds do not feed upon animal food or molluscs.

Where found.—This prettily ornamented bird is found in New South Wales, Queensland, Victoria and South Australia. Mr. Broadbent (Queensland) records that it occurred commonly both at Springsure and Barcaldie, a few were also seen at Black Gin Creek. The interior provinces are the stronghold of this species, where it is found plentifully dispersed all over the Lachlan and Darling River districts. It also occurs inland about 80 miles west from Rockhampton. It is abundant at Brezi, on the River Mokai, to the north of the Liverpool Plains; it is also equally numerous in all the low scrubby ranges in the neighbourhood of the Namoi, as well as in the open brushes which intersect the plains on its borders. It is met with in the north-west part of Victoria. Dr. Ramsay says, "Our knowledge of this species has recently been extended to Cape York; previously Rockingham Bay was considered its northern limit on the coast, and the Murray district in Victoria and South Australia its most southern range." It is very rarely indeed that Chlamydera maculata is found near the coast, although in 1861 Dr. Ramsay procured an egg on Ash Island, near Hexham, on the Hunter River, about ten miles from the sea coast. This was probably the first time the egg had been found. The *S. M. Herald*, of Jan. 24th, 1893, published the following telegram from Gilgandra:—"An exceptionally fine specimen of the bower-birds' play-house, containing bones, glass, tin, quartz, and crystals, has been discovered on the New Lawn Station at Marthaguy."

Dingo—*Canis dingo.*

Introduction.—The dingo was discovered in 1780. Warrigal is the native name; "dingo" is said to be only the black man's name for the white man's dog. It was first figured and described in "Phillip's Voyage to Botany Bay," published in London in 1789. The author writes:—"It has much of the manners of the dog, but

is of a very savage nature, and not likely to change in this particular. It laps like other dogs, but neither barks nor growls if vexed and teased; instead of which it erects the hairs of the whole body like bristles, and seems furious. It is very eager after its prey, and is fond of rabbits or chickens raw, but will not touch dressed meat. From its fierceness and agility it has greatly the advantage of other animals much superior in size; for a very fine French fox-dog being put near one that was captured, in a moment the dingo seized him by the loins and would have soon put an end to his existence had not help been at hand. With the utmost ease it is able to leap over the back of an ass, and was very near worrying one to death, having fastened on it so that the creature was not able to disengage himself without assistance." This dingo was sent to England by Governor Phillip, as a present to Mr. Nepean, the Secretary of State for the Colonies; she was for some time in the possession of the Marchioness of Salisbury, at Hatfield House. Governor Phillip says of a second, in the possession of Mr. Lascelles—"We have received much the same accounts in respect to its ferocity; whence it is scarcely to be expected that this elegant animal will ever become familiar."

Description (Professor Mivart).—The dingo varies in his colouration from red to black. There is a greyish under-fur, but, save in the black variety, the long hairs are generally yellow or whitish. The top of the head and dorsal region generally are of a darker reddish-yellow, often intermixed with black. Its head is somewhat elongated and flat; it is carried high. The end of the tail is very often white, as are frequently the feet and sometimes the muzzle, though this is also sometimes black. The animal may be of a uniformly light reddish or yellowish brown, save that it is paler beneath on the outside of the forelegs below the elbow, as well as on the inside of the limbs and on the cheeks. Mr. Gould remarks:—"All the specimens procured by me during my stay at the Lower Murray were distinguished by a white tip at the extremity of the tail; and among the trophies which so generally ornament shepherd's huts in Australia I do not recollect to have seen a tail without the white tip. The black variety is more scarce. The single specimen which I secured was quite black, except the inside of the fore-legs and paws and the outside of the hind legs and paws, which were of a tan colour. The head was more pointed than in the yellow variety, and had a distinct patch of white about the size of a shilling on each cheek." Professor Tate, of Adelaide, describing the dingoes to the north of the Great Australian Bight, observes:—"Though reddish-yellow is the common colour of its fur, yet black is not rare, and white has been observed." In western Queensland the black variety with white breast generally appears along with the red. Sturt, when writing of the mammalia he found in the interior, says:—"Dingoes were of all colours. It appears to me that if these animals are indigenous, Nature has departed from her usual laws as regards wild beasts, in giving them such a variety of colours."

Habits.—The Australian wild dog never barks. It has all the habits of a skulking low-bred dog, and none of the determined air and ferocity of disposition of the wolf or the jackal. It is very destructive, particularly in its mode of "rushing" a flock of sheep, when it not only wantonly kills great numbers, but scatters the remainder, and thus occasions additional loss. The dingoes are the wolves of the colony, and are, perhaps, unequalled for cunning. One had been beaten so severely that it was supposed the bones were broken, and he was left for dead. Upon the person looking back, after having walked some distance, his surprise was much excited by seeing the dingo rise, shake himself, and march into the bush, evading all pursuit. A settler returning from a hunt with six kangaroo dogs met with a dingo, which was attacked by the dogs, and worried to such a degree that the cunning animal, seeing only one means of escape, pretended to be dead; his assailants thinking he had departed the way of all dogs, gave him a parting shake and left him. Unfortunately for himself, the dingo was of an impatient disposition, and was consequently premature in his resurrection, for before the settler and his dogs had gone any distance, he was seen to rise and skulk away, but at a slow pace, on account of the rough treatment he had received. The dogs soon re-attacked him, when he was handled in a manner that must have effectually prevented a second resurrection. A litter was found near Yass Plains, which the discoverer failed to destroy, thinking to return and catch the mother also, and thus exterminate the whole family. She must have been watching him, for on his returning a short time after, he found all the little dingoes had been carried away, and he was never able, although diligent search was made in the vicinity, to discover their place of concealment. Dingoes breed in holes of rocks, and in the hollow trunks of trees. The blacks find the puppies, and rear them with greater care than they bestow on their own children, and bring them under subjection. The dingo is an important member of the family; he sleeps in the huts and gets plenty to eat, not only of meat, but of such fruit as they can obtain. Though treated so well, he often runs away, especially in the pairing season, and never returns; thus he does not become perfectly domesticated. He will follow nobody else but his owner; he is singularly averse to domestication and man's society, when compared with other dogs. The pure dingo can only express his feelings in long-drawn, weird howls, which, in the stillness of the night, have an indescribably depressing effect upon the traveller as he sits at his lonely camp fire in the ranges. Sturt, narrating his exploration of the interior, says: "These miserable and melancholy animals would come to water where we were, unconscious of our presence, and gain the very bank of the creek before they discovered us, rousing us by as melancholy a howl as jackal ever made."

Uses to the blacks.—Prior to the arrival of the settlers and their domestic dogs, the dingo was the only animal that the blacks could employ as an ally in procuring food, and to this day the wild blacks of the interior have no other attendant. Dingoes hunt less

wildly than our dogs, but very rapidly, and frequently capture the game on the run. Sometimes the dingo refuses to go any further, and his owner has then to carry him on his shoulder, a luxury of which the former is very fond. Having a keen scent, he is very useful to the wild blackfellow. He traces every kind of game, even the cassowary, and is able to capture the half-grown, and sometimes the old birds. Gentlemen of Australia hunt the dingo, just as the fox is hunted in England, for which he forms no mean substitute.

Food.—The dingo lives upon wallabies, bandicoots, opossums, wombats, and kangaroos, but since the flocks of the white man have occupied his native haunts he has manifested a preference for sheep and lambs. Mr. Gilbert states that the dingo will follow a flock of sheep, and when a lamb drops behind he immediately pounces upon it and carries it off. It is not altogether for the purpose of food that the dingo attacks sheep, but in mere wantonness he snaps at them right and left; from a single bite, which is not fatal at the moment, the sheep seldom recovers, but lingers and dies in a few days. Hence the dingo is the declared enemy of the squatters, who do all they can to compass his destruction. On large stations a man is kept whose work is to lay out poison for the dingo. He takes a leg of mutton from a fresh-killed sheep and having fastened a rope to the shank, it is trailed on the ground where tracks indicate the presence of these pests. He then suspends the mutton from the branch of a tree, so as to hang about a foot from the ground. Incisions are made in the flesh, in which strychnine is placed, the poison soaks through the flesh. If dingoes are numerous there will be nothing left in a day or two but the rope and bone, and their distorted forms lying here and there.

Where found. The dingo is extremely abundant, with little variation, over the whole of Australia. In some of the squatting districts he is still very destructive. In 1891 the *Sydney Morning Herald* reported that: "In the district of the upper Murray dingoes are very numerous at the present time. One settler lost as many as 300 sheep in a few months by their ravages." In April, 1892, it was announced: "Dingoes have inflicted a deal of damage recently amongst some of the flocks at Cooyal, Mudgee district." Mr. Le Souef, of Victoria, observes:—"The dingo of northern Australia can be distinguished from his brother of the south by his somewhat smaller size and courageous bearing. He always carries his tail curled over his back, and is ever ready to attack anyone or anything; whilst the southern dingo carries his tail low, slinks along like a fox, and is easily frightened." The dingo is not found in Tasmania. Professor Tate, writing of the Bunda Plateau, to the north of the Great Australian Bight, says: "The dingo is widely spread, and was seen farther inland than any other animal. The crevices of the Bunda cliffs are his favourite resort, and a well beaten track extends along the edge of the cliff from end to end.

Is the dingo indigenous?—Most writers have answered this question in the negative, Mr. Gould being one. This is his opinion: "Without going into the probable origin of this particular race of

dogs, or offering reasons why it should not be considered as indigenous, I may briefly state that I believe it has followed the black man in his wanderings from southern Asia through the Indian Islands to Australia, the southern portion of which country appears to be its boundary in this direction ; for I believe it has never been found in Tasmania in the wild or semi-wild state in which it occurs on the Australian continent. From what I saw of the animal in a state of nature I could not but regard it in the light of a variety to which the course of ages had given a wildness of air and disposition." In the "Mammals of Australia" he published an extract from a letter written by Mr. Krefft:—"In reply to your inquiry, I beg to state that it is proved without a doubt, as far as my own judgment goes, that the dingo is an original inhabitant of the Australian continent. There is now, at the museum in Melbourne, a fossil skull, found with other animal remains, in a cave at Mount Macedon, by Mr. Selwyn, the Geological surveyor of Victoria. This skull, according to the authority of Professor McCoy, is identical with that of the dingo of the present day." Smythe's Aboriginals of Victoria gives these facts: "In a well section at Tower Hill, western Victoria, sixty-three feet of volcanic ash was passed through, and then sixty feet of blue and yellow clay; *here* were found the skull and bones of the dingo." Again: "At Lake Timboon, western Victoria, bones of the dingo were found associated with those of the Tasmanian devil, those of Macropus titan, and bones and teeth of Diprotodon." Mr. Ogilby writes: "The recognition by Professor McCoy of fossil remains, in no wise differing from those of recent individuals, sets this question at rest, and goes far towards proving that this species is indigenous to Australia, and was an inhabitant thereof prior to its colonization by man, no human remains of such antiquity having as yet been discovered. Professor McCoy in his 'Prodromus of Palæontology' observes, 'The dingo was really one of the most ancient of the indigenous mammals of the country, and abounded as now most probably before man himself appeared. Our present species, although still living in great numbers, I have no doubt dates from the Pliocene Tertiary time, and I find on the most minute comparison and measurements no difference between the fossil and recent individuals, either of the adult age or of the younger periods before the milk teeth were shed to give place to the permanent molar teeth.'" Mr. Ogilby says: "These remarks from so high an authority, having the concurrence of Professor Mivart, cannot be ignored."

Venomous Snakes of Australasia.

Names and outlines of the five most deadly:—

Tiger snake (McCoy, Victoria), or Brown-banded snake (Krefft, New South Wales), or Carpet Snake (Tasmania)—*Hoplocephalus curtus.* Length from 4 to 5 feet. Brown above, banded with darker; yellow below. Tail-scales in one row.

Black snake—*Pseudechys porphyriacus.* Length, about 6 feet. Slate colour above; pink below. Tail-scales in two rows at base, thence one row.

Brown snake—*Diemenia superciliosa.* Length, about 5 to 6 feet. Brown above; pale below. Tail-scales in two rows.

Death adder—*Acanthophis antarctica.* Length, from 2 to nearly 3 feet. Brown above, banded with darker, paler below. Tail-scales in one row, a thorn at the end.

Copper-head snake (McCoy, Victoria), or Large-scaled snake (Krefft, New South Wales), or Diamond snake (Tasmania)—*Hoplocephalus superbus.*—Length, about 4 feet. Olive-brown above head darker, side-scales reddish; greyish below. Tail-scales in one row. (Professor McCoy, Victoria.)

The above characteristics constitute the key of identification, a rudimentary knowledge of which is sometimes serviceable. Professor Halford (Melbourne), writes: "A gentleman residing in South Yarra rang me up at about midnight in May, 1868. He told me he had been bitten by a snake, that he did not want my advice, that he only wished to know if it was a poisonous snake or not. With that he opened a parcel and let the snake, which had been cut in halves, fall upon the carpet. The fall made it, although dead, wriggle about a little. He became sick. I saw the punctures on his arm, examined the head of the snake, and found it to be that of a vigorous tiger snake I felt sure he would die, which he did, twelve hours after the bite." The Professor and Dr. Wooldridge attended him to the end. These five ophidians are the most dangerous, and they are common reptiles, the tiger snake being especially so in Victoria but uncommon in Queensland; it is too the only aggressive one. What is called the black snake in Tasmania is a dark variety of the brown-banded snake, identical with Hoplocephalus fuscus.

Number and danger.—Unlike all other countries, the venomous snakes are much more numerous than the harmless; of 108 species known to inhabit Australasia, only 35 species are innocuous. No other country possesses 73 species of poisonous reptiles (Sir W. Macleay, Pro. Linnean S. N.S W.) In India, which is looked upon as the home of venomous serpents, there is nothing like the same number. Dr. Gunther in the "Reptiles of British India" gives 18 species as the number of the venomous colubrine snakes, and 19 as that of the viperine, or 37 in all; whereas in Australia, when the sea snakes are deducted, there are 58 species. In America, too, also famed for its numerous reptiles, the numbers are few in comparison with Australia. In that vast continent, there are scarcely more

than 20 species regarded as venomous—these, no doubt, belong chiefly to the much dreaded family, Croatlidæ, or rattle snakes. Such being the facts, does it not seem strange that cases of snakebite are not more frequeatly heard of in this continent? From an official return, it appears that during 1891, no less than 796 persons died from snake-bite in the Punjab, India; and according to the statistics of the British Government more than 21,000 persons succumb annually in India from the bites of reptiles. The governments of Australia keep no official record of deaths from this cause, but newspapers are so widely circulated throughout the colonies, that no fatality occurs which is not chronicled. Looking at the paucity of announcements, it may confidently be concluded. that there are not more than 16 or 17 fatal cases annually. The death-rate, however, would be startling, if the victims were less prompt, and showed less fortitude, in suffering bleeding and self-mutilation, such as chopping off a bitten finger, or having one blown off by a gun. Dr. Mueller (Victoria) remarks: "Our greater immunity is due to our snakes giving off less poison at a bite, and with their short and (excepting those of the death adder) merely grooved poison fangs injecting it very superficially, thus making the process of elimination of the poison by ligature, and incision or excision of the punctures much more easy and successful. It is to this treatment, which as a rule is immediately adopted in the bush, that our small mortality is due. Our children are taught it in school, and the most illiterate bushman knows how to carry it out. Where it is omitted by persons not knowing that they are bitten, until the poison has been absorbed, recovery is rare." Australian snakes are not so aggressive as the cobra, but utterances in India about the innocuousness of their venom are mere nonsense. It should also be borne in mind that momentary action is the first principle of cure; a female snake-charmer, bitten three times in rapid succession by a tiger snake during a performance, at Albury, recently, saved herself by the instantaneous use of ammonia, which she always kept close at hand. The mortality is the highest in cases where the vital force is somewhat weak; but robust man himself, bitten in public by a tiger snake, has collapsed on several occasions; for it is the deadliest in the world. Dr. C. J. Martin (Sydney) observes: "Although the yield of poison from our Australian snakes is so small, the virulence of our black snake compares very favourably with the cobra; that is to say, the minimal fatal dose per pound weight is considerably less, than that given for the cobra by the Indian Snake Commission." Perhaps, the poison of the copper-head snake is the weakest of the quintette; as already shown, ammonia thrown together with its venom, even in a somewhat late stage, conquered. This reptile too, is not so widely diffused as the others, it being chiefly found in south-eastern Australia and Tasmania. The venom of the tiger snake and the brown snake, more especially that of Queensland, is extremely diffusible and quickly absorbed; it spreads with rapidity and nearly equal force over all the motor centres. The virus of the black snake does not produce so deep a coma and often none at all.

The patients generally feel drowsy and fall asleep, but are easily aroused and sometimes awake spontaneously.

Inoculation.—Professor Halford (Victoria), writing of his experiments in conjunction with Shires, says :—"This man apparently cared nothing for venomous snakes ; he would put his *bare arm and hand* into a box containing 50 snakes and pull out one, just as a fisherman would an eel from a bag of eels. One morning before commencing experiments with his antidote on 20 dogs, he said he would try an experiment on himself with some snakes from Gippsland—venomous without doubt. There were several gentlemen present, some of whom are still in Victoria. I told him I would not permit such a thing ; but he insisted. To guard against deception, I was foolish enough (I did not think till afterwards how foolish) to tell him to pick out a certain tiger snake—one out of many that I had received the evening before from Dr. Gummow, of Swan Hill. The snake bit him on the left fore-arm, three inches above the wrist, and held on. He applied his remedy, and I watched him throughout the day, and certainly no symptoms of snake-poisoning supervened. Had he died where should I have been? How could this immunity be accounted for, for 19 out of the 20 dogs died? I was aware that he had been bitten several times before this, and once or twice nearly dead. It occurred to me, could previous inoculation have saved him? as we know now that previous inoculations save, or greatly modify, the effects of other organic poisons. This brings me to a remarkable statement by Dr. C. J. Martin, which is :—'A previous injection of small doses of black snake venom confers an immunity, so far as intravascular clotting is concerned, against further injections of the venom. This immunity is very speedily produced, but how long it may last I am at present not in a position to say.'"

What to do in a case of snakebite.—Ninety per cent. of the bites on human beings are on the limbs. When the injury is thus located, tie a ligature tightly above the bitten part—that is, between it and the direction of the heart ; for, the bite being superficial, the poison unless arrested is conveyed into the circulation. Use a strip of clothing rather than waste time in searching for other material. The part containing the mark of the fangs should be cut out to the depth of a quarter of an inch, if practicable. The wound should be frequently sucked by some person having neither sores nor ulcers about the mouth If the bite is not on the limbs, a portion of the flesh should be pinched up and girt with a ligature. Wash the wound with a solution of the chloride of lime ; but, in all cases, a medical man should be sent for at once, as the remedy, if strychnine, is quite as dangerous as the reptile, unless skilfully handled. The fears of the patient should be allayed as much as possible, so that fright may not become an ally of the venom. The symptoms seem to be much alike in all cases of snakebite :—At first faintness and often slight convulsions, then sickness of the stomach (probably a reflex action from the brain), with trembling and weakness in the

limbs, the pupils of the eyes dilated, a tendency to sleep, then total paralysis, and coma immediately preceding death.

Dr. Mueller's Antidote.—This physician, when a new chum, was bitten by a tiger snake, which nearly cost him his life, and set him thinking on the action of the insidious venom, but it was many years before he could mature and announce his discovery—that strychnine is an antidote. In his work on "Snake Poison," Dr. Mueller quotes 50 cases of snakebite successfully treated with strychnine, only two of these by himself, the rest by doctors in the colonies who communicated the results to him. Of these 10 persons had been bitten by tiger snakes, 8 by black snakes, 7 by brown snakes, and 5 by death adders. In the other instances, the snakes having escaped could not be determined. He records six casualties in which the remedy failed, partly from lapse of time and partly from too weak injections. The discoverer does not take it for granted that all the 50 sufferers had lethal bites, perhaps some would have recovered under other treatment, or without any treatment at all, but he justly claims this much—their recovery was more speedy and, further, it was assured. No one can tell what might have happened but for his timely specific. Of the fatal cases two occurred in hospitals of New South Wales from bites of the brown snake. That of a beautiful lady aged 17, of Darling Point, Sydney, is the most remarkable. Being on a visit at Everton, near Beechworth, Victoria, Jan., 1893, she was bitten when stepping out of the bath at dusk one Sunday by a half-grown tiger snake, subsequently caught and killed in the room. The bite was in the back of the second right toe; she did not suspect snakebite, and no ligature was applied until the poison had been absorbed and had overpowered her. Instead of sinking into coma, she became unconscious for a short time only. When a doctor saw her a few hours after the bite, she declared herself well. She passed a good night, but in the morning symptoms made their appearance almost identical with those described by Indian writers as following cobra-bite. She had difficulty in breathing and swallowing, but a small injection, 1-10 grain of strychnine, removed these, and once more all danger was thought past. On Monday evening the symptoms appeared again in an aggravated form. Strychnine was again resorted to, but it failed to act as before, and from hour to hour this young lady's condition became more critical. Dr. Mueller having been sent for, arrived on Tuesday afternoon 42 hours after the bite. This young lady's case appeared hopeless, paralysis being imminent. He injected one tenth grain doses of strychnine every half hour, till the physiological action of the drug showed itself, but it failed to have the least effect on the affected centres, and complete paralysis ensued 45 hours after the infliction of the fatal bite. The conclusion the doctor arrived at from what he witnessed was—"the antidote can only be relied on within the first 24 hours after the bite." Patients die when treated in an advanced state of the malady.

Use of strychnine.—Dr. Rendle (Brisbane) designed a packet

containing the appliances. The case can be carried in the pocket. It contains directions—what to do, when to do it, how to do it, what not to do; also ligatures, scissors, strychnia in accurate doses, and a syringe. The strychnia is in the form of small tablets, each contains 1-50 of a grain, the smallest dose required. The direction runs thus: "Put the required number of tablets into the small saucer, fill the syringe with clean water, push out part of the water upon the tablet, stir it up with the end of the syringe, and when dissolved draw it up into the syringe; next remove the wire from one of the needles and fix the needle firmly on the syringe. Hold the syringe lightly in the hand with the needle between the thumb and finger; thrust the needle half-an-inch deep into any fleshy part above the part tied. Move the point about a little, then squirt in the liquid and withdraw the needle slowly. If the signs of snake poison do not pass off in 15 or 20 minutes, give a second dose, and repeat as needed."

Professor Halford's treatment of a man bitten by a venomous snake.

CHLORIDE OF LIME.

1. Place, if possible, an elastic ligature moderately tight between the bite and the root of the limb, so as to prevent absorption of the poison.

2. Inject at once into the wound, and all round about, 20 to 30 c.c. (1 oz. or more) of a recently-made solution of bleaching powder—a compound of hypochlorite and chloride of lime will suffice. (Note.—1 in 12 of water. When required, dilute 5 c.c. of this with 45 c.c. of water).

3. Remove the ligature as soon as the injections have been made. Wash the wound with an abundance of the concentrated solution of the bleaching powder.

It will be advantageous to sustain the heart's action by injecting a feeble dose of morphia (about one-seventh grain) or caffein subcutaneously.

After many years of patient investigation, the professor, in his invaluable work, communes thus:—"Is there any antidote to the venom? The answer is, I think, no. On examining the fang it will be seen that our modern hypodermic syringe is a rough copy of the original in snakes. No venom must be lost; the apex of the fangs must first penetrate, and subsequently the poison be thrown in. The whole mechanism is designed to kill. But surely someone will say there may be some remedy. Certainly; that I sincerely hope may be; but as yet we have none." Dr. Halford does not refer to the strychnine remedy, or even hint that there is such an antidote. No cases showing the efficacy of bleaching powder are cited.

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