The AUSTRALIAN MUSEUM MAGAZINE

EDITED BY C. ANDERSON, M.A., D.Sc.

PROFUSELY ILLUSTRATED.

Vol. 1. No. 8. APRIL, 1923. Price—ONE SHILLING.

THE AUSTRALIAN MUSEUM

COLLEGE STREET, SYDNEY.

BOARD OF TRUSTEES:

President:

T. Storie Dixson, M.B., Ch.M., Knight of Grace of the Order of St. John.

Crown Trustee:

James McKern.

Official Trustees:

His Honour the Chief Justice.
The Hon. the President of the Legislative Council.
The Hon. the Colonial Secretary.
The Hon. the Attorney-General.
The Hon. the Colonial Treasurer.
The Hon. the Secretary for Public Works and Minister for Railways.
The Hon. the Minister of Public Instruction.
The Auditor-General.
The President of the N.S.Wales Medical Board (T. Storie Dixson, M.B., Ch.M.).
The Surveyor-General and Chief Surveyor.
The Crown Solicitor.

Elective Trustees:

Prof. W. A. Haswell, M.A., D.Sc., F.R.S.
Prof. Sir T. W. E. David, K.B.E., C.M.G., B.A., F.R.S.
W. H. Hargraves.
Eric Sinclair, M.D.
Col. the Hon. Sir Jas. Burns, K.C.M.G., M.L.C.
J. R. M. Robertson, M.D., C.M.
Ernest Wunderlich, F.R.A.S.
G. H. Abbott, B.A., M.B., Ch.M.
J. Vernon.
The Hon. D. Levy, LL.B., M.L.A.
J. J. Fletcher, M.A., B.Sc.
G. McRae.

Director:

Charles Anderson, M.A., D.Sc.

Principal Keeper of Collections:

Charles Hedley (*Conchologist*).

Scientific Staff:

Allan R. McCulloch, *Zoologist, in charge of Fishes.*
William W. Thorpe, *Ethnologist.*
J. Roy Kinghorn, *Zoologist, in charge of Birds, Reptiles, and Amphibians.*
Ellis le G. Troughton, *Zoologist, in charge of Mammals and Skeletons.*
Anthony Musgrave, *Entomologist.*
F. A. McNeill, *Zoologist, in charge of Lower Invertebrates.*
T. Hodge Smith, *Mineralogist and Petrologist.*

Librarian:

W. A. Rainbow.

Accountant:

J. A. Trimble.

Table of Contents.

Young White-breasted Sea Eagle on Nest, Capricorn Group, North Queensland. The nest is built on a Sophora bush, whilst in the background is seen Tournefortia argenta. The leaves of this, which cluster on the ends of branches, are clad with silvery hairs, but the general colour is sage green.

See page 225.

[Photo.—*C. Barrett.*

THE AUSTRALIAN MUSEUM MAGAZINE

Published by the Australian Museum - - - College Street, Sydney.

Editor: C. ANDERSON, M.A., D.Sc. Annual Subscription, Post Free, 4/4,

VOL. I., NO. 8. APRIL, 1923.

Editorial.

THE AUSTRALIAN FAUNA.

AT the present time there is a good deal of public discussion on the subject of our native mammals and birds, and some of the participants are inclined to strike a note of pessimism as regards the future of these members of our fauna, particularly the marsupials. It is undoubtedly true that the total number of our wild animals is less now than formerly; that is an inevitable consequence of the advance of settlement, clearing operations, bush fires, the introduction of animals like the fox and the rabbit, and the widespread use of poison in the endeavour to control these pests. It is probably true, too, that some species which inhabited Australia when Captain Cook first landed on these shores are now extinct, but we hope that the number of these is small, and that some deemed extinct are yet lingering in some of the less accessible and more sparsely inhabited portions of our great continent.

As Dr. W. K. Gregory pointed out in a previous* issue, the Australian marsupials are in many respects the most interesting group of animals now existing, and their undoubted depletion is a deplorable fact. It behoves us as good Australians to do what we can to prevent, or at any rate postpone, their extinction. A rigid application of the laws protecting wild life would do much to save our marsupials, and the dedication of suitable reserves, where those species which are less able to cope with changed conditions, could find sanctuary, should be strongly urged on our legislators.

At the same time we would deprecate the desire evident in some quarters to curtail the operations of scientific collectors, especially those representing extra-Australian institutions. A little consideration of the facts will convince anyone that, so far as collecting for scientific and educational purposes is concerned, the damage done to our indigenous fauna is so slight as to be negligible. Within the last few years two of the leading American museums have had collectors in Australia, and between them they have accounted for about one thousand marsupials. During the same period the number of marsupials slaughtered for their skins runs into millions Let us devote our energies and ingenuity to controlling trade in our wild animals and birds, which has for its object, not scientific or educational advancement, but mere gain. On the other hand, if the pessimists are right, and our marsupials are

*THE AUSTRALIAN MUSEUM MAGAZINE, Vol. I., No. 3, December, 1922, p. 65.

doomed to extinction, surely it is advisable that scientific institutions should be allowed to obtain the comparatively few specimens necessary to exhibit to posterity the characteristics of these interesting animals.

Let us not, then, put unreasonable obstacles in the path of our scientific confreres. Their efforts will result in a distinct gain to Australian zoological science. There is yet much to be done in the investigation of our marsupials, and, along with our fellow citizens in other parts of the Empire, surely our American cousins have a right to share in our heritage, for, in their land as in ours, there are still existing members of the marsupial order of mammals so characteristic of Australia. But we may claim with justice that Australian scientific collectors should obtain special facilities and support in their work. The resources of our own museums are deplorably slender and it is to be hoped that public-spirited men like Sir William Macleay, Sir Thomas Elder, W. A. Horn, and Mr. H. L. White, will always be forthcoming, men who realise the necessity for the investigation of our wild life, and are prepared to give practical support to the work. All honour to them.

Notes and News.

Dr. J. R. M. Robertson, Trustee, has returned to Sydney after an extended trip to Europe and America. Another Trustee, Sir James Burns, has also returned from Europe. We are pleased to hear that his health is now improving.

Dr. T. Storie Dixson, President, left last month on a trip to the United States.

Mr. A. R. McCulloch, who has been away for five months with Captain Hurley in New Guinea, has now returned.

Among recent scientific visitors may be enumerated Professor P. B. de Rautenfeld, Commissioner, Chinese Maritime Customs Service, formerly of the University of Peking ; Mr. J. Emblom Gullberg of the Smithsonian Institution, Washington, who has returned from New Guinea and is now engaged in craniometric investigations in the Museum ; Major H. Newport, Department of Agriculture, Rabaul, who is in charge of the museum there and is keenly interested in museum methods.

Mr. H. C. Raven, collecting for the American Museum of Natural History, returned from Tasmania and later left for the United States. Mr. Raven has been successful in obtaining a fine collection of Australian mammals for anatomical purposes and for display in the projected Australian Hall in the New York museum. During his stay in Sydney Mr. Raven made a careful study of our collection of marsupial skulls.

Professor T. T. Flynn, of the University of Tasmania, recently spent several weeks at the Museum, working on the description of the squalodont whale skull discovered by him at Table Cape, Tasmania, and on the Mawson Collection of Antarctic Pycnogonida. A cast of the Table Cape Skull has been put on exhibition in the Museum, and a description by Prof. Flynn of the find and its significance will be published in our next issue.

The Museum lecture season will open on April 12th, when Mr. A. R. McCulloch will discourse on "The Mud People of Papua." The lecture will be illustrated by an exceptionally fine series of lantern slides.

Some Birds of Prey.

By Charles Barrett, C.M.Z.S.

As home pets, the birds of prey are not popular, though some persons (eccentric, you may say) have made a hobby of cherishing eagles and hawks, and members of the owl tribe. I am not one of these "peculiar people," but I am keen on making friends with the hunting birds in their native wilds, and in the course of many rambles afield, with binoculars and camera, I have met with a measure of success.

Perhaps it is too much to claim that one has gained the confidence and goodwill of eagles and hawks, unless the limitation is stated. Only young birds, in the nursery or just out of it, are promising subjects for overtures. My photographs are the evidence that I have not failed completely with them.

COWARDLY SEA EAGLES.

My first attack on an accipitrine citadel was surprisingly successful. On a little isle of the Capricorn Group, Queensland, a pair of White-breasted Sea Eagles (*Haliætus leucogaster*) had built a huge nest of sticks among low branches of a *Sophora* bush. It contained a lusty eaglet, almost ready to fly. As soon as I approached, carrying a half-plate stand-camera (which I find the most useful size and type for general nature photography), the old eagles flew out to sea, leaving their fledgling to its fate. Not a harsh fate, luckily, for I merely wished to "snap" it. But the youngster, bolder than its parents, greeted me as an enemy. It turned on its back in the bowl of the nest, and menaced me with beak and claws. I tried gentle persuasion, and at length the eaglet perched on the rim of the nest and remained fairly quiet for a minute. The camera was below, focussed on the spot and all ready. A quick pressure of the bulb release, the shutter clicked, and my first portrait of a bird of prey was secured.

Sea Eagles, judging by evidence gathered amongst the Capricorns, are fond of sea snakes; we found many skeletons, apparently of these reptiles, on the ground beneath several nests, mingled with those of fish.

The beautiful White-headed Sea Eagle (*Haliastur indus*) I have watched very often with admiration, in the coastal regions of North Queensland, but hitherto it has dodged my camera. These fishing birds, perched on piles or rocks, and in flight, look fine in their white and rich chestnut-coloured plumage.

Whistling Eagles are not rare, and most folk who are interested in wild birds must be familiar with them. The Ornithologists' Camp, on Wallis Lake, New South Wales, was close to a tall gum tree which held, in the loftiest boughs, a nest of this species. The curious whistling notes were constantly heard, and often we saw the birds sailing high, over land or sea.

THE EAGLE-HAWK.

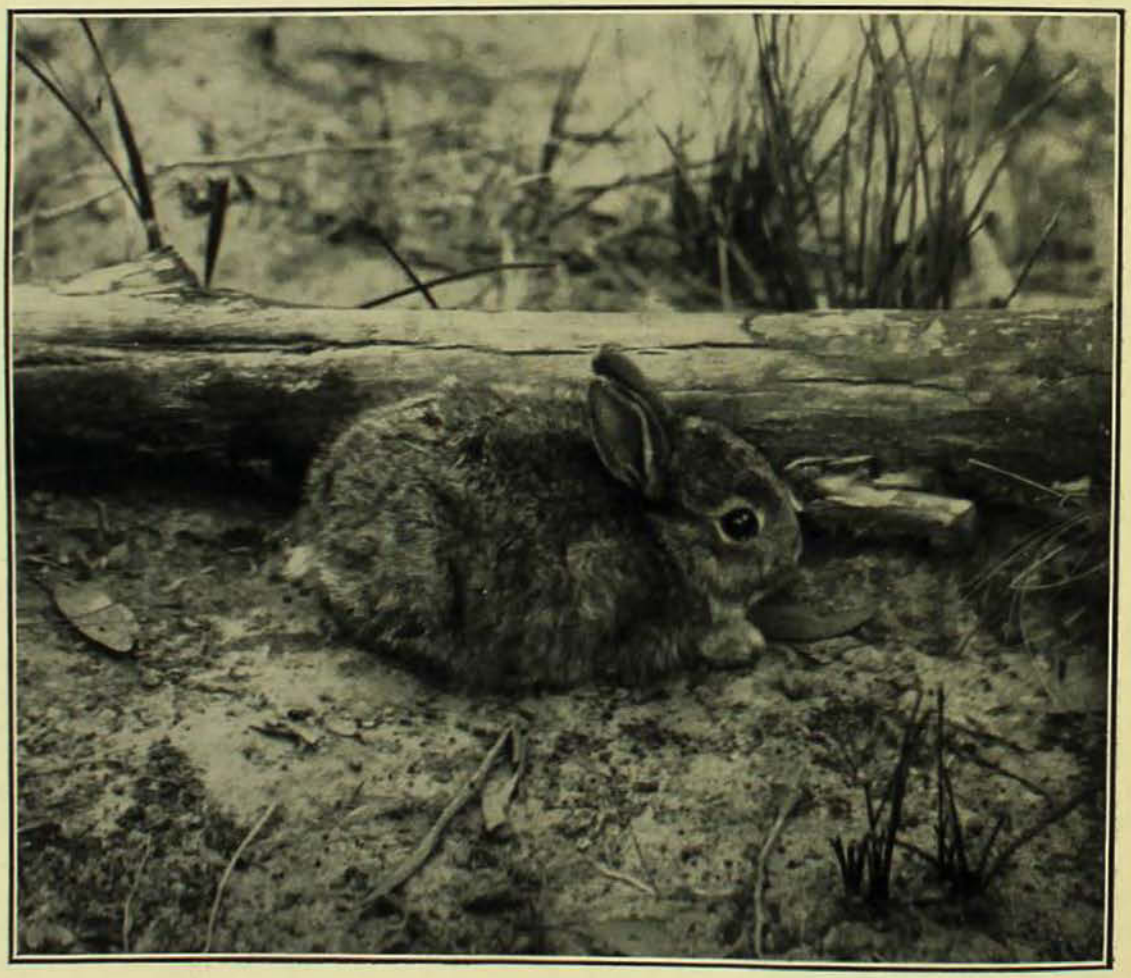
Though it has been greatly persecuted in many districts, our noblest bird of prey, the Wedge-tailed Eagle (*Uroætus audax*) is still far from the trail that leads to extinction. In some places, indeed, it is numerous.

I am a champion of the Eagle-hawk, for though, in drought times especially, it may do some harm among sheep, it performs good service in the war against rabbits. In the nests, and on the earth beneath, you will find remains of bunny. In his *Birds of the District of Geelong*, Mr. C. F. Belcher records: "I have heard of eagles which had a nest of young in a paddock where two thousand ewes with lambs were depasturing, yet the birds fed themselves and their young upon rabbits alone." Plenty of similar evidence in favour of the Wedge-tail could be produced if it came to a trial by jury formed of pastoralists and bird lovers.

Nest of the Wedge-tailed Eagle. [Photo.—*C. Barrett.*

We should save our eagles and other birds of prey from the fate that is overtaking their "cousins" in the British Isles. Happily, in Australia, we do not pamper partridge and pheasant against the "Opening Day." Gamekeepers as a class, I believe, are largely responsible for the decrease of hawks and owls in England. In the army I met one of these game preservers, a bulky sergeant-major. I argued with him in vain. "They're vermin, are 'awks and owls," he declared.

On the train trip across Australia I saw scores of huge Eagle-hawks, flying low, soaring, or perched on stunted bushes. The Nullarbor Plain, where dingoes roam and rabbits are not unknown, had some of the hunting birds to show to weary travellers. Observing wild life from a carriage window is one way of increasing the interest of the trans-Australian trip.



One of the Eagle-hawk's victims. [Photo.—*C. Barrett.*

"Leave me alone."—Young Brown Hawk. [Photo.—*C. Barrett.*

On my latest rambles in the Mallee, around the Pink Lakes, Victoria, I found half a score of nests of the Wedge-tailed Eagle. Some were in low trees, others fifty feet up, in "Belars," which are favoured also by White-winged Choughs (*Corcorax melanorhamphus*) as sites for their mud-bowl nurseries. Many nests, but all deserted: some had not been used for years. Settlement is driving the Eagle-hawks into the untamed wilderness, where, some day, wheat may grow.

A FRIENDLY FAMILY.

Near the settler's home where I camped with a brother bird-observer, in a barn next door to a heap of "cocky chaff" a pair of Brown Hawks (*Ieracidea berigora*) had a nest, accessible even to an unskilled climber. But we could not contrive to fix the camera safely in the boughs. The three young hawks that filled the nest almost to overflowing, were well grown, so we elected to risk an experiment. The nest, after much hard work with tomahawk and ropes, was lowered, with all its natural supports, to within five feet of the ground. A screen of green branches saved the nestlings from sun-stroke—if hawks are ever injured by solar heat—and they were made quite comfortable.

While we were exposing plates rather recklessly (they cost money nowadays), one of the parent birds appeared afar. She flew to a tree fifty yards away, and we saw that a lace lizard (or "goanna" as folk will call our monitors) hung limply from her beak. In the nest were the mummified remains of a "stump-tail." So it would seem that lizards are favourite food with these hawks.

At first, the young hawks were inclined to be "nasty." They took the offensive whenever we came near, and

clawed and snapped at intruding hands. Thus it was on the morning when their home was shifted nearer to the ground. Next day we visited them to see whether all was well with the trio. They had been fed and were fairly contented. Still, they rather resented our presence. Our third visit, twenty-four hours later, was memorable. For the youngsters seemed to recognise us, almost to bid us welcome. Daily, after this, our relations improved, until we were on the most excellent terms with the family. They made no protest when we handled them. In the early stages of making friends, when one baby was posed on a bough, he assumed an attitude of fierce defiance, as shown in my photograph.

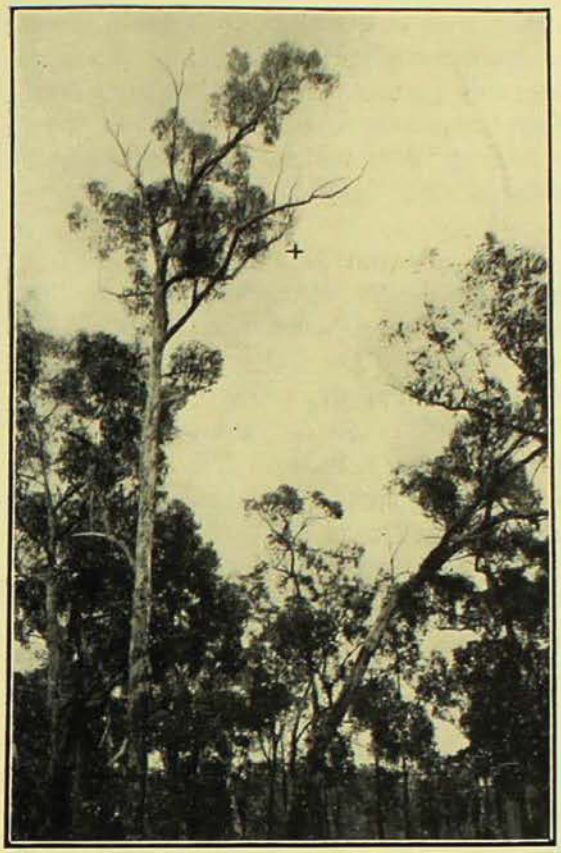
Brown Hawks are our most abundant birds of prey ; they are to be seen both in town and country districts, perched very often on a telegraph post. They are good citizens from our point of view, preying, as they do, upon mice and insects, as well as lizards—though I am not aware that the latter do us much harm, excepting, of course, the "goannas," which are destroyers of eggs and young birds.

THE GOSHAWK.

Lately (in December, 1922) I had the good fortune to be introduced to a family of Australian Goshawks (*Astur fasciatus*). They had flown from the nest, which was sixty feet up in a gum tree, growing in a paddock at Mooroolbark, Victoria, and were camped among thick foliage in a native cherry tree (*Exocarpus*). There, ranged in a row on a horizontal bough, they remained daylong, while the old birds at intervals brought them food.

When my friend, Donald Thompson, who had discovered the nest, guided me to the cherry tree, the young Goshawks glowered, but showed no signs of fear. They watched us closely, though, and, when my companion commenced to climb, two of the trio took wing. The one that remained was incapable of flight, for the nonce. He had eaten, not wisely but too well, and was at table still. We were shocked to

Nest and young of the Brown Hawk. [Photo.—*C. Barrett.*



Where the Goshawk makes its home.
[Photo.—*C. Barrett.*

find the legs of a bird (evidently an Indian Myna) protruding from the Goshawk's beak—*and feebly moving.* It was no pleasant sight, but, in the cause of science, it had to be recorded. So the fierce-eyed little glutton was placed on a stump and photographed. He tried to show fight, but his efforts were feeble.

We heard the loud twittering call, a single note repeated quickly many times as the parent birds circled over neighbouring trees. They had two of their offspring in hiding somewhere, but were fearful for the fool of the family, who had been greedy beyond measure.

Swift upon its way is the Goshawk, and powerful, too—one of our finest hawks. It has been branded as a poultry thief, but, I think, without a fair trial. I do not assert that it never offends, only that it preys chiefly on small wild birds. Near the paddock where our trio was reared a poultry-run exists, yet we heard no complaint regarding the Goshawks, and the refuse at their feeding camp contained no chicken's bones.

CHARM OF THE KESTREL.

Of all the birds that are "red in beak and claw," after good hunting, I like best the beautiful Nankeen Kestrel (*Cerchneis cenchroides*). Its habit of hovering above haystacks, on the watch for mice, has made the Kestrel a most familiar bird, and a favourite with wise farmers. On wide-spread wings the little hawk hangs motionless until it tires of hovering, or a mouse rustles in the hay and earns swift death. Frogs, lizards, and insects are also included in the Kestrel's menu, and rarely it takes a small bird.

In Riverina one season, I found many nests of the Kestrel—homes in hollows, all of them, some high, some within easy reach. One nursery was a deep hollow in the bole of a dead gum standing in creek water. A little exertion and ingenuity, and taking the risk of a fall, enabled me to get one indifferent photograph—a baby Kestrel at the "door" of the home. The

Young Goshawk swallowing prey brought by parent. Legs of victim (? Indian Myna) are seen protruding from hawk's bill.
[Photo.—*C. Barrett.*

Young Kestrel at entrance to nest hollow.
[Photo.—*C. Barrett.*

family was a quartette. Taken from the hollow under protest, they made a charming group when settled on a log. We returned them, of course ; but they had tried their wings, and were eager to remain out in the world.

Years afterwards, when wandering amid the noble ruins of Karnak, in Egypt, I remembered the Kestrels of Yanco Creek. On ledges and in crevices in the Hypostyle Hall, that forest of mighty columns reared of old, Kestrels were nesting. Their shrilling calls echoed through the aisles—fancy transformed the pillars into gum trees, and the voice of the wind in the palms to a murmur of running water in Australian wilds.

* * * *

I have given only side glances at some of our birds of prey. Those not even mentioned are worthy of pictures and praise. See them in Nature if you can, and learn, as I have done, to think of them as "Good Australians."

BALL'S PYRAMID.—In an article by Mr. A. R. McCulloch, published in this MAGAZINE (Vol. I., No. 2, p. 41), it was mentioned that Ball's Pyramid, "a pinnacle rising eighteen hundred feet into the sky, yet but sixty chains long at the base," is practically a *terra incognita*, none but a party of surveyors having ever landed upon the rocks around the base. Recently, however, the intrepid Morrisby brothers succeeded in landing on the Pyramid, and Mr. Logan H. Morrisby ascended the steep rocky face for about seven hundred feet, after a three hours' arduous and dangerous climb. Last year Mr. Morrisby sailed all round the Pyramid and scanned it eagerly through his binoculars, but was unable to land. He was then under the impression that the pinnacle was entirely bare of vegetation, but he now finds that, on the northern faces, there is a certain amount of short grass, rushes, and small tea-trees ; the southern sides are practically bare, perpendicular, and unscalable. Streams of fresh water trickle down the cliffs, which are formed of basalt. As for animal life, beside the innumerable gannets, which nest in the caves that honeycomb the cliff sides, the daring explorers found some small lizards and a sort of "Silver Fish" (*Lepisma*), but think it probable that there are other insects on the island. We are indebted to Mr. Camden Morrisby for these particulars.

Sea-Dragons

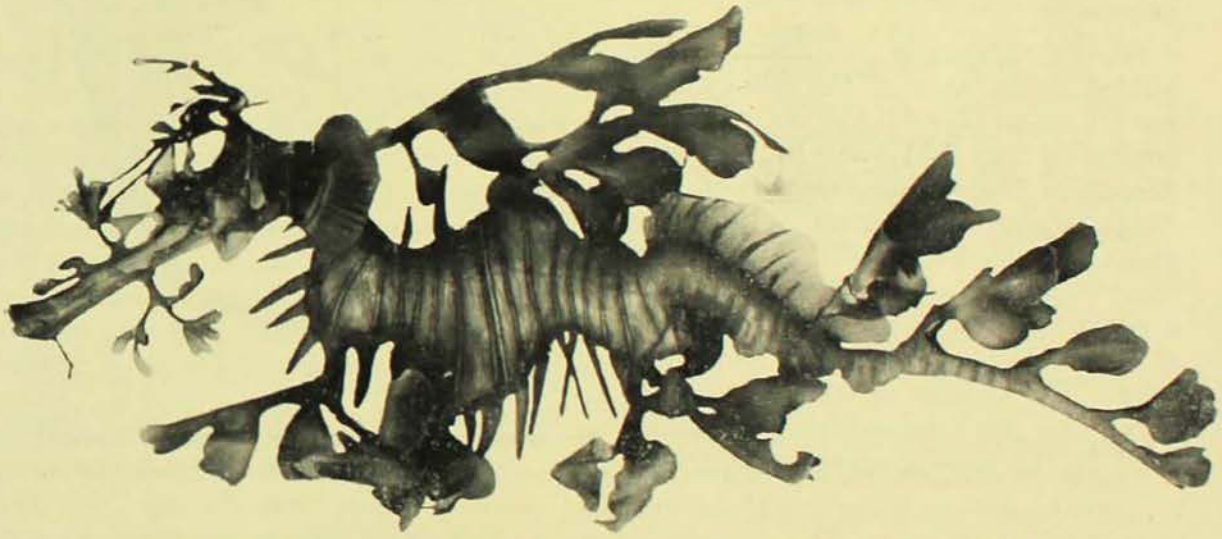
(Phyllopteryx)

By Allan R. McCulloch.

WHENEVER the winds blow harder than is usual from the sea, the waves churn up the animals and plants which live just below the lowest limits of the tides. Our ocean beaches at such times become strewn with an assemblage of marine organisms which are rarely exhibited to our view under any other circumstances. They live among rocks where they are safe from capture by either nets or dredges, and, unless lured to destruction with a baited hook, they are almost entirely safe from ill-treatment at the hands of human beings.

Australian waters, which is here illustrated, is provided with a whole series of not only leaves, but branches and shooting twig-like growths, which are so perfectly developed in shape and colour that they must render the fish well nigh invisible when it secretes itself among the weedy growths of its haunts.

The species common around Sydney is highly ornate, being decorated with brilliant scarlet, yellow, and dashes of violet, which suggest that its haunts are among the red sea-weeds of the littoral zone. Its leafy appendages are less



A South Australian Sea-dragon. One step more, in evolution, and it would become a bunch of kelp. [Photo.—*G. C. Clutton.*

After almost every storm, one or more specimens of the queerest of fishes, the Leafy Sea-dragon, are picked up by some wandering beach-comber, and find their way to the Australian Museum. There are several species of these remarkable animals, some of which are even more extraordinary than the others, but all are provided with a larger or smaller number of leaf-like appendages from which they derive their popular name. A species from South

developed than in its South Australian cousin, being confined to the end of each of the spines which project like outstanding bones from its queer shaped body.

The Sea-dragons are members of a large group which includes the Pipefishes and Sea-horses, all of which are encased in a jointed armour of tough horny plates. Their mouths are tiny openings at the ends of long tube-like snouts, and are so small that they can

engulf nothing larger than the minute crustaceans which run over the weeds of the sea just as do ants upon terrestrial plants. They are very helpless creatures, with fins so small that their fastest movement is not much better than a snail's pace. They therefore rely upon their imitative ornamentation, their hard armature, and their powers of clinging firmly to stems of weeds by their prehensile tails, for protection from enemies.

A remarkable feature of the group, is that the males take charge of the eggs as soon as they are deposited by the females, and carry them around in special brood-pouches until the young are hatched. In some species the pouch is complete with overlapping sides to protect the developing young, but in others, as in the Sea-dragons, there is merely a pulpy area on the under surface of the tail or the abdomen to which the eggs become fastened by some sticky substance.

Several attempts to describe the quaint appearance of the Sea-dragons have been published, but none is more successful than that of the Rev. Tenison Woods in *Fishes and Fisheries of New South Wales*. He writes "It is the ghost of a sea-horse, with its winding-sheet in ribbons around it ; and even as a ghost it seems in the very last stage of emaciation, literally all skin and grief. The process of development by which this fish attained to such a state must be the most miserable chapter in the history of 'natural selection.' It this be the 'survival of the fittest' it is easy to understand what has become of the rest. . . . . Never did the famishing spectres of the ancient mariner's experience present such painful spectacles. If these creatures be horses, they must be the lineal descendants of those which were trained to live on nothing, but unfortunately perished ere the experiment had quite concluded. . . . . If this be development, it stopped only just in time ; one step more and it would have been a bunch of kelp."

The Sea-dragon of Sydney beaches is less weedy, but decorated with rich colours.
[Photo.—*G. C. Clutton.*

Essay Competition.

Mr. George A. Taylor has generously presented five guineas to be awarded as a prize for the best essay by a pupil of a New South Wales school, the subject being "A Visit to the Australian Museum." The competitors, who must be between the ages of twelve and sixteen on 1st March, 1924, may select any department or may write a general account of the whole institution, the essay to contain 1500 to 2000 words. Teachers are asked to select the three best essays by pupils of their school and forward them to the Director of the Australian Museum on or before March 1st, 1924. The successful essay will be published in THE AUSTRALIAN MUSEUM MAGAZINE.

A Talk about Shells.

By Charles Hedley.

THE Army of the Animals is ranked in regiments, one of which has for its official title "The Mollusca." This name means the "soft things," and is properly given to the slug, the snail and the squid. In days of old the knights put on coats of hard and heavy armour, to save their soft flesh from thrust of spear or chop of axe, when fighting with their enemies. In the same way most soft things among the Mollusca have put on some hard covering that they might battle better with the cruel world.

These hard coverings, the shells of the sea shore, have been considered by all people in all ages to be some of the prettiest things in the world. Birds, butterflies, and flowers are painted no brighter, and their beauty soon fades or decays. Not only have the shells a lasting brilliance of colour, but they are wrought in most exquisite and dainty shapes. Appreciation of such attractive tints and forms is older than our civilisation; a thousand generations ago the sea shells were loved for their beauty. Even in prehistoric graves one finds beside mouldering bones some fragments of sea-shell or crumbling pearls, brought from far distant shores; records of pyramid and tumulus show that both the dark queens of the East and the fair princesses of the North clasped some favourite pearl or cowry as they were laid to their rest.

Indeed, as the race grew more civilised, as it grew older, richer, and wiser, so it grew to forget most of what it once knew about the mollusca. Before metal knives were seen in the world, the mollusca were more important to mankind than they are now. For one kind of shell-fish eaten at present, a dozen good and wholesome kinds were eaten formerly. To people whose life was one long picnic in the open air, these shells presented ready-made cups, spoons, or knives. This tractable material was always at hand, and was worked up by savages into innumerable odds and ends. Shells were pierced and strung into necklaces, or were cut into bracelets or earrings, or made into fishhooks or trumpets.

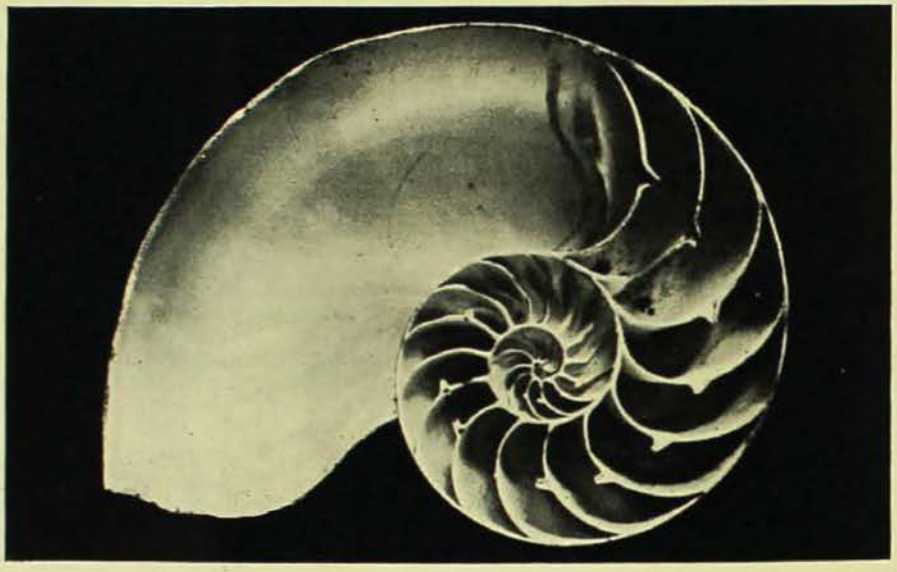
The best advice to give to anyone who wishes to know about shells is to begin a collection. Most people collect something or other. A financier collects bank notes, a philatelist his stamps, other folk have pictures or porcelain, while a naturalist takes to butterflies, beetles, birds, shells, fossils, or plants.

There are few objects easier to obtain or to preserve than shells, for they are not liable to decay, and they can be found almost everywhere. They occur even in freezing water, under polar ice, and among the scorched vegetation of the desert; but the most beautiful in shape and colour are those found among coral reefs, where the water is warm and clear. The smallest are atoms which would almost go through the eye of a needle, and the largest are the Giant Clams, which may reach a length of four feet and a weight of five cwt.

The first thing to remember about a shell is that it was made by something that lived in it; that some soft live thing once sat in the shell as the kernel of a walnut sits in the walnut shell, and and that it built that shell with lime, just as our body builds our bones. In some cases that live thing does without a shell, and crawls naked on the ground as a slug, or swims naked in the sea, as an octopus. So the shell may be considered as the costume of a snail. Now, sometimes that costume is in one piece, as with a whelk or a periwinkle, and at other times it may be in two pieces as with an oyster, a cockle, or a clam. These are the principal arrangements, but there are a few other fashions in shell costume, such as that of the chitons, which wear a suit of armour in eight pieces, and that of the squids, which, by a curious perversity, wear their costumes inside their bodies.

Probably about sixty thousand different kinds of mollusca have been discovered and named, but many remain yet unknown. About four thousand are recorded from the partially explored fauna of Australia.

Naturalists have classified mollusca into four main groups—the *Cephalopoda*, the *Gasteropoda*, the *Pelecypoda* and the *Amphineura*.

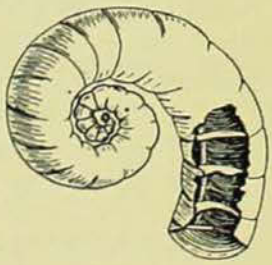


Pearly Nautilus shell, cut in half. As the animal moved forward to inhabit a larger room it built a fresh partition; communication with each apartment is maintained by a central siphon.
[Photo.—*G. C. Clutton.*

CEPHALOPODA.

Though largest in size, the Cephalopoda are fewer in number of individuals or species than the other orders. They are exclusively marine, making a home in every climate and on every coast from the Equator to the Polar Circle, and from the rock pool left by the retreating tide to the abysses of the ocean. This wide distribution through geographical space is rivalled by that through geological time, for the fossil remains of these organisms occur in every stratum from the youngest beds to the ancient rocks of the Silurian epoch.

Like other mollusca, the Cephalopoda are usually provided with a shell, external in rare and archaic forms, but usually internal. The Pearly Nautilus has a shell of many chambers, in the last and largest of which it lives. An example cut in half shows how a pipe communicates with all the inner chambers, by which the specific gravity of the whole organism can be raised or lowered The Post-horn shell (*Spirula*), common on the ocean beaches near Sydney, is similarly partitioned by septa, but it is half internal, small and loosely coiled. The shell possessed by the



Post-horn shell. Several joints broken open to show the siphon.
[*C. Hedley, del.*

squid (*Loligo*) is a slender internal spine or pen; because this animal also carries a vessel of sepia ink, it has been called the "clerk of the sea." The Cuttle-fish (*Sepia*) has a large, oblong, white shell, or bone, which is also internal; this is commonly seen among drift rubbish on the ocean beaches.

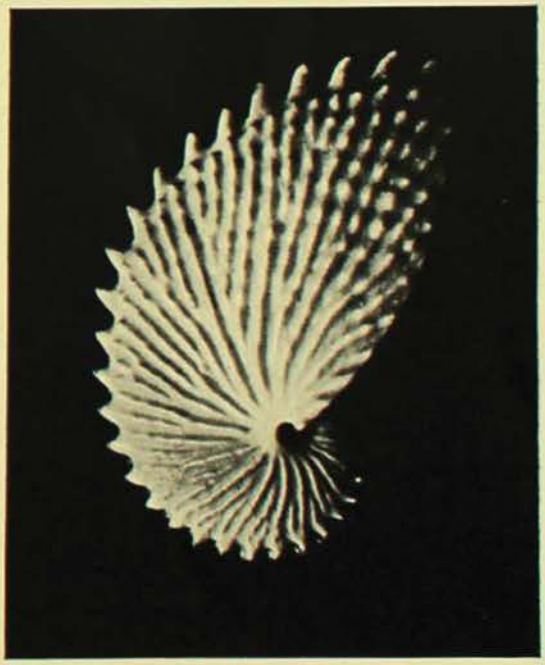
A Cuttle bone; the internal shell of Sepia.
[Photo.—*G. C. Clutton.*

The *Sepia* has its English name from the way it "cuddles" down to rock or sand on the sea floor. An exquisitely graceful hull, with a texture like the finest porcelain, is constructed by the Paper Argonaut. A fairy tale told how the molluscan mariner hoisted a sail upon this dainty craft and sailed away across the summer seas. But in truth the shell of this Paper Argonaut is not a dwelling as other shells are, but a nest in which the eggs are laid and hatched while carried about in mid-ocean, clasped in the mother's arms. Finally, the octopus or polypus has out-grown its shell, leaving no trace of it either within or without.

Cephalopods are more highly organised than other members of the molluscan family. Indeed, no other invertebrates are so elaborately constructed, furnished with so quick an eye, so sharp a tooth, so long an arm, or so cunning a brain. Probably a cephalopod is more than a match for anything its weight in the marine world. If pursued by a stronger foe, none can dart quicker through the water; should speed avail not, the resourceful cephalopod discharges an inky cloud of sepia, in which it disappears.

Commonest of the Cephalopoda is the octopus. When seen at rest in an aquarium tank, the large flabby body of the octopus is bag-shaped; it contracts and expands as the animal pants heavily. Round it are curled the long arms, of which the inner sides are beset with a double row of disks, tapering down from the size of a shilling at the base to the tiniest dot on the tips. These are the suckers; when their surface is applied to anything they contract, and by pneumatic action obtain the firmest possible grasp. Below the arms there is on either side a bulging eye with a narrow slit-like pupil.

At rest, this octopus imitates in form and colour the ground on which it lies, till it becomes almost invisible. It smoothes its skin, or puckers it, fades or blushes, till it has assumed the appearance of some particular dark rough rock or smooth gray sand, on which it chances to be. Around the entrance of its den is strewn the refuse of the hunt, heaps of broken shells and bones, for the octopus is a voracious animal which greedily devours fish, crabs, or cockles.



Paper Nautilus; a cradle, not a boat as is generally considered.
[Photo.—*G. C. Clutton.*

When the octopus launches itself in the water, it expands a large web, like an open umbrella, the ribs formed by the eight arms or feet, to which its name refers. In the centre of the arms is the mouth, the point of whose black parrot-like beak rises above the lips. The octopus has many ways of swimming; sometimes it rows itself along with the arms for oars, or it spreads the umbrella web and then darts backwards with a jerk by suddenly furling it, or the arms may be held straight and together while the animal drives backwards by pumping jets from the siphonal tube.

An Octopus at rest.
[Photo.—*G. C. Clutton.*

Some fanciful writers like Victor Hugo treat the octopus unjustly, describing it as the most horrible and dreadful creature in the world. The following account of an octopus hunt from the pen of that able naturalist, Mr. J. K. Lord, describes the octopus as it really is:

"The Indian looks upon the Octopus as an alderman does on turtle, and devours it with equal gusto and relish, only the savage roasts the glutinous carcase instead of boiling it. His mode of catching octopi is crafty in the extreme, for Redskin well knows from past experience that were the octopus once to get some of its large arms over the side of the canoe, and at the same time a holdfast on the wrack, it could as easily haul it over as a child could upset a basket. Paddling the canoe close to the rocks and quietly pushing aside the wrack, the savage peers through the crystal water, until his practised eye detects an octopus (with its great rope like arms stiffened out) waiting patiently for food. His spear is twelve feet long, armed at the end with four pieces of hard wood, made harder by being baked and charred in the fire; these project about fourteen inches beyond the spear haft, each piece having a barb on one side, and are arranged in a circle round the spear end and lashed firmly on with cedar bark. Having spied out the octopus, the hunter passes the spear carefully through the water, until within an inch or so of the central disk, and then sends it in as deep as he can plunge it.

"Writhing with pain and passion, the octopus coils its long arms around the haft; Redskin, making the side of the canoe a fulcrum for his spear, keeps the struggling monster well off and raises it to the surface of the water. He is dangerous now; if he could get a holdfast on either savage or canoe nothing short of chopping off the arms piecemeal would be of any avail.

"But the wily Redskin knows all this, and has taken care to have another spear, unbarbed, long, straight, smooth, and very sharp, and with this he stabs the octopus where the arms join the central disk. I suppose the spear must break down the numerous ganglions supplying the motive power, as the stabbed arms lose at once strength and tenacity; the suckers that a moment before hold on with a force ten men could not have overcome, relax, and the entire ray hangs like a dead snake, a limp, lifeless mass. And thus the Indian stabs and stabs until the octopus, deprived of all power to do harm, is dragged into the canoe, a great inert quivering lump of brown-looking jelly."

Though our people despise cephalopoda as food, they are esteemed a dainty in many parts of the world. The fish markets of the Mediterranean are always stocked with *Loligo*. In Ancient Greece, the epicures feasted on them, boiled, roasted, stewed, or grilled. Squid is a reliable bait for sea fishing; the bulk of the Newfoundland cod is taken by it. An international dispute once arose over the question of the squid bait for cod-fishery.

The stories of prodigious monsters that could pull down ships were idle tales. But there are still alive in the sea some cephalopods of gigantic size. Authentic measurements show that some have tentacles thirty feet in length, and some can fight with whales.

Mateship with Birds. By ALEC. H. CHISHOLM. Whitcombe and Tombs, Melbourne. (Angus and Robertson, Ltd.) 7/6.

This represents probably the most definite attempt that has yet been made in Australia to link nature and literature as was done by the late John Burroughs in the United States and the late W. H. Hudson in Britain. Mr. Chisholm began his nature studies in Victoria, and continued them in Queensland, where for many year he was a leader among working field naturalists; he was, variously president of the Gould League of Bird-lovers, President of the Field Naturalists' Club, State Honorary Secretary of the Royal Australian Ornithologists' Union, etc. His book is not in any sense a text-book; it is a literary record of the experiences of a roving naturalist. Commencing with Victoria, the author gives, in "A Pageant of Spring," an intimate study of the re-awakening of the Southlands from the respite of winter. Reading this, one hears the vital voices of returning birds, sees the small nests taking shape in secret coverts, and catches the fragrance of the small orchids of September and October days. The "Pageant" concludes with a study relating to children in Birdland, a chapter derived largely from the author's experiences when lecturing in schools or leading boys and girls in the bush.

Possibly more value attaches to the second portion of the book, if only for the fact that its subject, "Biographies of Birdland," has not been well explored in Australia. In various chapters of this section intimate details are given of the life-histories of our honey-birds, robins, crested birds, whistlers, and other avian notabilities, the whole concluding with the firsthand account of the long search for, and discovery of, the rare Paradise Parrot, of Queensland, a bird that, like many of the *Neophema* parrots of New South Wales, has been lost to sight for many years.

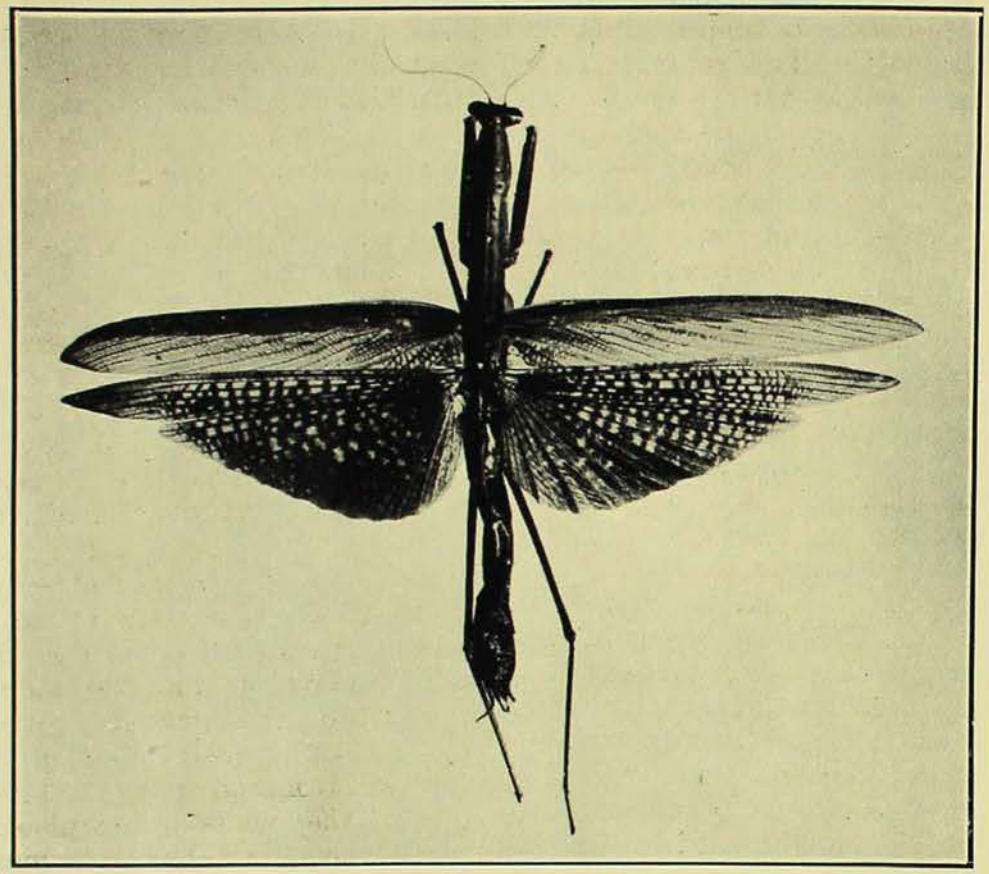
"Mateship with Birds" is enriched with an introduction by Mr. C. J. Dennis, who further assists to ally nature and literature, and with a comprehensive index and list of scientific names.

How to Study Birds; a Practical Guide for Amateur Bird-lovers and Camera-hunters. By H. K. JOB. The MacMillan Co. 1922. (Angus & Robertson, Ltd.) 8s., Post free.

Birds have ever been a favourite subject with nature-lovers and these will find much to interest them in the above work, which, though dealing with the birds of America, will appeal to ornithologists in all countries. The author is a born bird-lover, and his enthusiasm will infect his readers with something of his own spirit. He explains how and where to study birds and gives useful hints as to cameras and the art of photographing birds in the wilds. The book is enlivened with many incidents of the author's adventures in the field and contains some fine photographs.

The Praying Mantis.

By Gilbert Whitley.



The Long-winged Praying Mantis. (Tenodera australasiae.) The coarser fore-wings, when at rest, cover the more delicate and gauzy hind-wings.
[Photo.—*G. C. Clutton.*

PRAYING Mantids are found in all the warmer countries, and on account of their quaint appearance and peculiar habits, have excited interest since the earliest times. Their grave and apparently devout actions led the Greeks to apply the name *mantis* (meaning prophet) to them and for the same reason they became known to the Romans as soothsayers. In France they have been given the title of Prie Dieux (pray to God) in reference to the praying attitude that the forelimbs so often suggest, while among the practical American people they are often designated Camel-Crickets or Rear-Horses. To Australians they are sometimes known as Forest Ladies but the old name mantis has stood the test of common usage throughout the ages, and to this now universal title is often prefixed the word "praying."

LEGENDARY.

It has been claimed by the Arabs that the mantids face Mecca when "praying," while to the simple Hottentot tribes of Africa these insects were sacred and received full-hearted worship which protected them from the only too frequent ill-use and destruction to which they are so often subjected. In consideration of the above facts it is hardly surprising that the mantids have been responsible for the weaving of

many legends, not a few of which have been handed down from very early times. The old English naturalist, Thomas Moffatt wrote that "they resemble the Diviners in the elevation of their hands, so also in likeness of motion; for they do not sport themselves as others do, nor leap nor play, but walking softly they retain their modesty and shewe for th a kind of mature gravity . . . So divine a creature is this esteemed that if a child aske the way to such a place, she will stretch out one of her feet, and show him the right way, and seldom or never miss." A ludicrous incident also related is that St. Francis Xavier saw a mantis with its legs elevated as in prayer, when he desired it to sing the praises of God, and the creature immediately raised its voice in a beautiful canticle. Further, the Roman writer, Piso, deceived by the likeness of certain exotic species of mantids to foliage or twigs, thought that, when they alighted on the ground, roots grew from their feet so that they were gradually transformed into perfect plants.

STRUCTURE.

All mantids possess a more or less elongated body, which is divisible into the three main regions characteristic of insects—head, thorax and abdomen. The head is small and can be freely moved by its owner on a short and flexible neck-region. From a front view it roughly resembles a triangle in shape, the two upper angles of which are formed by the large opalescent eyes. Each eye possesses a small black pupil, capable of movement in various directions, so that, when the mantis is stalking its prey, it need not betray its evil intentions by any unnecessary turning of the head. Between the eyes on the upper half of the head are two thread-like antennae, and at the lower angle is situated the mouth region. The thorax or chest bears the three pairs of legs, and sometimes two pairs of wings in addition; these latter, however, may be absent in certain species. When wings are present they are borne on the upper surface of the thorax, and are usually smaller in females than in males. The forewings (tegmina) are coarser in structure and act as a protection for the more delicate and gauzy hinder wings, which are folded fanwise beneath them. The front legs are thick, heavily armed appendages, and very different from the two slender pairs behind. They are usually carried folded against the long anterior section of the thorax (prothorax), and it is the assumption of this curious posture that gives one the impression of a worshipper engaged in prayer. The abdomen is long and narrow, and divided into several well-defined segments, the most posterior of which bears two long jointed horns or cerci.

The mantids are often confused with the phasmids or Stick and Leaf Insects,* to which they bear a general superficial resemblance. The phasmids may be readily distinguished from the mantids, however, by the absence of any raptorial modifications of the forelimbs. Again, the head is practically immovable, and the cerci on the abdomen are unjointed. Another important difference is that of diet, for, in direct contrast to the carnivorous habits of the mantids, the phasmids feed exclusively on vegetable matter.

PROTECTIVE IMITATION.

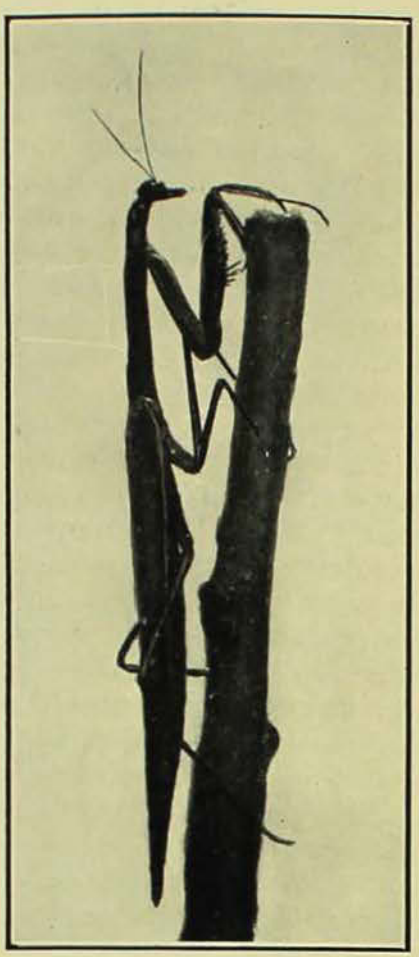
Like the phasmids, the mantids have been endowed by Nature with form and colour which often render them inconspicuous when in their customary surroundings. Several Indian species imitate various kinds of flowers, particularly orchids, and are renowned for their beautiful colours. In some cases this resemblance is so perfect that the mantids not only successfully deceive their insect prey, but on several occasions have misled botanists also. Those inhabiting the deserts of Arabia exactly match the colour of the sand, and are indistinguishable at a little distance. The Australian species, while they do not offer such sensational examples of imitative colouration, simulate to a greater or lesser degree the leaves or sticks among which they live.

* See Musgrave, THE AUSTRALIAN MUSEUM MAGAZINE, Vol. I., No. 6, 1922, p. 177.

HABITS.

There are over thirty species of mantids in Australia, and though each has its own specific habits, these are all alike in a general sense. For the sake of convenience the habits and life-history of a common local species, the Long-Winged Praying Mantis (*Tenodera australasiae*), will be hereafter discussed as typical. This widely distributed Australian mantis has often been observed by the writer in the coastal bush around Sydney, where it occurs fairly plentifully during the spring and summer months. It may be found on the ground or in low scrub, stealthily walking from twig to twig, sedately unfolding its front legs to assist itself in the process. Sometimes it stops and sways from side to side, as it stands delicately poised on its hinder legs. When performing this action its resemblance to a stick moving slightly in the breeze is very striking. If its attention be attracted by some moving object, the mantis will quickly turn or lift its head in order to investigate. This action is a comical one and almost human in its impression, for one can imagine the presence of a quizzical expression on the face of the insect as it "takes stock." It is a proficient jumper and leaps from relatively great heights, always landing safely on its feet like a domestic cat. When at rest, the well-known praying attitude is assumed, when the forelimbs are folded with their inner surfaces closely adpressed. So far as the Long-Winged Mantis is concerned the males appear to be more efficient on the wing than the females, for these eventually develop a bulky form of body which is quite out of proportion to their wing capacity. The species in question is sometimes attracted by artificial light, and, during its active nocturnal wanderings, may enter dwellings in order to satisfy its curiosity.

The gruesome work performed by the forelimbs is quite out of keeping with their sanctimonious appearance, as they are used for the purpose of killing insects for food. These weapons of destruction can be manipulated with deadly speed and accuracy when directed at an unsuspecting prey. If a grasshopper or any other insect or spider that the mantis has a gastronomic fancy for is espied, the serrated forelegs are launched at the prey, and the spines along their inner edges penetrate the wretched captive's body, gripping it so firmly that all its struggles are in vain. If the victim be a large one, the mantis puts an end to its efforts to escape by biting it at a point situated just behind the head; a procedure which causes almost instant death. In the case of smaller "fry," no such delicacy of feeling is exhibited, and the ruthless captor may begin eating at the head, feet or sides, without regard to the sufferings of its victim.



The fore-limbs of the Mantis are well-developed and are used principally for securing prey, which is held by the prominent spines.

[Photo.—*G. C. Clutton.*

The mantis is a voracious insect, and an example kept in captivity by the writer was observed to eat fourteen young locusts (short-horned grasshoppers) in a single day, consuming

an individual portion of this meal every five minutes. The remains of the feast consisted of wings and other portions which were discarded as unpalatable. At the termination of this greedy procedure the mantis commenced to clean off the remaining food particles adhering to the spines on its forelimbs by passing these appendages and also its antennae and hind legs through its jaws.

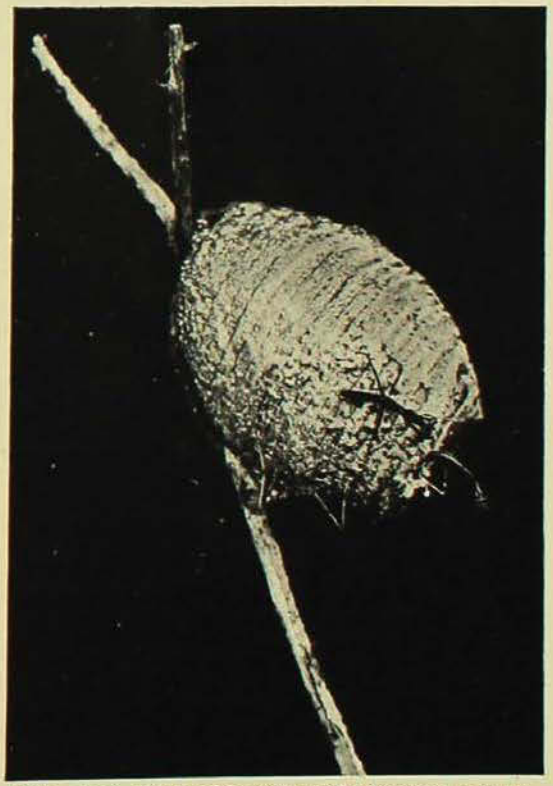
BREEDING.

During the mating season, which occurs about midsummer, an extraordinary substitute for divorce is revealed to us. The female mantis calmly, and with apparent relish, devours her own husband. The male, docile creature that he is, makes no attempt to resist his mate in her somewhat gruesome expression of affection, but allows himself to be slowly crunched and consumed in small mouthfuls, a sordid spectacle of which the writer has been more than once a witness. Then, too, the lady mantis is polyandrous, and may devour several consorts in the same breeding season.

When the time is ripe for the deposition of her eggs, the female mantis rests on a twig, usually with her head towards the earth. From the extremity of her abdomen issues a greyish volume of foamy matter. This frothy substance is full of minute air-bubbles, and, as it issues forth, two lateral processes situated on each side of the abdominal tip churn it up until the soft nest gradually begins to form. Within two minutes of delivery the material becomes transformed into a hard parchment-like porous mass. The slow turning of the tip of the abdomen during the hardening is instrumental in moulding the oval outline of the gradually forming case or nest, the building of which occupies a period of about two hours. The mantis stands on all six legs during these actions, and is not disconcerted by an occasional jolt from an inquisitive observer. Ordinarily she is practically motionless except for a slight rocking movement as the eggs are being laid and packed in the foam. Just how they are laid and put into position baffles explanation, yet the eggs are plainly visible to one facing the head of the mantis and looking along the under surface of the body. When the nest has reached its required dimensions, the extremity is often produced by the mantis into a curved tail as she moves slowly away from her handiwork. No further attention is now paid to the finished structure by the maker, for the writer has seen a large grasshopper pounce on to a nest immediately after its completion and bite deeply with its strong mandibles into the papery covering, the artificer standing barely two inches away, apparently quite unconcerned about the outrage.

THE NEST.

The nest itself is a marvel of architecture and is likely to be found in the bush attached to anything with a rough surface. It is an egg-shaped, tough, pithy structure a little over an inch in length, and of a dirty cream colour. It lies at a slight angle to the surface



The nest of the Mantis with several young soon after hatching. The cast and shrunken skins of the insects may be seen as small, white, bubble-like structures adhering to the surface.

[Photo.—*A. Musgrave.*

upon which it is laid, the end last constructed being somewhat elevated and free. Along the top of the newly made nest is situated a groove, which is sealed with a substance whiter in colour than the main mass. This latter, however, is gradually weathered and eventually disappears as the nest ages. Within the groove lies a longitudinal row of small openings leading into tunnels which penetrate to the middle of the nest, where the egg layers are situated. The egg mass may be somewhat likened in form and position to the stone in a date. The arrangement is vertical, and the eggs in each layer have their anterior ends converging to one of the tunnels. If a nest be cut transversely these structures may be studied to better advantage. The mantis, unconsciously, and apparently with little effort, raises an incubator for her hundreds of eggs, which leaves us lost in admiration of her art.

THE YOUNG.

The nest remains for months, resisting all weathers until the day arrives for the baby mantids to emerge from their common cradle. When this happens, the young are seen to issue forth from the tunnels in the nest, and each is invested with a protecting skin for the lanky little legs and feelers ; but this sheath is almost immediately discarded by the insects as they hang suspended from the nest by minute silken threads.

The productiveness of the mantis calls for some consideration. Hundreds of eggs are deposited in a single nest by a female that is often able to build as many as two, or two normal and one half-sized nest in a single season. Despite this fact, however, there is never a superabundance of these useful and harmless insects. Considering the enemies that the young mantids have to contend with before and after they reach the outer world, it is not surprising that these insects are comparatively scarce. As if by some incomprehensible understanding swarms of ants are attracted to the nest just about the time that the hatching commences. Even before the mantids develop in the eggs, the long egg-laying tube of a tiny hopping chalcid wasp may desecrate their abode, with the result that many wasp-grubs hatch out and feed upon the eggs and nest. The mantids that are fortunate enough to overcome these and many other difficulties at once begin an active and free-roving life, the early stages of which are spent in frolicking about like a litter of kittens. They are quarrelsome little chaps, and, not content with successfully evading natural enemies, will often turn upon and devour one another. They also search for such small prey as the aphis, gradually tackling larger insects as they become older and their size and strength increase. Their growth is slow, and, after some weeks, wing-buds appear, which gradually assume a length more proportionate to the size of the insect. The full adult stage, however, is not reached till nine to twelve months after birth.

Robert Grant, a former employee of the Trustees of this Museum, recently passed away at the age of sixty-nine. He was born in Scotland, and while carrying on his duties as a gamekeeper to the Duke of Hamilton, he imbibed a love for natural history which he never lost. Coming to Australia as a young man he worked for some time as a miner, but soon abandoned that work and was employed by the Trustees as a collector. He made many excursions into the wilderness of Queensland and New South Wales, bringing back valuable collections and natural history notes on the districts visited. He was an accomplished taxidermist and in this capacity was subsequently employed at the Museum, where many of the exhibits are a testimony to his craftmanship. He retired from the Museum's service in 1917.

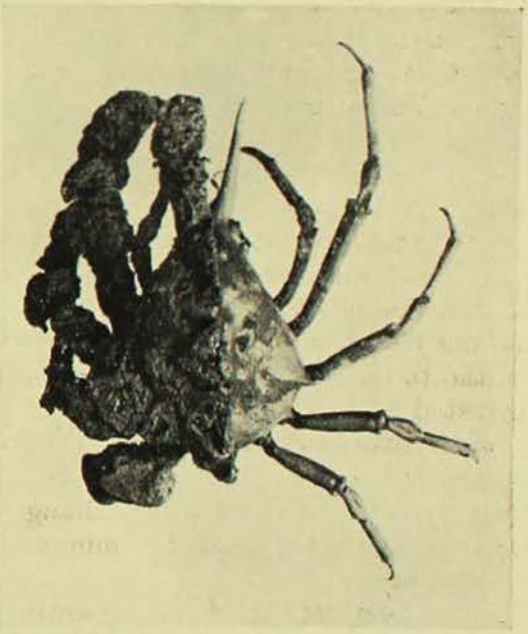
Crustacean Camoufleurs.

By Frank A. McNeill.

CAMOUFLAGE is a term which has only recently come into almost universal usage. It had its origin many years ago in France and, before the days of the World War, stood for the art practised by the people of that country in producing artistic but deceptive screen effects on the legitimate stage. On the outbreak of hostilities a new use was found for camouflage, and the term was expanded to embody all those well-known and elaborate measures adopted by the various belligerents for the protective colouring, screening, and covering of vital objects both in attack and defence. Just as the art has been developed by man, so do we find many parallel instances of its use among some of nature's more lowly organised children.

Mother Nature has paid particular attention to the crabs, for example, and many of them are endowed with wonderful modifications of structure which enable them to escape the notice of their enemies or creep unobserved upon their prey.

Many of the Spider Crabs are remarkably clever and proficient in their methods of disguise, and as a consequence are usually very sluggish in their movements. One of the common Australian representatives of this group of crabs is a species known as *Hyastenus diacanthus*, commonly called the Sponge Crab. It has a wide range along our eastern shores, occurring very plentifully in the bays and estuaries, and is very common in Port Jackson, where it frequently inhabits water over muddy bottoms. When captured, it is invariably found to be almost completely hidden under a luxuriant growth of marine life, principally various types of sponges. On close examination, it will be seen that the attachment of the disguise to its back and legs is effected by means of numerous, stout, hooked hairs, which are embedded in the substance of the hard shell. But if an example of the species were secured immediately after it had cast its shell, as it must often do, it would be found to be covered with a thick coat of these hairs; and their tips, instead of being curled over, would be seen to be almost straight. With the hardening process which takes place, these tips, like the tendrils of a vine, soon begin to curl and twine around the stems of marine growths placed in position by the crab.

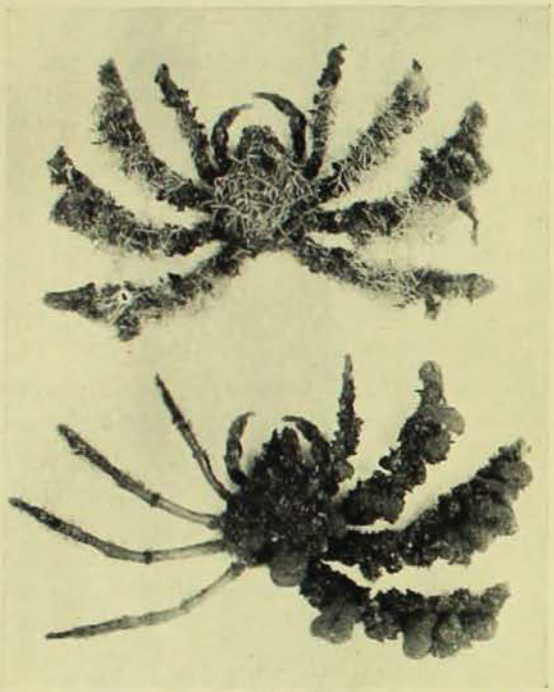


The Sponge Crab (Hyastenus diacanthus), with half of the body denuded of hairs and protective covering. One has only to block out this bared portion to obtain an impression of the shapeless appearance which the creature assumes in life.

[Photo.—*G. C. Clutton.*

With protective covering such as this the Sponge Crab is practically immune from attack as it lies huddled-up on the bottom, and the same tactics ensure it a meal when hungry if practised on an unwary prey. The animals which provide the cloak, however, are apt to grow if uncontrolled, and envelop their bearer—a contingency doubtless overcome by the crab pruning off superfluous portions. This would undoubtedly be

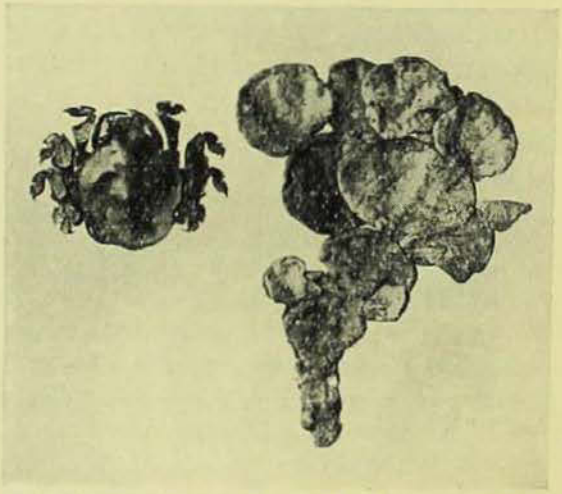
effected by means of the nippers, which curiously are never covered. Sometimes, however, mere pruning is ineffectual in controlling the growth of an ill-chosen cloak, and then the unfortunate bearer has to await the seasonal moulting, when the encumbrance is shed along with the disca ded shell.



Harlequin Crabs (Camposcia retusa). The upper example is disguised with a cloak of seaweed and sponges. Below is depicted a half denuded specimen, showing the stiff hooked hairs on one side and a dense mass of conglomerate sponge growth on the other.
[Photo.—*G. C. Clutton.*

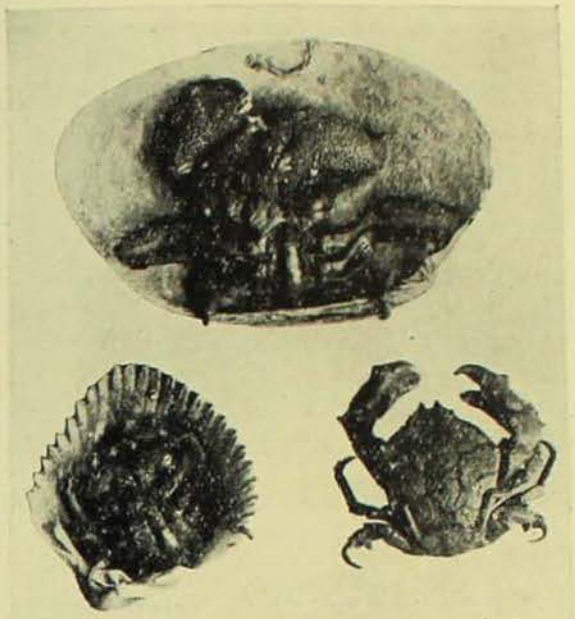
A near relative of the foregoing is the Harlequin Crab (*Camposcia retusa*) of the tropical Australian coast, which also possesses a growth of hooked hairs ; but these are much denser and coarser than those of the Sponge Crab. This species gathers unto itself a marvellously varied assortment of marine growths which cover it with a coat of many colours. The covering completely harmonises with the brightly tinted objects amongst which the Harlequin lives, and provides means of escaping unnoticed in any sudden emergency or disarms suspicion in the case of smaller prey. The Harlequin Crab stands alone amongst its kind as a master of disguise, and, as it lies quietly at the bottom of a shallow coral pool, with its legs and nippers (*chelae*) tucked in close to the rest of the body, its real identity is often unrecognised by the human eye. Collectors have time and again grasped what they supposed to be a beautiful conglomerate mass of marine life, only to discover that what they held was mostly crab.

With regard to the protective resemblance of form, it will be as well to mention here the peculiar adaptation of another Spider Crab called *Huenia proteus*, a species which exhibits a most striking example of modification in external structure. The carapace or shell is flat and extraordinarily variable in shape. In most of the males it is more or less triangular in outline, but in the majority of the females as well as in some males, it is broadened by leaf-like expansions of the lateral edges. This crab commonly lives among the seeweed, *Halimeda*, to the fronds of which it bears a striking resemblance in both form and colour. It is found only in the shallow reef waters of the Indian and Pacific Oceans.



The Halimeda Spider Crab (Huenia proteus), photographed alongside a portion of the seaweed from which it derives its name.
[Photo.—*G. C. Clutton.*

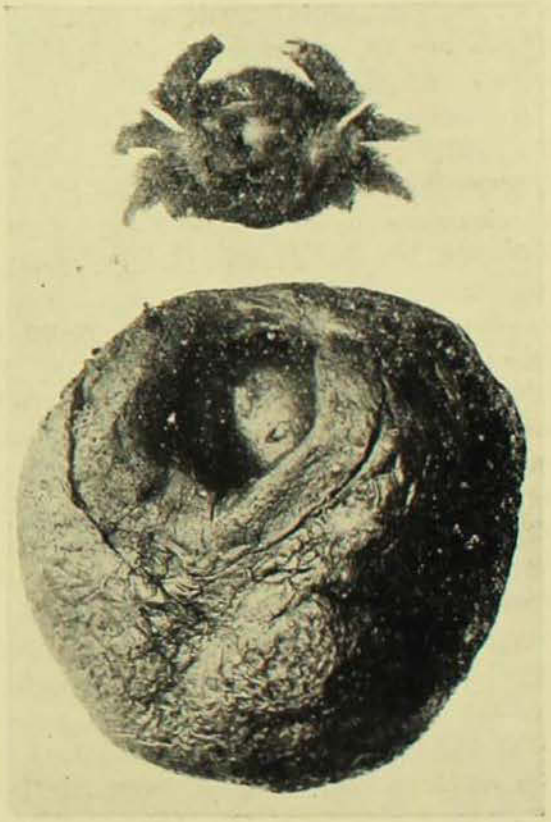
Among other crabs possessing the same habit of hiding underneath portable coverings are several species included in two allied families known as the *Dromiidae* and *Dorippidae*. In the former the various members lead a more or less sedentary life. The adults have the last pair or the last two pairs of legs short and placed in a most unusual position over the back, where they serve to hold a mass of living sponge or other marine growth.



The Shell-dwelling Crab (Conchoecetes artificiosus) belies its name, for its association with shells is purely for the sake of disguise, and the creature is just as active, or more so, when disengaged from such a weighty covering.
[Photo.—*G. C. Clutton.*

This forms an adequate cloak to protect and conceal the bearer, and is firmly secured by a pair of nippers on the hinder legs, which are very perfectly developed, sharp and strong, and, like those of the hand, are formed by the opposition of the terminal joints to prolongations of the last joints but one. As its name implies, *Conchoecetes* is a shell dweller, and there are several species which practise this peculiar mode of hiding. One can easily imagine the surprise of the naturalist who first discovered these peculiar crabs. The appearance of shells apparently walking along the shore must surely have tried his conscience had he happened to have been a little indulgent the night before. By a wonderful arrangement of the terminal joints of the second last pair of legs, as previously described, *Conchoecetes* is enabled to grasp the edge of the single valve of a bivalve mollusc, beneath which its presence when stationary would never be guessed. From a downward view the only visible signs of habitation are the two tiny terminal claws of the prehensile hinder limbs of the occupant, which overlap the edge of the covering. One species of the genus is fairly common in shallow water at low tide on the sand and mud flats of the north-east Australian coast, whilst others are widely distributed throughout the warmer seas of the Indian and Pacific Oceans.

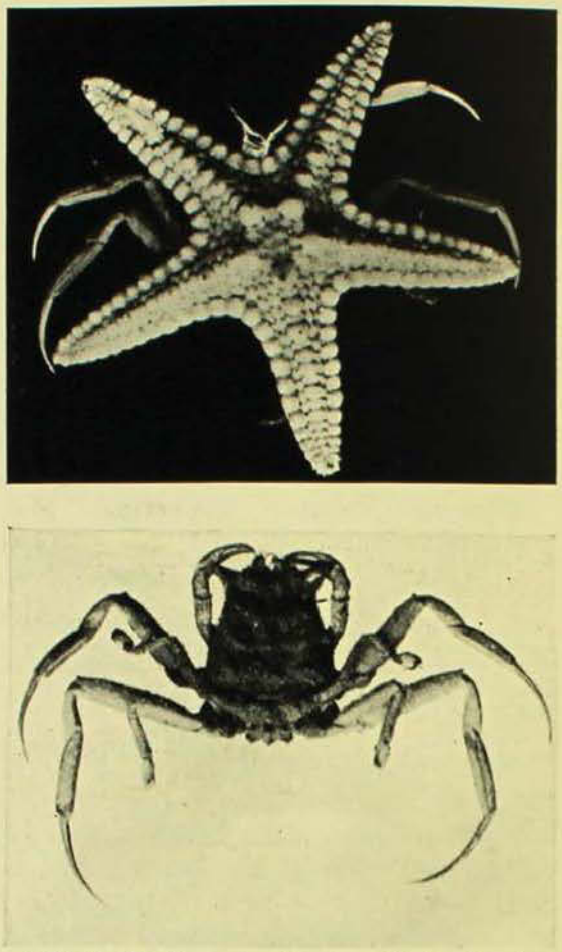
Another near ally of the foregoing is the Shaggy Crab (*Dromidiopsis excavata*), which invariably has a covering of either sponge, or a more or less bulky growth of a compound animal colony belonging to the class of the Ascidians. It is this latter covering which seems to give camouflaged crabs the most trouble. In many instances the ascidian colony assumes such comparatively huge dimensions as to seem more annoying than useful to the bearer. The whole body of this species is covered with a thick growth of coarse hair, and the back is beautifully rounded in shape. This fits comfortably into the cavity of its protective covering, giving the impression that the hole was cut to the order of the occupant. The species has a wide range along



A Shaggy Crab (Dromidiopsis excavata), showing the relation of its size to the comparatively huge dimensions of a covering consisting of a colony of compound ascidian. The crab has been extracted from the cavity it has created in its four-and-a-half inch wide enveloping cloak.
[Photo.—*G. C. Clutton.*

the eastern Australian coast, where it occurs in depths down to forty fathoms, and it is commonly secured in the nets of the trawlers.

In the crabs of the family *Dorippidae*, we find the hinder legs in a position corresponding to that of the same appendages of the members of the *Dromiidae*. These creatures are not so prone to the hiding habit as their near allies, and they are commonly secured without any covering other than an accumulation of silt, which probably helps to render them indistinguishable as they lie on the bottom. When coverings are affected, however, they are always novel in form, and of such a nature as to excite but little suspicion in the minds of natural enemies. A species occuring in the waters of the Malay Archipelago, and known as *Dorippe astuta*, has the peculiar habit of grasping a mangrove leaf with its hinder limbs in the same manner as *Conchoecetes* grasps a shell. With this covering held over its back for protection the crab offers an unusual spectacle as it moves along the shore. Another member of the genus (*D. dorsipes*) is not uncommon on the sand and mud flats in and around Port Denison, Queensland, and an example recently forwarded to the Museum by Mr. E. H. Rainford was captured whilst carrying a starfish on its back. Considering the nature of this covering, it is interesting to note here some of the impressions of the collector, which are vividly set out in a note accompanying the specimens. He writes that he was walking on the beach at low water when his attention was drawn to the erratic progress of a small starfish. It was apparently rolling and staggering about like a sailor "half seas" over. Accustomed to the demure, quaker-like movements of these creatures, Mr. Rainford could not fathom for the moment the true meaning of the scene he was witnessing. On closer examination, however, he found that the starfish was firmly held on the back of the crab by the four posterior legs, which accounted for its "unseemly conduct." He says that he admired the instinct which taught the crab to camouflage itself in this way, but could not but feel that in this case it fell somewhat short of perfection. He considers that a starfish is quite an unsuitable disguise for *Dorippe dorsipes*, which apparently finds its burden a clumsy one to balance, tending rather to attract than escape the eye of an enemy.



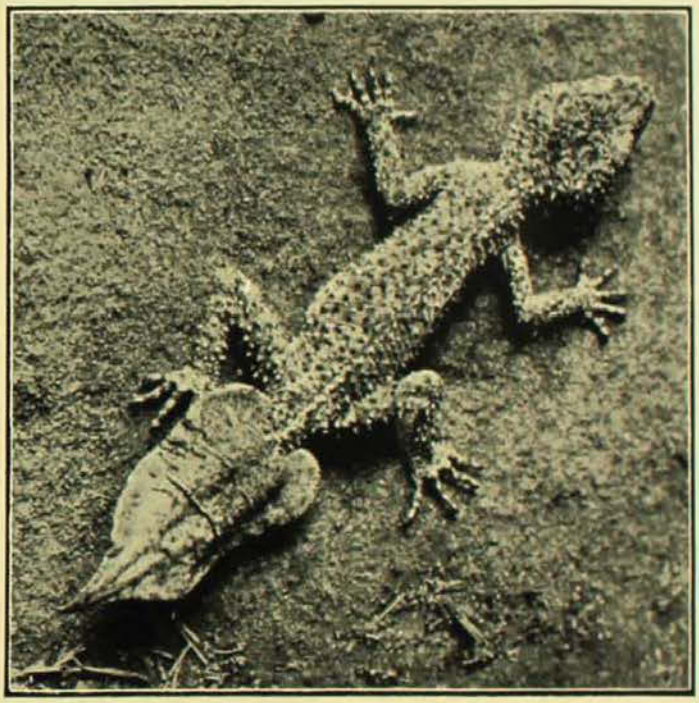
A Crab (Dorippe dorsipes), with its burden of starfish (Pentaceros nodulosus), as it was received at the Museum from the collector, Mr. E. H. Rainford. The lower illustration is that of a similar crab about the same size, and shows the wonderful prehensile modification of the hinder limbs.

[Photo.—*G. C. Clutton.*

Some Little Known Lizards—
The Geckos.

By J. R. Kinghorn.

MANY species of geckos are variously known throughout Australia as Rock Adders, Rock Scorpions, Wood Adders, as well as other frightful misnomers freely given by persons who are afraid of them, and who can relate highly coloured stories concerning their supposed poisonous properties. Many readers, therefore, will doubtless be surprised when they are informed that all geckos are harmless and inoffensive. These little creatures appear to have given rise to a greater number of fables and legends than have any other animals. So great is the fear of them among some native races that they are referred to as devils; they are almost worshipped as such, and the natives will not kill them for fear of possible consequences following on the death of one. In Egypt they were once widely known as "Abou burs," which means the father of leprosy. In spite of all these myths, science has proved, and most people now know, that the gecko does not possess any fangs, poison apparatus, or venom, nor does it secrete any irritant mucus. It might be as well to mention here that there is only one genus of venomous lizard in the world, and that is the Gila Monster (*Heloderma*) of Central America. Throughout Australia we have over sixty species of geckos, and it would be hard to determine which is the most common, but the accompanying illustrations may be relied upon to represent the two most typical forms, the broad, or leaf-tailed, and the cylindrical-tailed varieties.



Broad-tailed Gecko (Gymnodactylus platurus).
[Photo.— *J. R. Kinghorn.*

The reason they are seldom seen is that they are nocturnal in habits, living under loose bark or stones during the daytime, coming forth at night-time

only, in search of food. I have often seen the leaf-tailed variety, in wet weather, climbing up the walls of houses in search of a dry bed. Geckos may be freely handled, and in some countries are encouraged as pets, when they are allowed to crawl all over the inside walls of the houses where they eat up the flies. Occasionally, if cornered or frightened, these lizards open their mouths very wide and, by clicking the tongue against the roof of the mouth, emit a sound which resembles "yecko," hence the probable derivation of the name.

The gecko has a peculiar and very disconcerting habit of throwing off the tail when handled too roughly, or when too closely pursued by a hungry enemy. The discarded member continues to wriggle furiously for some time, thereby attracting the attention of the pursuer while the owner makes good its escape, and in its place a rather rudimentary one is grown. The colour and texture of the skin of these lizards affords wonderful protection, and at a distance of a few feet it is very hard to distinguish one of the broad-tailed varieties from any rough rock upon which it may be resting.

Their food consists of almost any small insect, especially the small beetles which may be found under bark and stones.

One of the Wood Geckos (Diplodactylus vittatus).

[Photo.— *J. R. Kinghorn.*

During the last year over 208,000 visitors were admitted to the Museum, whilst more than 2000 availed themselves of the popular lectures provided by the institution. The attendance and interest of school pupils is extremely encouraging. For these, arrangements are made to enable them to visit the galleries on Mondays, a day not available to the public, unless it be a holiday—so that the teacher-in-charge may make freer use of the exhibits than would otherwise be possible.

At the present time a considerable interest is being displayed in the recent discoveries at Luxor, Egypt. The opportunity is here taken to draw attention to those exhibits in the Museum's galleries illustrating the culture of the race which in the past inhabited that land. Amongst these exhibits may be mentioned the mummies, in their original coffins, our possession of which is due to the munificence of the late Sir Robert Lucas-Tooth, Bart.; a large series of ornaments presented by Mr. E. Wunderlich, trustee, in association with Mr. A. Wunderlich, some of which were previously described in THE AUSTRALIAN MUSEUM MAGAZINE; there are also examples of pottery and fragments of mural decorations.

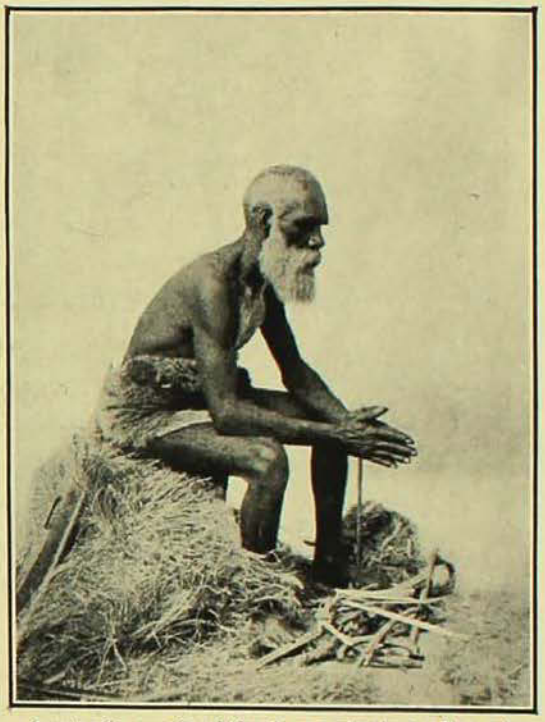
In the last issue of THE AUSTRALIAN MUSEUM MAGAZINE an appeal to our readers was made for observations regarding the Bulbul, an introduced bird which may, or may not, become a serious pest to our orchardists. The metropolitan press very kindly gave this appeal prominent notice in their columns. In response a number of replies has come to hand—all containing valuable information but there may be still some who, whilst possessing first-hand knowledge have not written. We would ask that they reply as soon as possible, for every detail, no matter how trivial it may seem, possesses some value.

Primitive Fire Production.

By William W. Thorpe.

IT is commonly accepted by students of ethnography that the production and use of fire, now so essential to us, was a comparatively late discovery of primitive man, and that our ancestors were for a very long time content to eat their food uncooked. How man first discovered fire is a subject for conjecture. According to classic mythology, Prometheus stole fire from Jupiter and conveyed it surreptitiously to earth concealed in a hollow tube. Less romantic and fanciful views are that the discovery was made by observing the result of a lightning stroke, the heat produced by the rubbing of trees in contact during a gale, or the sparks emitted by striking two hard stones together. In countries where active volcanoes exist fire would always be available, but in other parts of the globe man must have had other natural or artificial indications to guide him to its discovery. It is a curious fact that the Andaman Islanders although possessing fire when first brought into contact with civilised man, were no longer acquainted with the means of producing it, and the onus of keeping it alight devolved upon the women-folk, who in truth, had to "keep the home fires burning."

All methods of producing fire practised by primitive races are based on friction. The three principal fire-producing implements are the "drill," the "plough" and the "crosscut." The first named consists of two sticks, one placed horizontally on the ground and held in position by the feet of the operator, or the hands of an assistant; while another upright stick is rapidly twirled between the palms of the hands, working in a slight depression previously made in the horizontal one. A lateral slit, allows the surplus of triturated wood to fall away. As the speed is increased the wood begins to char, first smoke and then a spark appears; this is carefully nursed, blown upon, and tinder added to the spot until fire results. The writer has



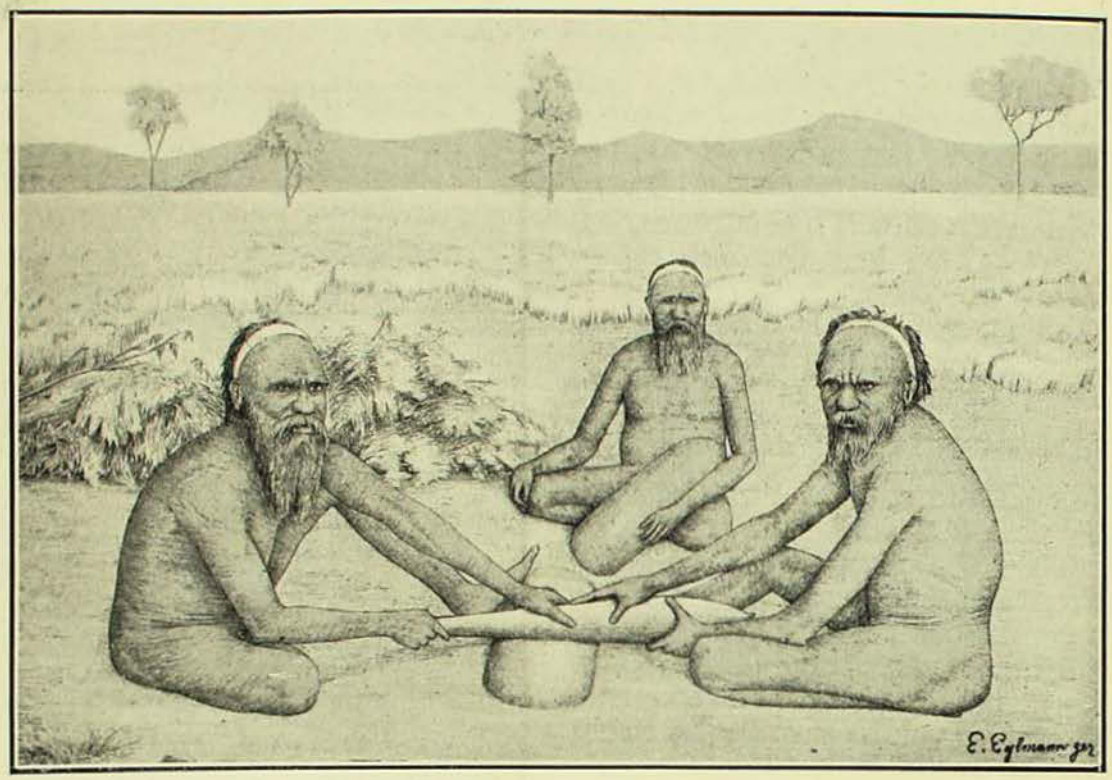
Australian aboriginal producing fire by "twirling."
[After *N. W. Thomas.*

frequently tried this method without result; the hands, in bearing on the twirling stick work down and the difficulty seems to be in recovering the top without losing speed of rotation. Our aboriginals used this method, and in Cape York the working ends are kept dry in a double sheath often decorated with red *Abrus* seeds.

The Eskimo produce fire by means of a rotary bow drill, the upper end of the spindle revolving in a bearing gripped by the teeth.

The "plough" outfit consists of a tongue shaped stick rubbed along a groove in a softer piece of timber. This is the method adopted by the Polynesians.

The "cross-cut" method, as its name applies, consisted in rubbing one piece of wood across another. Usually the nether timber is cleft and tinder is placed in the gap. The aborigines of Central Australia used a flat spear-thrower on edge across a soft-wood shield. A variation in this method is followed in New Guinea, where a



Arunta men (Central Australia) making fire by womerah and shield "crosscut."
[After *E. Eylmann.*]

Maoris employing the "plough" as a means of fire production.
[After *E. Tregear.*]

flexible cane is passed beneath a dried stick held under the feet, the cane being see-sawed up and down by each hand alternately. Sand is sometimes added to increase the friction.

The Tierra del Fuegians obtain sparks by striking together pieces of iron pyrites, while in the northern regions of America, pyrites and flint are used in conjunction.

This brings us to the practically modern method of flint and steel, still practised by some of the " old hands " in the bush. Perhaps the most remarkable of all fire-producing implements is the fire piston of the East Indies. It consists simply of two parts, a cylinder of brass closed at one end, and a neatly fitting plunger of the same metal. Some tinder is placed in the bottom of the tube and a smart hand blow, combined with pressure, produces fire by the compression of the imprisoned air.

In concluding this short description of fire-production it may be added that fire is ever associated with domestic felicity. The sentiments connected with our hearths and homes and the inglenook are universal, and civilised races have no monopoly of these feelings ; even our aborigines recognised that the marriage was ratified when, according to custom, the dusky bride had built a shelter and kindled a fire for her husband.

Life and Strife Among the Sea Birds.

By Arthur A. Livingstone.

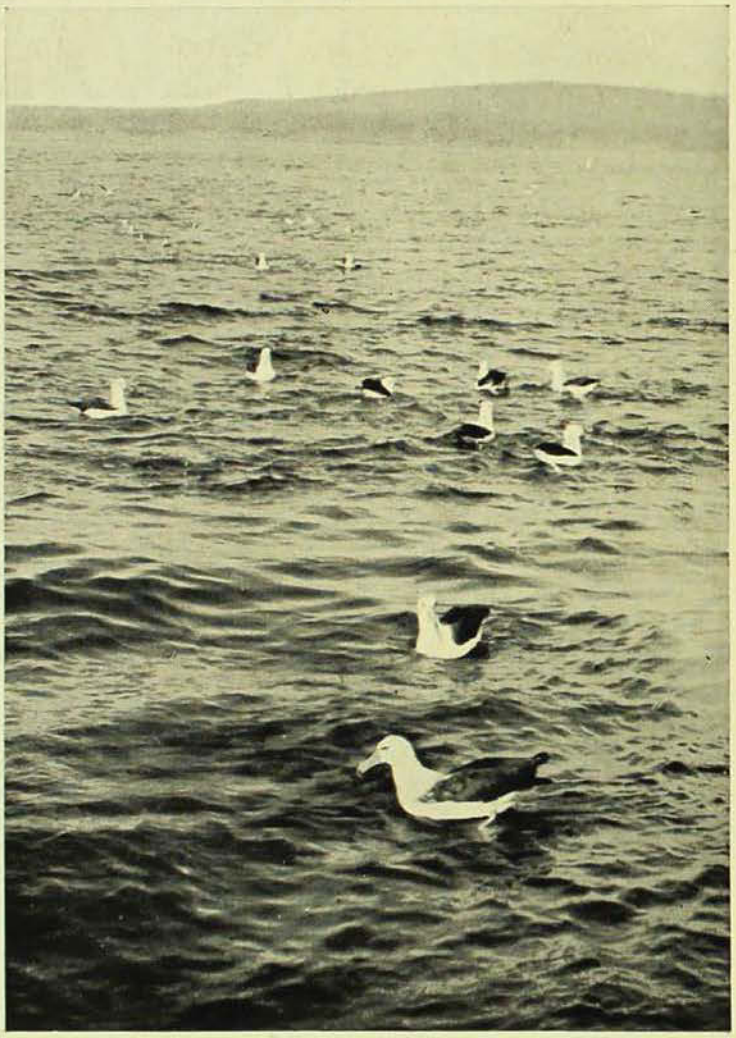
WHILST accompanying one of the State trawlers on several cruises off the coast of New South Wales, I have had excellent opportunities of observing the habits of some of the larger species of our sea birds. During the whole period of the cruises they were in constant attendance on the ship. The Black Eye-browed Albatross (*Diomedia melanophrys*) was in great abundance, and proved itself to be quite as active at night as in the daylight. This bird, known to the trawler's crew as the Mollyhawk, levied its tax on every haul. No sooner did the winch sound its warning than they gathered together close alongside, waiting to snatch up any fish that might become disengaged from the net. Of a naturally disagreeable temperament, they ever failed to evince an amiable disposition towards each other, and fought and squabbled over the fish they captured. On one occasion an unfortunate accident precipitated half of the trawler's catch over the side, providing food in plenty for the ever hungry birds. This untoward happening attracted a greater number of mollyhawks than usual, and they were to be seen sitting on the water, tearing at, and swallowing the floating fishes. When one fish seemed more tempting than another, they drove their weaker brethren away, and fought over it as if the sea was not covered with others equally good. All the time the noise they made, " poultering " down in the water, and squawking or quacking—I do not know which to call it—was deafening. No bird could really claim a fish as its own until it was safely within its stomach, which seemed to provide ample space for a prodigious feed of this kind. On one occasion I observed a bird greedily attempting to swallow a flathead which was much too large for its throat to accommodate. Ejection of the fish was prevented by the large backwardly directed spines on its head, and, after a fruitless struggle, the bird lay outstretched and exhausted on the water. Had it not been for the timely help afforded by its comrades, this bird must have choked ; but, prompted by greed rather than compassion, the rest of the flock pounced on the invalid, and tore the fish bit by bit from its mouth.

In their eagerness to obtain fish, these birds often approached within

reach of our hand-nets, and, on one occasion, a fine large specimen was secured and lifted inboard. When placed on the deck it was practically helpless, but uttered shrill cries of protest and flapped its wings in impotent efforts to escape from its captors. Though failing utterly to take wing from the deck, it soon proved its ability to rise from the surface waters of the sea when ultimately released overboard.

Mollyhawks measure as much as six feet from tip to tip of the wings, and lift their heavy bodies into the air much as an aeroplane " takes off " from the ground, assisting their gradual ascent by pushing backwards against the water with their broad webbed feet. They are very strong and graceful on the wing, and, though they scarcely seem to move their rounded pinions, they can fly in the teeth of a gale, now swooping into the dark troughs of the sea, now skimming over the white foaming crests.

Another bird particularly noticeable was the Giant Petrel (*Macronectes gigantea*), which paid the ship intermittent visits either singly or in pairs. In contrast to the almost uniform white of the Mollyhawk, from which they always seem to hold aloof, the colour of these birds was sooty-black, and their heavy orange-yellow bills seemed to be quite out of proportion to their shapely heads. They were as formidable as they appeared, and contact with them was always avoided by the mollyhawks. At times I was amazed to see a single Giant Petrel drive as many as six or eight of its larger antagonists away from a tasty morsel.



No sooner did the winch sound its warning than they gathered close alongside.

[Photo.—*H. O. Fletcher.*