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

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The AUSTRALIAN MUSEUM

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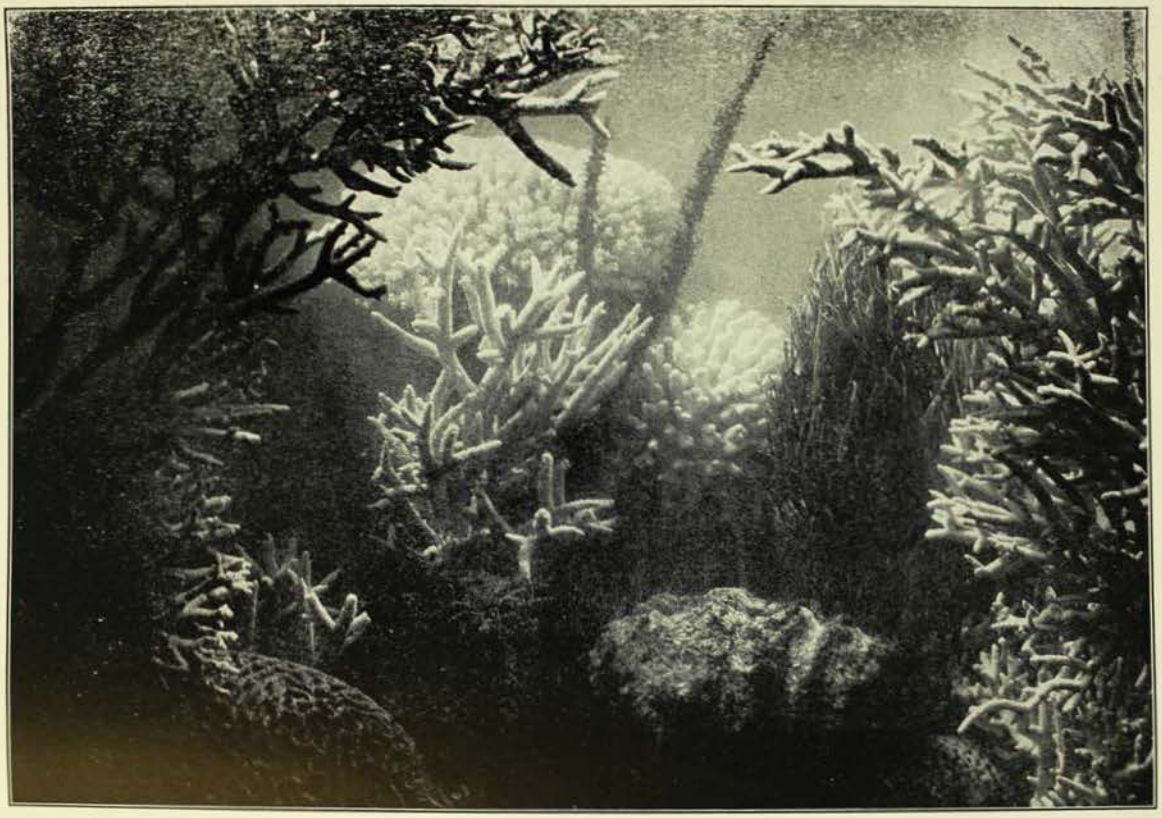

A submarine garden flourishing in the quiet depths of a coral pool. In such sheltered situations on the Great Barrier Reef, undisturbed by the surf, coral grows at its best and provides a charming background for the activities of bizarre fish, crabs, and the numerous other reef denizens.

[Photo.—*Frank Hurley.*

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VOL. III., No. 12. OCTOBER-DECEMBER, 1929.

Notes and News.

At the July meeting of the Board of Trustees of this Museum, Mr. Melbourne Ward was appointed an Honorary Zoologist on the staff. For some years past Mr. Ward has been an assiduous and successful collector on behalf of the Museum, and he has travelled widely in search of specimens, having visited California, Panama, the West Indies, and South America, besides much of the north-east coast of Australia. Through his generosity and untiring efforts many valuable marine specimens, particularly of the Crustacea, have been added to our collections.

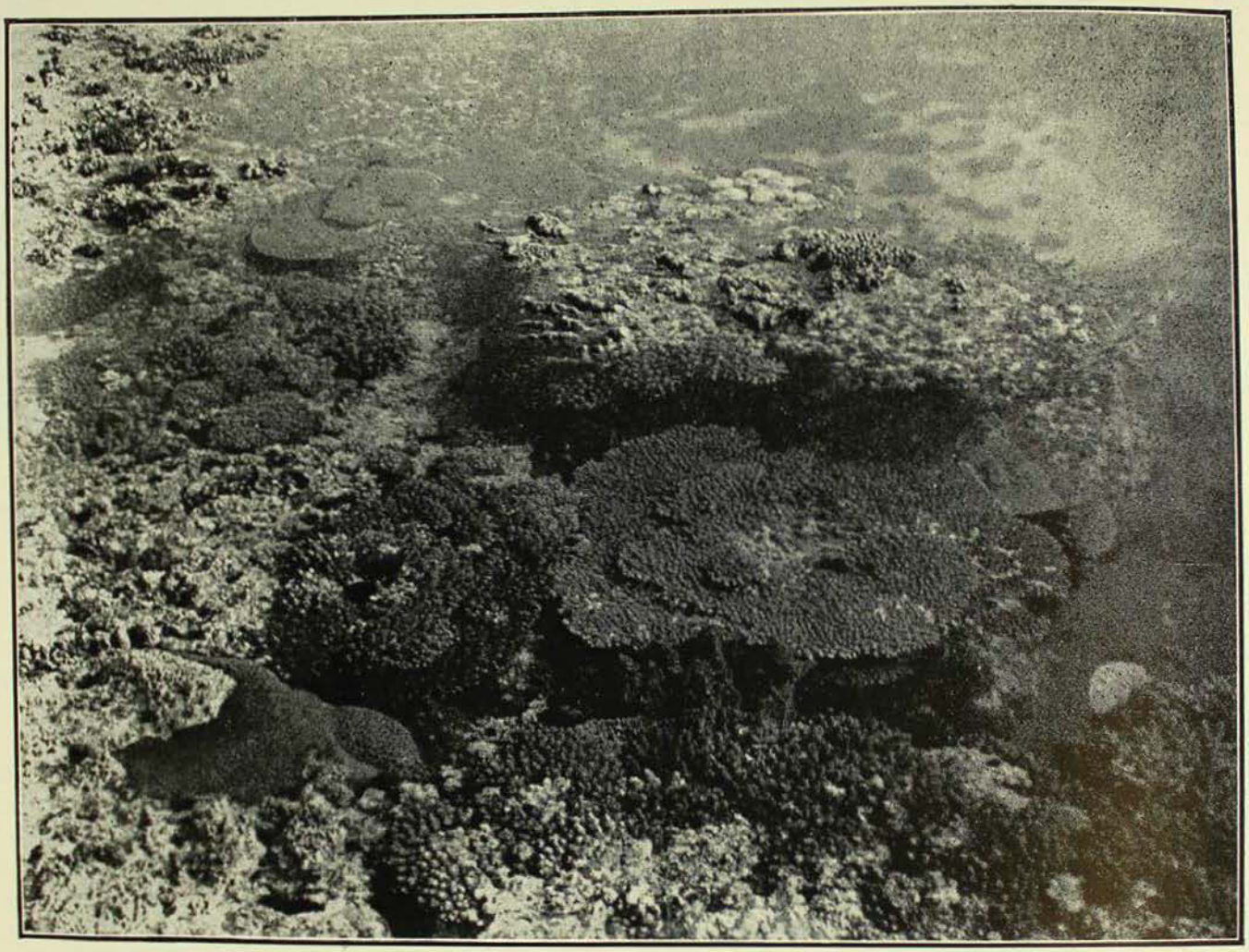
On the 9th September, Mr. H. O. Fletcher, Assistant on the Scientiffc Staff, left Sydney for Cape Town, where he joined the *Discovery*, which, under the leadership of Sir Douglas Mawson, will shortly leave for the Antarctic on a voyage of exploration. Mr. Fletcher has had considerable experience during his period of service at the Museum, and we have no doubt but that he will prove a useful member of the Expedition. His unfailing good humour and cheery optimism make him peculiarly fitted for an expedition of this kind.

Dr. H. Lyman Clark, of the Museum of Comparative Zoology, Harvard, Massachusetts, has been spending some months exploring and collecting along the north-west coast of Australia from Darwin to Broome. At his request, Mr. A. A. Livingstone, Assistant Zoologist in the Department of Marine Zoology, was given leave to join Dr. Clark, in order to assist him in his work, and to make collections for the Museum. From letters received we learn that the trip has been eminently successful, and should result in an important increase in our knowledge of the marine fauna of that part of our continent, which hitherto has been rather neglected by collectors.

Mr. W. W. Thorpe, Ethnologist, has been spending some time at the Auckland Museum, New Zealand, where he has been assisting in the installation of the ethnological collections in the new building.

The Reef Builder.

By W. Boardman.

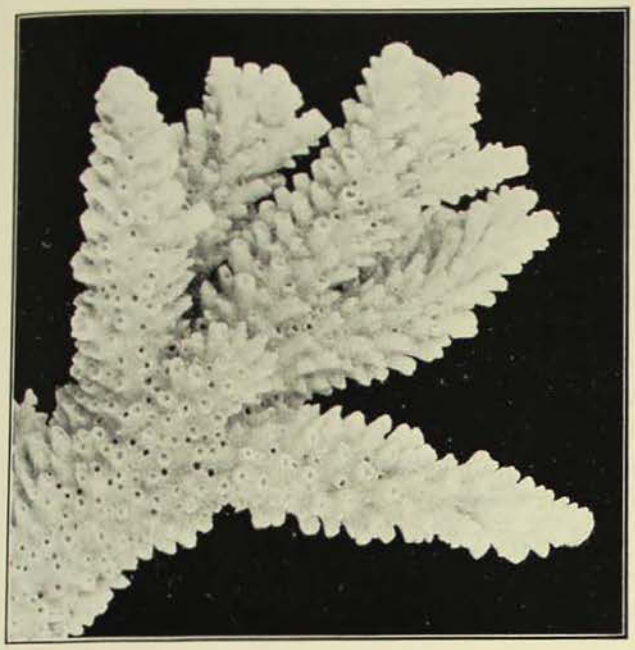


A shallow coral pool on the reef crest at North-west Islet, Capricorn Group. Tabular growths of Acropora, which may measure a yard or more across, are the most conspicuous form.

[Photo.—*A. Musgrave.*

THE Great Barrier Reef of Australia is well worthy of a place among the world's natural wonders. For twelve hundred and fifty miles, commencing in Torres Strait in the north and terminating at Lady Elliot Island in the south, this great rampart hugs almost the whole length of the Queensland coast, forming an effective barrier between the open Pacific and the mainland. And, presumably because most of the examples of Nature's architecture which come under popular notice are the work of industrious insects, the reef builder is vaguely and erroneously spoken of as the "coral insect": if not an insect then what is it?

Among the bric-à-brac used as ornaments in many homes one not infrequently sees pieces of bleached coral—pale, pathetic remains of one time delicately tinted growths which graced some quiet reef pool. These



The numerous pores or corallites, which in life each accomodate a complete coral animal, are clearly shown on this piece of bleached coral.

[Photo.—*A. Musgrave.*

MANTELPIECE SKELETONS,

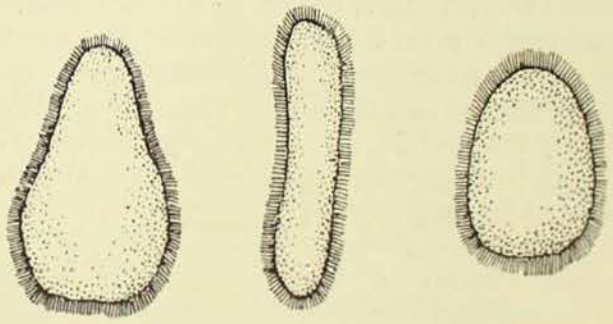
for skeletons they are, can tell us a little regarding the coral animal. Let us take one down, say, a branched piece, and examine it. A series of simple chemical tests reveals that we are handling a substance which is mostly carbonate of lime. Following that we notice that the surface is pitted with many pores ; each one of these pores is in life the home of a complete coral organism. The majority of corals are similarly colonial and large examples may be formed of an aggregation of many thousands of individuals. Examining a single one of the pores with a strong lens, we see that there is within it a peculiar arrangement of delicate partitions attached to the inner surface and converging inwards towards the centre like the spokes of a wheel, but not actually meeting ; between these is a series of shorter or secondary septa. Such is the cup or corallite within which the animal lives.

THE CORAL ANIMAL.

The beauty and tinting of living coral is bestowed on this limy form by the fleshy animal, which in itself is the acme of simplicity. Imagine resting within each one of the skeleton cups a hollow drop of firm jelly, perforated at its outer end by a small mouth aperture, which is surrounded by a circlet of fine tentacles, and you have a conception of the so-called "coral insect." The animals are not usually seen expanded during the daytime, having retracted their tentacles and withdrawn themselves down into the corallite. Only at night, and rarely during the day (if the colony should be in dark shadow) are the polyps seen extended, and then each individual looks like a little flower with adjacent ones so close that the skeleton is completely hidden as beneath a living bouquet.

Within the body there are no organs of any description, no heart, no lungs, no intestine, just a body wall enclosing a simple digestive cavity, with a tentacle-surrounded mouth.

The chief reason why the polyps are expanded only at night is because it is then that the microscopic sea life on which the animal feeds migrates to the surface layers of the sea. Any of these minute organisms sufficiently luckless to touch the waving and alert tentacles are at once enmeshed and conveyed to the stomach. Within the body nutrient matter from the prey is absorbed by the body wall, and any waste matter simply discharged into the sea through the mouth.



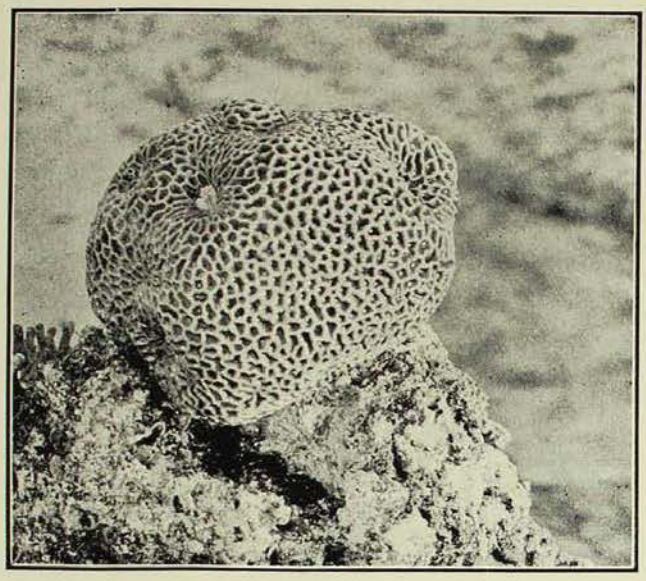
Free-swimming coral larvae (greatly enlarged) covered with vibrating hairs which propel them through the water. They ultimately settle down, and by secreting lime and budding give rise to a coral colony.

[After *Duerdin.*

HOW CORALS BREATHE.

The oxygen required for respiration is derived from that which normally occurs dissolved in the sea water. In addition what is thought to be another source of oxygen is provided by the thousands of rounded, brown microscopic plants, which live within the tissue of the polyps, especially in the vicinity of the mouth. These microscopic plants possess a colouring matter which enables them to make starch from water and carbonic acid gas in the presence of sunlight

During the daytime, in the shallow waters of the reef pools there is ample light, and carbonic acid gas, which is a waste product of animal metabolism, occurs plentifully, so this starch-making process goes on continually, and simultaneously large quantities of oxygen are liberated as in normal plants. The plants do not seem to harm the corals in any way, nor yet receive from them any particular advantage other than protection, giving in return a bounteous supply of oxygen. Truly an admirable example of natural harmony and balance.



One of the heavy, solid corals (Goniastrea pectinata). The individual corallites, which are much larger than those of branched forms, are conspicuous.

[Photo.—*A. Musgrave.*

THE GENESIS OF A COLONY.

The radial arrangement of the septa or delicate limy partitions is, of course, duplicated within the gastric cavity of the polyp, and it is on fleshy mesenteries situated between these partitions that at certain periods of the year masses of minute cells develop, one series towards the free edge of the mesenteries, the other more towards the base; the basal series ultimately develops into ova, the others into sperms. The sperms are liberated and are thus able to fertilize other colonies, but the ova do not move for some short time after fertilization, undergoing the earlier stages of their development within the body of the parent. The fertilized ova soon attain a stage known as the planula, and in this form are liberated, being passed through the mouth in successive batches into the surrounding sea water by muscular contractions of the parent. The free-swimming larva or planula is at first generally pear shaped, the entire surface being covered with rhythmically vibrating hairs or cilia which serve to propel it through the water. Later, a dimple appears at one end and gradually deepens within the body, so that shortly a hollow is formed which will ultimately be the stomach. After a few days free-swimming existence the larva becomes attached to some solid object, the mouth being at the free end, the tentacles commence to grow, and the process of secreting lime is commenced. The lime used in building the skeleton occurs in solution in sea water, but the process by which it is extracted and used is not completely understood. By and by a daughter polyp is budded off from the original stock, and so by a continual process of budding and lime secreting a coral colony, may be comprising thousands of individuals, is gradually formed.

FORM AND COLOUR.

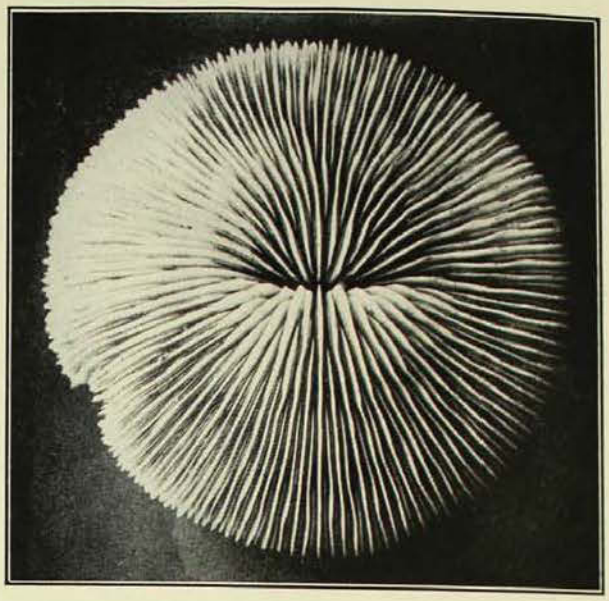
Coral is found in an amazing variety of forms. Some are branched, others occur as encrusting, globular, laminated, disc or cup shapes, and every conceivable intermediate stage. A fact which has caused no end of confusion in the separation and definition of species is that the same coral may have quite a number of distinct shapes according to the influences acting in its environment. What in the still waters of a deep pool thrives as a highly branched colony will, if exposed to the beat of the surf, be found as a shapeless branchless mass. As previously mentioned, most corals are colonial, but there are one or two notable exceptions, the best known of which is the mushroom coral (Fungia), a disc-like form which lies free on the sand in sheltered crevices among the coral. Specimens average five or six inches in diameter and show the arrangement of the septa to excellent advantage. During the daytime it seems to be just a skeleton, overgrown with a greenish film, but at night the comparatively huge polyp emerges and surprisingly long tentacles move and sift the water for food.

The colour of coral has always contributed much to the glowing accounts one reads of the gorgeous, tropic, marine gardens. Individually, however, most corals, though delightfully tinted, are not in themselves particularly bright, but when arranged in a setting with multi-coloured fish and sea stars, and the whole viewed through some fathoms of limpid water, a picture is formed which delights the eye and quite defies verbal description. Most of the heavy spherical forms, among which are the brain corals, are usually sombrely coloured, with greenish browns or yellowish browns, but the branching varieties display a pleasing range of tints in which greens, purples, and pinks predominate.

POSITION IN THE ANIMAL SCALE.

As might be surmised, the position of the coral animal in the scale of life is very low indeed. The lowliest of all animals are the mostly microscopic specks of jelly composed of but a single cell, of which dozens may often be seen in a drop of pond water. Above them are the sponges, nature's first real attempt at the formation of a body, and above them again, and all characterized by the possession of a primitive digestive cavity, an enormous group called the Coelenterata, among which are the corals. Also included in the Coelenterata, and related to the corals, are the zoophytes, the soft corals, jelly fish, and a number of other obscure animal groups.

Reef-building corals thrive in the warm shallow waters of tropic seas. Thirty fathoms is regarded as the maximum depth in which they can live, but the zone of prolific growth is in considerably shallower water.



The Mushroom Coral (Fungia) is of special interest in that it is not colonial but is composed of a single individual. The arrangement of septa present in corals generally is seen to excellent advantage.

[Photo.—*G. C. Clutton.*

THE ATOLL PROBLEM.

The origin of coral atolls, the foundations of which sometimes extend to great depths, has always been an attractive problem to scientists. Darwin advanced a subsidence theory to account for their existence, suggesting that the coral had established itself on subsiding high land, and as the land sank further the coral maintained its level with the sea and gradually laid the foundation of an island. To attempt a verification of this a bore was sunk on the Funafuti Atoll, the cores of which at a depth of over a thousand feet still contained reef-building corals—corals which live only in shallow water. Although scientists are not unanimous in their interpretation of the Funafuti results, there is more than a possibility that Darwin was right.

Honeyeaters of the Heath.

By K. A. Hindwood, R.A.O.U.

THE family of birds known generally as honeyeaters and scientifically designated Meliphagidae, is distinguished by the fact that all its members have a protrusible and partly cleft tongue, each half of which is divided into numerous stiff hairy fibres forming a brush. Whilst such a character denotes a habit of feeding on nectar and indicates an age-long association with an indigenous flora, it must not be supposed that honey-eating birds exist solely on this substance; indeed, many species feed extensively on insects, or fruit and berries.

In the Australian region upwards of seventy species of honeyeaters occur, and, as they are found in all types of habitats throughout the continent, from the dry interior to the open forests and luxuriant jungle clad hills of the eastern coast, it is apparent that there are marked contrasts in their habits due to conditions imposed by varying environments.

Heath country, really the flat tops of sandstone hills, or gently sloping plateaus covered with a stunted vegetation, largely composed of different kinds of banksia, is the favoured haunt of some six or more species of honeyeaters, especially during the early days of spring; then their spirited calls and lively movements give an added charm to a ramble among beautiful native flowers and strange flowering shrubs.

White Bearded Honeyeater (Meliornis novae-hollandiae). In the nest are two fledglings, open-mouthed, anticipating food from the parent.

[Photo.—*K. A. Hindwood.*

THE WHITE BEARDED HONEYEATER.

Perhaps the most commonly observed species is the White Bearded Honeyeater *Meliornis novae-hollandiae*, so named because of the long hair-like, white-tipped feathers of the throat and fore neck, and readily identified by a white iris. It is often seen in the same locality as the White Cheeked Honeyeater, *Meliornis niger*, a bird of similar appearance and habits, but easily recognised by a prominent fan-shaped shield of white feathers below the eye. In the White Bearded Honeyeater this is replaced by a much smaller tuft adjacent to the base of the bill, with another tuft on the side of the neck. Both birds have striated markings on the underparts, and to a lesser degree on the back. The outer edges of the wing feathers are tipped with golden yellow. Except in the severe months of winter the White Bearded Honeyeater breeds throughout the year; usually several pairs nest in close proximity to one another, building their cup-shaped nests of dried grasses and strips of bark, occasionally held together with cobwebs and spider's egg bags, within a few feet of the ground. Invariably nests are lined with the rust-coloured, velvet-like tufts covering the dead flowering spikes of certain species of banksias, a happy choice, for, apart from

Tawny Crowned Honeyeater (Glycyphila fulvifrons) admiring her two babies.

[Photo.—*K. A. Hindwood.*

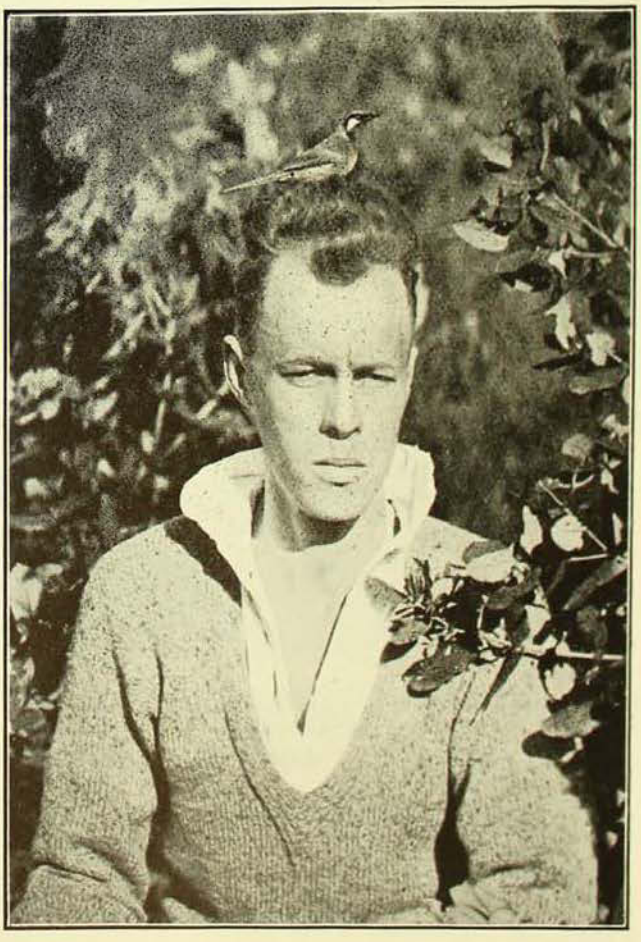
its warmth, it displays the delicate beauty of the two pale pink eggs, sparsely touched with magenta spots.

When breeding this bird does not maintain the right of territory, a trait of many species, to any degree, and seldom does it express alarm or agitation when disturbed.

THE TAWNY CROWNED HONEYEATER.

In size and external appearance the nests of the heathland honeyeaters are much alike, but there are minor and fairly constant differences which at once distinguish them. That of the Tawny Crowned Honeyeater, *Glycyphila fulvifrons*, is composed outwardly of strips of old bark, dried blades of old grass, and finer grass stalks, giving even a new nest an appearance of age. Often the nest is cosily lined with a white downy substance, the seed cases of a shrub, *Petrophila pulchella*, common on the heath, and not unlike the better known "drum sticks" plant, *Isopogon aneathifolia*. An average nest measures approximately four inches in diameter; the actual nesting cavity is two inches across and of a like depth. The eggs, two in number, are a lustreless white, blotched with dull pink overlaid with darker spots, mostly towards the larger end.

Tawny Crowned Honeyeaters nest in the open, grassy heath, covered with a scattered vegetation and generally build within a few inches of, and seldom more than two feet from the ground. Prior to nidification they congregate in flocks of a dozen or more birds, and it is an experience rarely to be surpassed to hear them singing, not in unison, but haphazardly, their rich, tinkling, bell-like notes, of great variety, remindful of a small boy toying with a flute. A peculiarity of the Tawny Crowned Honeyeater is its habit of flying a hundred feet or so in the air; with beating wings it will then flutteringly descend more like a song lark than a honeyeater; if



White Eared Honeyeater perched on the author's head plucking hair with which to line its nest. A self-portrait taken by means of string attached to the shutter release.

[Photo.—*K. A. Hindwood.*

watched it will often be seen to approach its nest from the ground also in a lark-like manner. The latter habit is probably due to the openness of the country in which the bird nests.

The Tawny Crowned Honeyeater, as its name implies, has a reddish, fulvous forehead, a whitish streak above the eye, a black patch behind the eye, and a white throat. The feathers of the breast and side of the neck are of a blackish brown colour edged with white, giving these parts a mottled appearance, those of the upper back or mantle are dark brown with paler centres.

White Eared Honeyeater (Meliphaga leucotis) at nest in Dwarf Apple Gum (Angophora cordifolia).
[Photo.—*K. A. Hindwood.*

THE WHITE EARED HONEYEATER.

The White Eared Honeyeater, *Meliphaga leucotis*, shows a decided liking for heathland extensively covered with Dwarf Apple Gum, *Angophora cordifolia*, and interspersed with moderately tall trees. The nest of this species is often placed in an apple gum. The foundation of the structure is commenced with a few broad and, generally, decayed leaves, sometimes pieces of paper, the rest of the nest being built of stringy bark fibres, and lined with animal fur when it is possible for the bird to obtain this material.

White Eared Honeyeater perched on twig above nest.
[Photo.—*K. A. Hindwood.*

So strong is the instinct to line the nest with fur that the White Eared Honeyeater will even perch on one's body and head searching for wool and hair. There have been many records of such happenings from the neighbourhood of Sydney, several further afield, and some instances from Victoria. Personally it has happened to myself at least half a dozen times in two years, and my experiences with this attractive bird are interesting and not a little amusing. While watching the shy Heath Wren, *Hylacola pyrrhopygia*, at Middle Harbour, near Syd-

Yellow Tufted Honeyeater (Meliphaga melanops) at nest.
[Photo.—*K. A. Hindwood.*

ney, during August of last year, I was surprised to see a White Eared Honeyeater perch within a few feet of me. How great then, was my astonishment when it flew to my head and vigorously attempted to remove some hair. My two companions who were nearby displaced their hats and " Whiteear " visited them both. Meanwhile I hastily removed my socks, placing them upon my head, and on returning to me the bird, a female, was able to obtain the much sought for nesting material.

During August of this year I visited the same area and again experienced the pleasure of having a wild bird alight, not only on my head, but on my arms, body and legs. In endeavouring to test the boldness of the bird, I walked slowly away ; she remained on my head, an increase in speed causing her to fly to a nearby sapling, and then follow closely behind me, protesting in a voice, which, in tone, was very much like the cry of a petulant child. The moment I stopped she unhesitaingly flew to my body or head.

It appears that the female on such occasions always calls the male, a similarly plumaged, though larger bird, who, though obviously curious and probably somewhat alarmed, plays the role of an interested onlooker.

The general colour of the White-Eared Honeyeater is dark green above, with the underparts inclining to an olive yellow ; the throat, neck and face, excepting a conspicuous white ear patch, black. The presence of one of these birds on the topmost branch of a sapling uttering its very loud call notes, " Tchoo o, Choo-del-oo," is an indication that a nest is nearby.

THE YELLOW TUFTED HONEYEATER.

Strictly speaking, the Yellow Tufted Honeyeater, *Meliphaga melanops*, cannot be considered a bird of the heath ; it seems to prefer sloping hillsides covered with thick underscrub and an open growth of trees. Sometimes it will build close to the earth,

though more often in a small shrub some three or four feet high. The nest is cup-shaped and composed of strips of bark, grass and spiders' cocoons, and lined with fine grass stalks and feathers. The two, occasionally three, eggs, may vary somewhat in colouration ; mostly they are marked with dark red spots having an underlying colour of light purple on a white or pale pink ground. Of an active disposition, especially during the breeding season, which lasts from August until December or even later, Yellow Tufted Honeyeaters often congregate in small companies or flocks. They delight in darting through the scrub, incessantly chattering ; it is an unforgettable sight to watch them playing on a quiet spring morning when the dew-drops are still clinging to the foliage. In the autumn and winter months they leave their erstwhile haunts for the wooded gullies ; here among the outer foliage of tall eucalypts, they unobtrusively seek insects and blossoms, and the delightful simplicity of their colourful plumage of olive greens and yellows imparts to the sympathetic observer a sense of the real beauty of nature.

Review.

Snakes of Australia. By J. R. KINGHORN, C.M.Z.S. $5\frac{1}{2}$ x $3\frac{3}{4}$ inches. Angus and Robertson Ltd., Sydney, 1929. 10/–.

This little pocket manual by a member of the Museum Staff, supplies a need that has often been felt by naturalists, professional and amateur, by medical men, and by country dwellers, who now and then come into contact with snakes in their native haunts and wish to know something about them. It is sixty years since Gerard Krefft, Curator of the Australian Museum, published *The Snakes of Australia*, and thirty years later the late E. R. Waite, then of this Museum also, brought out his *Australian Snakes*. Since that time the list of described species of Australian snakes has been considerably lengthened. In the book under review thirty-four non-venomous and one hundred and five venomous snakes are described. It will be observed that we have many more of the latter kind than of the former.

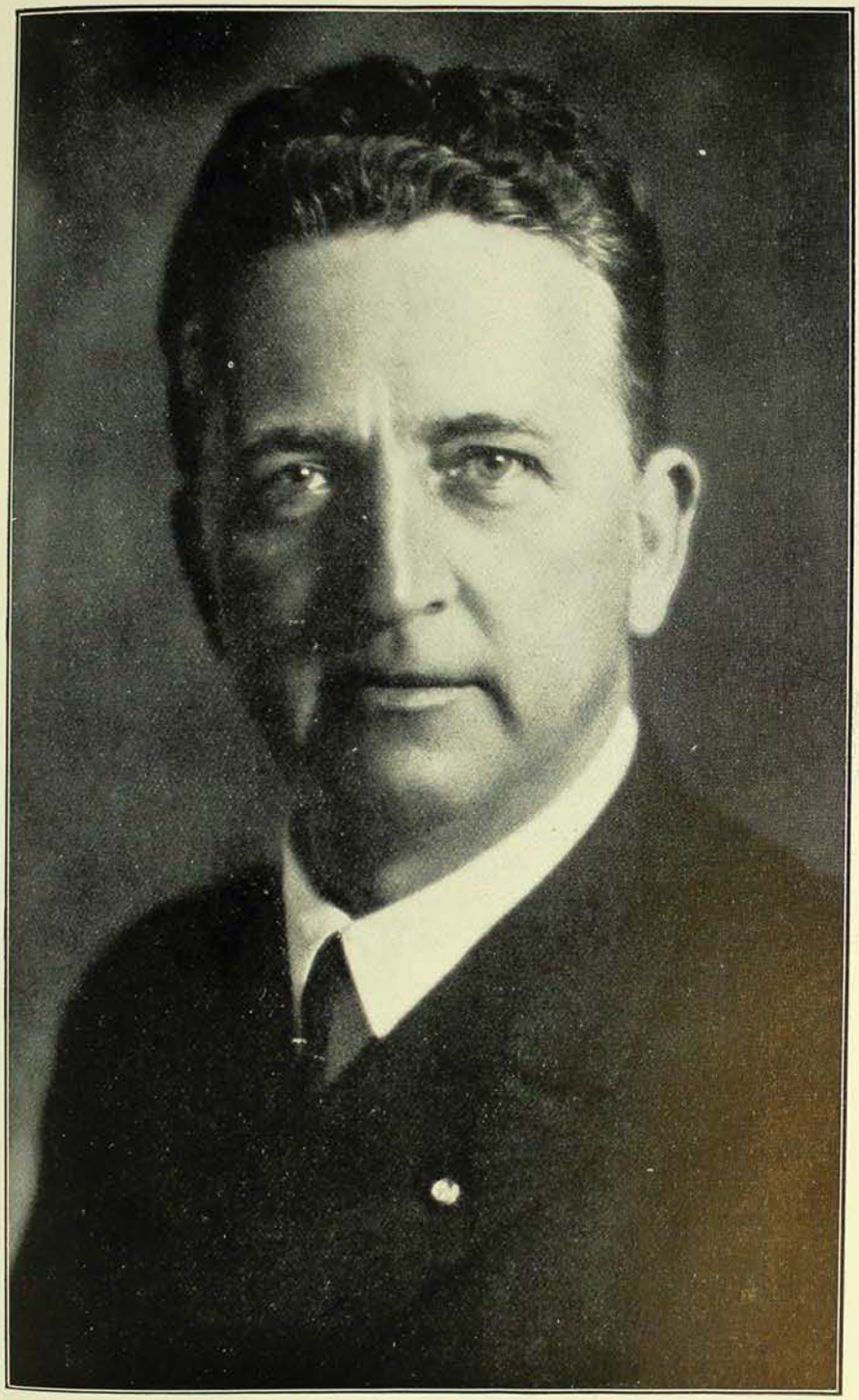
In the introduction Mr. Kinghorn gives a brief description of the characteristics of snakes, their structure and habits, and discusses some popular beliefs and fallacies regarding them, including a short account of aboriginal myths and legends. This is followed by a useful discussion of venomous snakes, their venom apparatus, the action of snake poison, and remedies and procedure in case of snake bite. He points out that the most dreaded Australian species is the Death Adder (which he prefers to call Deaf Adder), the mortality from its bite being fifty per cent. The second most dangerous is the Tiger Snake, the Brown Snake coming third. Then follows a useful key to the genera and species of Australian snakes ; by its aid the layman will be materially assisted in identifying any snake that he may encounter.

The body of the work is taken up by a systematic, but necessarily brief, description of the various species, particulars being given of their habits, scalation, colour, size, food, and distribution.

This extremely useful book is well printed and illustrated by more than a hundred fine colour drawings by Miss E. A. King, in addition to photographs by Mr. G. C. Clutton, and text figures by the author. Mr. H. A. Longman, Director of the Queensland Museum, who is himself an authority on Australian reptiles, has contributed the foreword.

Deep Sea Exploration on the "Dana."

By T. C. Roughley and G. P. Whitley.



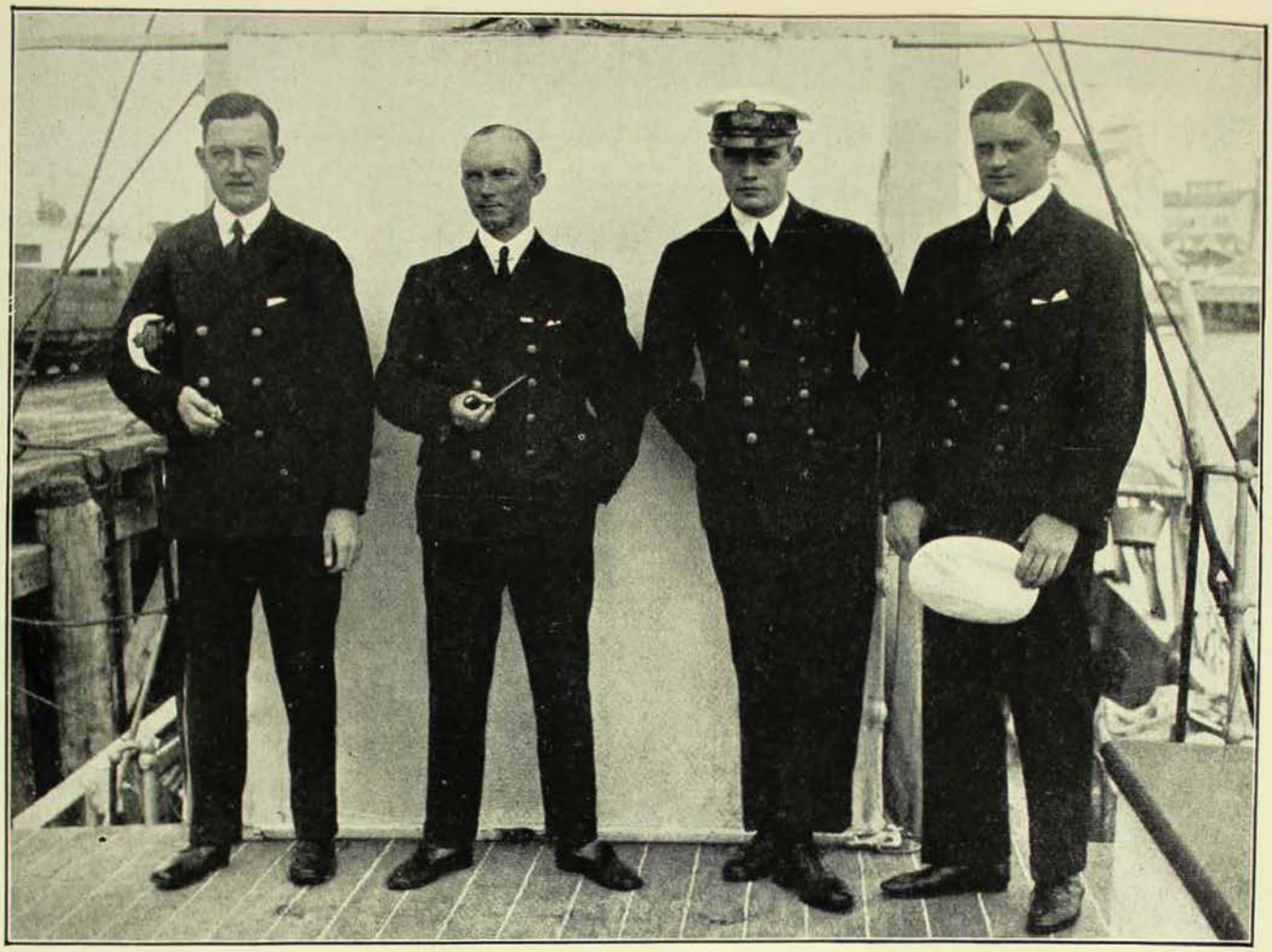
Professor Johannes Schmidt, D.Sc., Director of the Carlsberg Laboratory, Copenhagen, and leader of the "Dana" expedition.
[Photo.—*Tornquist*, Auckland.

THE inhabitants of the great abysses of the ocean have always had a peculiar fascination for man, and until quite recent times they have been enveloped in mystery. Many and varied were the conjectures regarding these mysterious denizens of the deep, and in the absence of reliable information man's imagination had full sway. The vast oceans have been the birthplace of enormous sea-serpents and comely mermaids, and many sailors have returned with graphic descriptions of their encounters with these weird creatures.

Is it any wonder, then, that scientific men have brought all their resources to bear on the probing of the ocean's mysteries in an endeavour to arrive at a true estimate of the creatures which inhabit those dark and dismal depths ?

PREVIOUS INVESTIGATIONS.

Oceanographical exploration may be said to have begun with Captain Cook, who during his voyage of discovery in 1768 made both temperature observations and deep sea soundings. Following Cook, a long line of distinguished biologists set out on voyages of marine exploration. Mention may be made of the voyage of the " Beagle " in 1832, on which Charles Darwin sailed ; the voyage of the " Erebus " and " Terror " to the Antarctic in 1839, under Sir James Ross ; and that of the " Rattlesnake " in 1846, with Thomas Huxley on board. But the greatest expedition of all time was that of H.M.S. " Challenger," which set out from England in 1872, in order to explore all the oceans of the world, to study the animal and plant life which they contained, and the conditions which governed their existence. Many scientists of note accompanied this expedition, which was led by Sir Wyville



The scientific staff of the "Dana" expedition. Left to right, Mr. A. F. Bruun, (zoologist), Dr. P. Jespersen (senior zoologist), Mr. E. Nielsen (botanist), Mr. H. Thompson (hydrographer).

[Photo.—*T. C. Roughley.*

Thomson. The " Challenger " sailed over the oceans for three years, covering in that time 69,000 miles, and the results obtained marked a new era in oceanographical exploration. The great " Challenger " reports form a solid basis on which all modern deep-sea research has been built. Nets were towed even in the great abysses of the ocean, and much light was thrown on the strange inhabitants of those regions.

Since the " Challenger " expedition a number of similar, though less pretentious, voyages of marine exploration have been made, the British, Norwegian, Danish, and German nations predominating. A great incentive to marine exploration was given in 1901 by the formation of the " International Council for the Exploration of the Sea." The nations participating in this council embrace Great Britain, Denmark, Norway, Sweden, Finland, Germany, France, Holland, and Belgium. Although the principal objective of this Council is the scientific investigation of the fisheries of the North Sea, nevertheless, marine exploration in waters farther afield has received great encouragement and a definite stimulus.

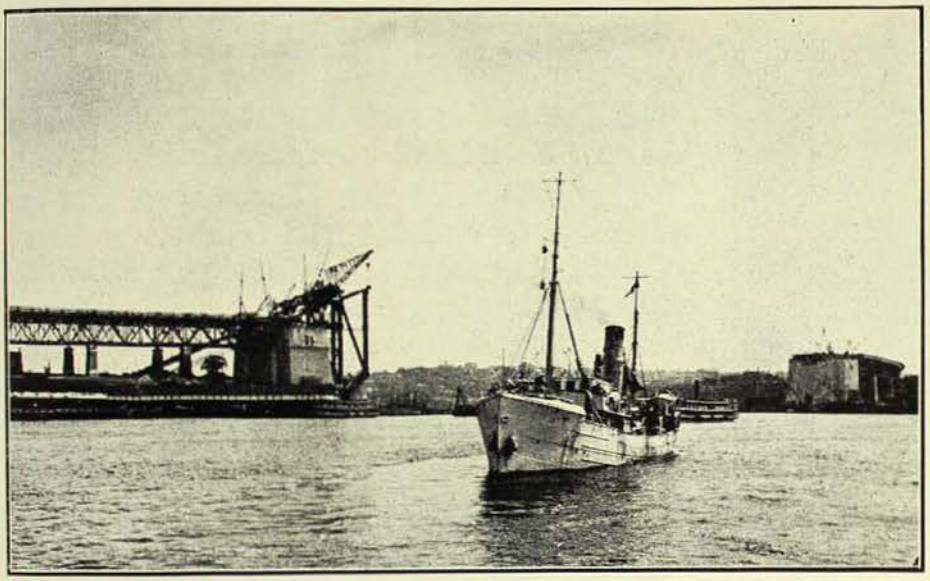
THE DANISH EXPEDITION.

As a contribution to the work of the International Council, Denmark last year decided to carry out a two years' investigation of the oceans of the world, and on the 14th June, the Danish research vessel, " Dana," left Copenhagen to begin her long voyage. The " Dana," which is specially fitted for oceanographical work and marine exploration, is a trawler of the " Mersey " type, and displaces 360 tons. She was built in Glasgow, in 1918, and was used by the British Admiralty as a mine sweeper during the war. She was purchased by the Danish Ministry of Agriculture and Fisheries in 1920.

The expedition is under the leadership of Professor Johannes Schmidt, the Director of

the Carlsberg Laboratory, Copenhagen, who is a recognised leader in the science of oceanography in the world to-day. Amongst other marine researches, his discovery of the spawning grounds of the European and American eels is one of the most notable contributions to marine biology made during recent years.

In addition to Professor Schmidt, the scientific staff consists of Dr. P. Jespersen and Mr. A. Bruun, whose work embraces a wide field in marine zoology ; Mr. H. Thomsen, who carries out the hydrographical work ; Mr. E. Nielsen, who investigates the plankton organisms ; and Dr. Andersen, the medical officer, who assists in general zoological work.



The Royal Danish Research Steamer "Dana" leaving Circular Quay, for her investigations in the Tasman Sea. The beginnings of the Sydney Harbour Bridge form an imposing background.

[Photo.—*Mrs. Ove Lunn.*

The " Dana " first crossed the Atlantic, then proceeded through the Panama Canal to the Galapagos Islands, thence to the Marquesas, Tahiti, Raratonga, Samoa, Union Islands, Fiji Islands, New Caledonia, Kermadec Islands, New Zealand to beyond the South Island, and arrived in Sydney on February 12th, 1929. Prior to reaching Sydney, observations were made at sixty-four stations along the route, and many extraordinary fishes and other types of marine life were captured, some of them at very great depths.

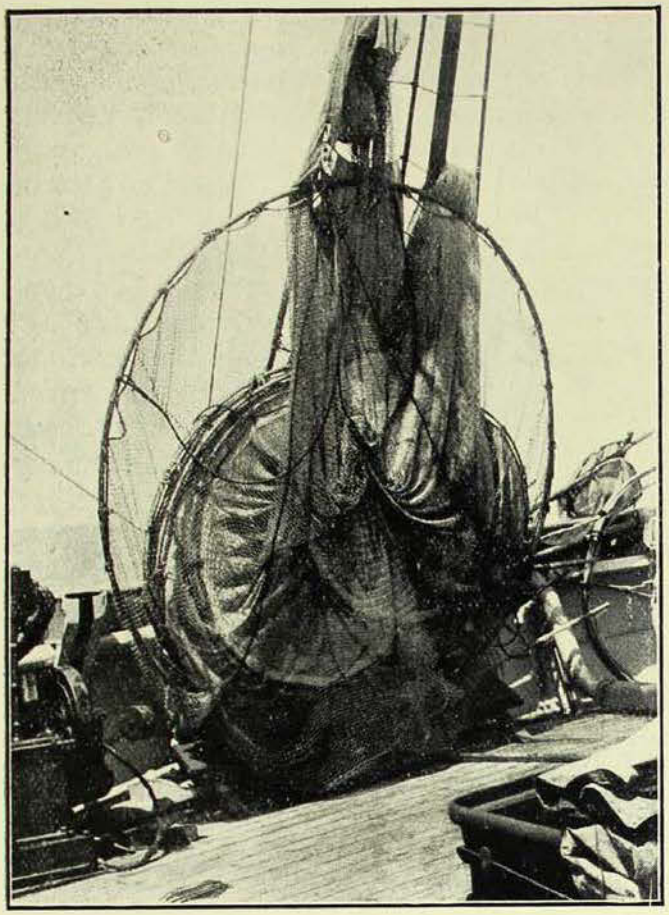
The " Dana " is probably better equipped for marine exploration than any vessel which has visited Australia since the " Challenger " explored these waters in 1874. Not since that time has an opportunity presented itself to study the technique of deep-sea investigation in its various branches, and, therefore, when Professor Schmidt invited us to accompany the " Dana " on a cruise out from Sydney we accepted with alacrity. With high spirits and keen anticipation we left Sydney on Saturday, February 16th, and made for a station about 200 miles east of Sydney, but soon after clearing the heads a strong wind and a heavy sea tended to dampen our enthusiasm, and our disappointment was complete when, on arrival at the appointed station, it was found that the sea was too rough to allow any work to be carried out. After cruising about for some time, without any promise of calmer weather, it was decided to return to port. We arrived in Port Jackson at midnight on Monday, February 18th, much sadder and little wiser for our experience.

The elements having denied us an opportunity of gaining the information we desired, Professor Schmidt kindly invited us to accompany the " Dana " to Brisbane, and this invitation we gratefully accepted, but, it must be admitted, with somewhat less enthusiasm than previously.

Leaving Sydney in a bright sun and a gentle north-east breeze, we again made for the station 200 miles east of Sydney, where in delightful weather we fished at depths from 4,500 metres (approximately $2\frac{3}{4}$ miles) to near the surface. In addition, a complete hydrographical survey of the water from near the bottom to the surface was made, and much plankton material collected.

A CYCLONE AT SEA.

Having raided these waters of some of their most guarded treasures, the ship's course was set north, where it was intended to carry out similar work about 200 miles east of Brisbane. But the elements did not long remain kind to us. On the fourth day out from Sydney we encountered a heavy sea which made our passage difficult, and when, after a severe tossing about, we at last reached our goal, the sea was so rough that



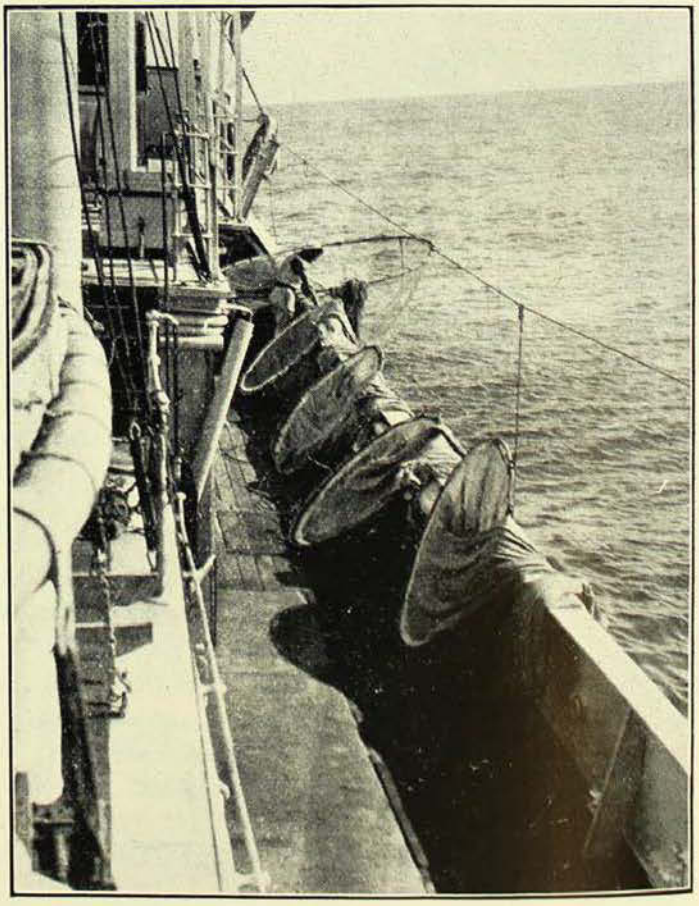
The large conical nets, attached to circular iron frames, hanging on board the "Dana" prior to use.
[Photo.—*T. C. Roughley.*

work was rendered impossible. After waiting for some time for more favourable conditions without success, the " Dana " was turned west for Brisbane. Worse was yet to come. We woke on the morning of the 28th February to find ourselves in one of the worst cyclones ever known in these waters. With every outlet securely closed, the stuffiness of the cabins was appalling ; yet there was no comfort on deck ; heavy seas were breaking over the gunwales, the pitch of the boat made standing hard work, and the effect of the howling wind, blowing the tops of enormous rollers into surf and carrying it along for hundreds of yards, was not pleasant to look upon. For two days we battled against these seas, not knowing where we were, and wondering if ever they would cease their raging, and then at dusk on the second night we found ourselves within signalling distance of the Cape Byron light in New South Wales. The boat was headed north and little sleep was obtained that night. When dawn broke, a bright sun shone on the waters ; they had lost their fury and heaved, as it were, with the exhaustion of their mighty efforts. Thoroughly relieved at our escape from the cyclone as we steamed serenely towards Brisbane, we gathered on deck and drank the old Viking toast, " Min Skaal, din Skaal, alle smukke Pigers Skaal " (Here's to me, and to you, and to every pretty girl).

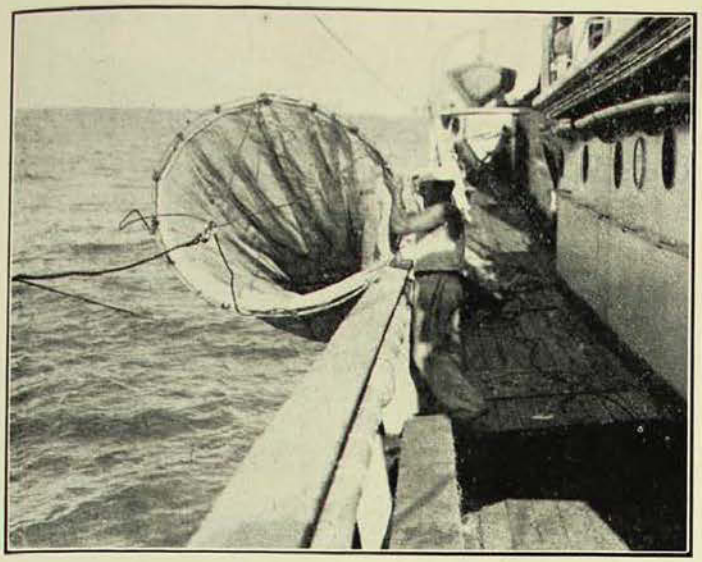
FISHING.

Fishing is divided into two classes, deep hauls and surface hauls. Deep hauls extend from the greatest depths up to within 600 or 700 metres of the surface, the latter being attained with 1000 metres of wire out ; surface hauls embrace the region above this depth. Both hauls are made mostly at night.

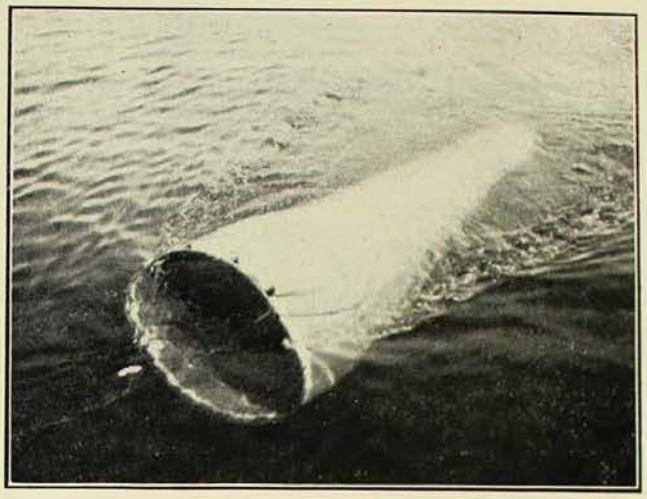
The nets used are cone-shaped, and are attached to circular iron frames, the length of net being from three to five times the diameter of the ring. Two kinds of nets are used, one 3 metres (nearly 10 feet) in diameter, with a mesh approximately an inch square ;



The five nets ready to be lowered overboard and towed at intervals of 1,000 metres of wire to secure specimens of deep-sea creatures. The large three-metre net is the first to be put down.
[Photo.—*T. C. Roughley.*



Lowering a stramin net into the Tasman Sea.
[Photo.—*T. C. Roughley.*



One of the nets of the "Dana" being drawn in after having been towed at a great depth.
[Photo.—*A. F. Bruun.*

the other 1½ metres in diameter, constructed of hemp, and containing 16 meshes to the inch.

In practically every haul five nets are used, the lowest being the 3-metre net, the remaining four being of the smaller diameter and finer mesh. If it is intended to make a deep haul—to fish with, say, 5,000 metres of wire out—the nets are attached to the wire every thousand metres.

If, however, a surface haul is contemplated, the nets are attached to the wire at 50, 100, 300, 600, and 1000 metres, the large net again being the deepest. The wire is wound round a drum for'ard of the hatch, the total length of the wire available being 10,000 metres. A steam winch controls the paying out and hauling in of the wire. Hauls are usually of two hours' duration, and the speed of the boat is slackened to about two knots.

The contents of the nets never lack interest; one never knows what strange creatures will be brought to the surface. Fishes of bizarre form, prawn-like crustaceans, blood red in colour, curious and oftentimes beautiful jelly-fish, larval fishes and crustaceans are nearly always present, and the wonderful luminosity of many of them never ceases to excite wonder. A description of these, of their luminosity and their wonderful ways must, however, form the subject of a subsequent article.

Obituary.

A. E. PHILLIPS.

Mr. A. E. Phillips, Managing Director of V. Moss & Co. Ltd., died on 15th September, at the age of fifty. Mr. Phillips was an Honorary Correspondent of this Museum, elected on account of his generous gifts to the institution. He was the first benefactor to make a money gift to the Museum, on the occasion when funds were needed for an expedition to Lord Howe Island. Since that time Mr. Phillips had more than once shown in a practical manner his interest in the Museum and its work. He had been for fourteen years the Honorary Secretary of the Industrial Blind Institution, and in many other directions had shown himself to be a generous and public-spirited citizen. He was exceedingly popular amongst his fellows on account of his genial and engaging disposition, and he will be sadly missed by a large circle of friends and acquaintances. C.A.

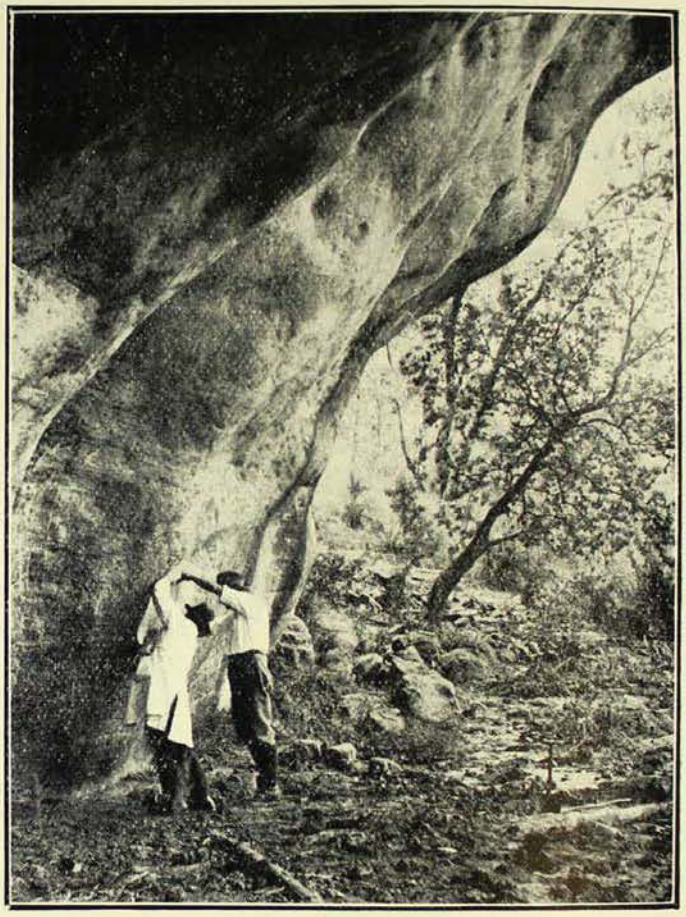
Cave Hunting and What We Found.

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

CAVE hunting in Australia may not yield, as in Europe and Asia, remains of ancient man, but the hunters find many relics of a "Stone Age," culture, and evidence of primitive people. They see, also, on rock walls of the caves and shelters, aboriginal pictures carved, painted, or stencilled, that are as interesting in their way as the art of the Bushmen in Africa, and ancient paintings of the Pyrenees.

All the records of our aboriginal art have not been published, and photographs and copies that have been reproduced are scattered through many books and journals. We need a whole volume devoted to the subject. Many discoveries have been made since Worsnop's *Prehistoric Arts of the Aborigines* appeared in 1897, an excellent little work, rare now, and worthy of a new enlarged edition. It is essential for a study which is growing steadily in favour, even beyond the circle of ethnologists. Some of our artists are keenly interested in the work of the aborigines—the earliest painters and sculptors of Australia.

This is a prelude to my own gleanings, from fields old and new, from caves long known to us and others but lately discovered, at least from the scientific point of view. In Victoria for half a century ethnologists knew of only one cave or rock shelter, used as an art gallery by the aborigines—the famous Glen Isla Rock in the Grampians, which has been defaced by the scribblings of vandal visitors.



Tracing aboriginal drawings on the wall of Glen Isla Rock-Shelter in the Grampians, Victoria.
[Photo.—*Chas. Barrett.*

GLEN ISLA ROCK SHELTER.

Recently, with other amateur ethnologists, I went to the mountains to see Glen Isla Shelter, and shared in the discovery of a previously unexplored cave. Many people, residents of Hamilton, and neighbouring districts, had known of it for years. Strange that we should be the first students of primitive art to enter the "Cave of Red Hands." Through thick scrub we were guided to the lonely spot, where, for centuries perhaps, the blacks of the range and the valleys had gathered to print or stencil in red ochre their hands upon the rock. Here strange ceremonies were performed. For, besides the red hands, which may be only "play about" pictures, the friends of idleness, on the cave wall are figures and markings the meaning of which is quite unknown. Indeed, the red hands are a mystery. Though they occur in caves and on sloping rock faces, in many parts of Australia, and are widespread in other lands, we can only guess at their significance, or declare that they have none at all* Con-

*See "Stencilled Handmarks," by W. W. Thorpe, The Australian Museum Magazine II., 7, 1925, pp. 253-4.

The Great Cave of Mootwingee, really a vast rock-shelter. Its walls are rich in "red-hand" paintings.
[Photo.—*Chas. Barrett.*

jecture is useful but never conclusive, though some ethnologists would make it so. Probably red hands in many cases are merely due to childish pleasure in making such impressions, but in others they may be symbolical, or records of ritual. Who knows? They have been found in Egypt and Palestine, in India, Africa and America. They occur in a cave at Castillo, and date from the early Aurignacian Epoch.

In his latest book, *The Art of the Cave Dweller*, Professor Baldwin Brown remarks, after mentioning stencilled hands in Spain: "It is very noteworthy that these same hands with their positive and negative colouring, occur in the wall paintings of the caves of Central Australia." He adds that red hands on the rocks are sometimes accompanied by signs that look like characters in a prehistoric alphabet. This has been noticed, too, in Australian caves and shelters. Some of the markings on the wall of Glen Isla and elsewhere certainly resemble picture-letters, symbols that bore a meaning to the men who drew them, and others of the tribe. They remain, for us, enigmatical.

I have been termed a romanticist, because in cave pictures I find romance and please my fancy by making them relics of an ancient people. Not all are old, assuredly, but surely many of these carvings and mural paintings were done thousands of years ago. At Mootwingee, in western New South Wales, the evidence is most convincing.

MOOTWINGEE CAVE.

In March last a party of ethnologists visited Mootwingee, which lies some eighty-four miles to the north of Broken Hill, and is easily reached by motor car from the Barrier. An area of the range, including the gorge and other spots where the carvings occur, has been permanently reserved. This is one of the most interesting places in the Commonwealth, and must become a Mecca for ethnologists.

At Mootwingee the naturalist, botanist, or geologist, as well as the student of aboriginal art, may spend many days quite happily. The scenery, too, is wild and romantic. There are high, rugged cliffs, deep rock-pools, linked by running water in a good

season, and stony "tablelands" to wander over. In these hills, where we camped for awhile in summer weather, the former inhabitants had a kind of Eden. Here, when the country beyond the range was too barren even for aboriginal life, the blacks were sure of water and game. Their needs were supplied by the rock holes and wild animal life of the hills; game must come to the water, both mammals and birds. While we were there great kangaroos were seen, the dark-faced, beautiful Euro; a mob of seven went up the hill one day. And, long ago, when Mootwingee was a camping place of the blacks, one may be sure that game was much more plentiful.

The carvings upon Mootwingee rocks, and red hands and other paintings on the cave walls, are evidence of occupation by the primitive folks from a remote age, probably. There are hundreds of carvings, or rather, "picked out" pictures; the sandstone in places is covered with them. Many are indistinct, as a result of weathering, and our experts pronounced them age-old, from 5000 to 10,000 years perhaps. Others are evidently more recent, done not a century ago. It is all a matter of guessing, however, this dating of carvings on the rock. Conjecture, but it seems certain that Mootwingee was a camping ground of some tribe that roamed the west country before the coming of the blacks that explorers found in occupation. A more primitive race than Sturt dreamt of has left traces of its existence, unless we are deluded by appearances.

The carvings that seem to be most ancient may be only a few centuries old. We cannot tell. Only, certain skulls found in Queensland and Victoria point to a trail of ancient man. There are other pointers, and one I possess—the flint of Puralka. This stone implement was found in a shallow limestone cave in western Victoria, associated with fossil bones of extinct animals, including the large kangaroo, *Macropus titan*. We are on the trail of prehistoric man in Australia, and will yet find in the caves evidence that he is not imaginary. So cave hunting is likely to lure others than students of primitive art—the seekers for fossil man.

Mootwingee is a really magnificent art gallery. Whether or not one admits the great antiquity of the carvings, one must be

Remarkable figure on the rock, Mootwingee. [Photo.—*Chas. Barrett.*

intrigued by them. They are "genuine blackfellow." Fools here and there have tried to improve or to imitate the figures; their work is easily identified. Unfortunately, here, as in other caves and rock-shelters I have examined, the vandal has been at work. Undistinguished names are scratched among red hands, yes, and stupid comments in some cases. The worst examples of this craze of the nonentity for publicity were found at Glen Isla. We deleted scores of names in charcoal from that grand old rock.

Mammals, notably a kangaroo, nearly four feet in length, are figured on the rock in Mootwingee Gorge. There are birds and human figures, weapons of war, a battle scene, or a tribal fight, lizards and other animals, and the tracks of birds including the Emu and the Plain Turkey. The face of a rock sloping into a pool bears numerous bird footprints. They are, I think, among the oldest of the carvings, and were pecked out many centuries ago. By the pool above that of the footprints I found a stone axe of unusual shape, polished once but now rough as a weathered flake unworked by man.

The "Pool of Footprints," in Mootwingee Gorge. These carvings are very ancient, probably the oldest at Mootwingee.

[Photo.—*Chas. Barrett.*

It was deep in the mud and ashes of a mound—the mound of a thousand fires. Flints with secondary chipping were fairly plentiful, chiefly in the open, where, too, mill-stones and pounders were scattered.

Near the dry, stony bed of the creek I found a heap of beautifully worked flakes. They were arranged, I believe, by the maker, not swept together by the wind. Each artifact was perfect. A master Stone Age craftsman fashioned these scrapers and knives. Collecting stone implements merely as a hobby is delightful. When one has a real interest in his finds, the pleasure is doubled. Collecting becomes a scientific pursuit, and may be enjoyed with an easy conscience, particularly if the collection is destined ultimately for a public museum. The magpie type of collector and the hunter of aboriginal relics for sale must be discouraged. They would, were it possible, take the red hands and carvings bodily from the rocks.

Ancient and modern are mingled at Mootwingee, and some of the carvings are obscure. Remember, in the famous galleries of the Pyrenees pictures are superimposed. Competition for space? No, the artists chose spots where it was most comfortable to work. Not always, for in some cases, one wonders how the paintings "got there."

The great cave or rock-shelter at Mootwingee is rich in red hands; all are uplifted and stencilled, as it were, not painted or impressed. The living black hand was placed outspread on the rock, and powdered red ochre blown about it. Thus, we think, red hands were fixed, indelibly, upon these sandstone walls. They cannot be erased by the most vigorous rubbing with a hard-bristled brush. It has been attempted, and vandals have tried to scrape them off with a knife.

Figures and Footprints on a rock-slope at Mootwingee.
[Photo.—*Chas. Barrett.*

CAVE ON MOUNT MISTAKE.

The latest cave to be examined by ethnologists is on the slopes of Langi Ghiran, better known as Mount Mistake, in Victoria. The figures on the rock are different from those at Glen Isla. One represents an animal of the quaintest form, which may be mythical. Though so lately revealed to science, this cave was found by a bushman, I believe, sixty years ago. It has been rediscovered, and now will receive many curious visitors.

OORAWINNA CAVES.

Cave hunting has taken me far afield. On a memorable day, accompanied by Dr. Keith Ward, I motored out from Alice Springs to the Oorawinna Range. He had often visited the famous rock-hole, finely described by the late Sir Baldwin Spencer: "The water pool lies to one side of a kind of amphitheatre amongst the limestone rocks, completely shut in except at one point where a winding valley runs southwards." (*Wanderings in Wild Australia*, page 367). He mentions the little cliff formed by overhanging rocks, a gum tree and a few native figs. Thus is the water sheltered from the sun, when the rock hole has been replenished by rains; it was dry when we were there. This spot in the Ooraminna Range for centuries was a resort of the aborigines; a sacred place. Here, Sir Baldwin tells us, in old times a group of the Unjiamba, or Hakea flower people, performed their ceremonies; it was their central camp. They are all gone now, the Hakea blossom people, and Oorawinna rock-hole has long ceased to be sacred, a place forbidden to the women. Even the drawings on the cave walls and roof have been defaced or nearly obliterated by vandal visitors, camel drivers and others. I searched the cave for relics. Chipped flakes were found in the fine sand, where water lies in the season of rain. A stone knife without a handle was the best

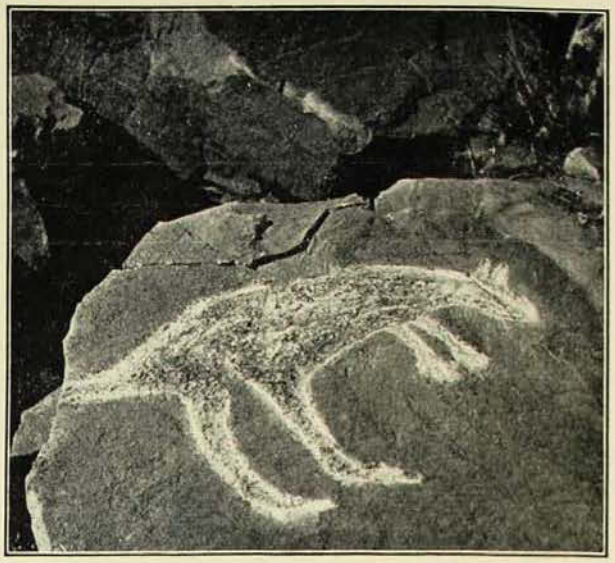
find that day, but hundreds of scrapers and rejected flakes were scattered among chips and boulders of quartzite on the ridges round about, above the pool.

AYER'S ROCK.

Oorawinna is hardly worth visiting now if your quest is for unspoiled rock-drawings. But Central Australia offers a wide field to the ethnologist specialising in native art. He must make a far journey to see what few have seen, the wonderful Ayer's Rock, with its caves and paintings, in the Aboriginal Reserve. It lies to the east of Mount Olga and south of Lake Amadeus, and is the most sacred place to the natives in all that country.

During his exploration of the great reserves in South and Central Australia, my friend, Mr. Ernest Kramer, the Aboriginal Friends' Association Missionary at Alice Springs, visited Ayer's Rock, and photographed many of the ancient paintings. He describes the Rock as an "artists' wonderland." It is called "Uluru" by the aborigines, who still resort to it for performance of their ceremonies. Some sections of the Rock women are forbidden to see; disobedience means death for the lubra whose curiosity overcomes her fear.

Ayer's Rock is a monolith, dome-shaped and dominating the sea of mulga scrub and sand that lies about it. It is splendid in its isolation and its venetian-red colour. But more memorable even than the Rock itself are the native drawings in the shallow caves at the foot of the monolith. Many of the paintings are of a sacred character; others are "play about," at least the spots where they occur are not forbidden to the women and uninitiated boys of the tribe. "Red hands" are here, figures of animals, and mystic circles, some resembling miniature rifle targets. Human heads, in outline only, are drawn in charcoal. The geometrical drawings are not the least interesting.



The Famous Kangaroo of Mootwingee.
[Photo.—*Chas. Barrett.*

Those who find no special meaning in aboriginal drawings of the class described as "play about" are probably right, but yet are only guessing. We have much to learn regarding aboriginal art, and the cave hunter for relics of the former inhabitants has more little worlds to conquer.

Among recent visitors to the Museum may be mentioned the following:—Mr. Joseph R. Slevin, Curator of Herpetology at the Californian Academy of Sciences, who has come to Australia to collect reptiles and batrachians; Mr. David N. Newland, State Geologist, New York; Dr. Margaret Mead Fortune, Assistant Curator of Ethnology, American Museum of Natural History, who has returned from the Admiralty Islands; Dr. and Mrs. C. M. Yonge, British Great Barrier Reef Expedition; Professor Joseph Shellshear, University of Hong Kong.

Obituary.

Sir BALDWIN SPENCER, 1860-1929.

The death of Sir Baldwin Spencer, K.C.M.G., F.R.S., Emeritus Professor of Biology in the University of Melbourne, removes one of the outstanding figures of Australian science.

Walter Baldwin Spencer was born at Stretford, Lancashire, England, in 1860, and was educated at Owen's College, Manchester, and Exeter College, Oxford. After acting as assistant to the Linacre Professor of Human and Comparative Anatomy at Oxford University, he came to Australia in 1887 as Professor of Biology in the University of Melbourne, from which position he retired in 1919. After his arrival in this country he devoted himself enthusiastically to the study of the fauna and the aboriginal inhabitants of Australia, and a long series of original papers and works testifies to the zeal and success with which he prosecuted his researches.

His zoological articles cover a wide range of subjects. He made important researches on earthworms, contributed several papers on the pineal eye in the lizards, and on the anatomy of the Queensland lungfish. On the marsupials and monotremes he published several papers, and described *Wynyardia bassiana*, the oldest known Australian marsupial, found fossil in the Table Cape beds, Tasmania. To him we owe the first description of some new species of marsupials.

In 1884 he accompanied the Horn Expedition to Central Australia, subsequently acting as editor of the Reports to which he contributed the narrative and several of the zoological articles. Apparently his interest in anthropology arose out of his experiences on this expedition, to which also we are no doubt indebted for his fruitful association with the late F. J. Gillen in the study of the natives of the interior. From this period until the close of his busy life Spencer devoted himself more and more to the subject of ethnology, and his work in this branch of science is probably better known than his contributions to zoology.

In 1899 he collaborated with Gillen, a postal official stationed in Central Australia, and a sound ethnologist, in publishing *The Native Tribes of Central Australia*. In 1902 the two partners crossed Australia from south to north, publishing the results of their observations in *The Northern Tribes of Central Australia* (1904) and *Across Australia* (1912). In 1912 he was appointed Special Commissioner and Chief Protector of Aborigines in the Northern Territory, from which resulted *The Native Tribes of the Northern Territory*. In 1928 appeared *Wanderings in Wild Australia*,* which gives a more popular account of the inhospitable but intensely interesting regions of Central Australia, its animals and human inhabitants.

In 1927 he left Australia for London in order to superintend the publication of his work *Arunta*, and while there he joined an expedition which sailed from Liverpool to conduct researches into the history and customs of the primitive Patagonians. He died at Ushuaia, Argentine, in the end of July, 1929.

Besides being eminent as a zoologist and ethnologist, Spencer had a good knowledge of art, and was a discriminating collector of pictures. He himself was no mean artist, and many of his works are illustrated by his own hand.

Spencer took a leading part in scientific societies and institutions, and for many years was a trustee of the Public Library, Art Gallery and Museum of Victoria, and Honorary Director of the National Museum, Melbourne.

C. A.

*Reviewed in The Australian Museum Magazine, Vol. III., No. 10, April-June, 1929, p. 339.

Captain Cook's Leatherjacket.

By Tom Iredale and Gilbert P. Whitley.

WHEN Captain Cook introduced into his Journal the name Leatherjacket for a fish at Botany Bay, he was probably unaware that this name had not been used in print before. He stated that the Australian fish was like the fish called the Leatherjacket in the West Indies but the compilers of Murray's Dictionary have been unable to find a prior use of the name in literature. Cook's Journal was not published until 1893, so that the name Leatherjacket apparently first appeared in Hawkesworth's account, in 1773, practically a transcript of Cook's M.S., as follows—

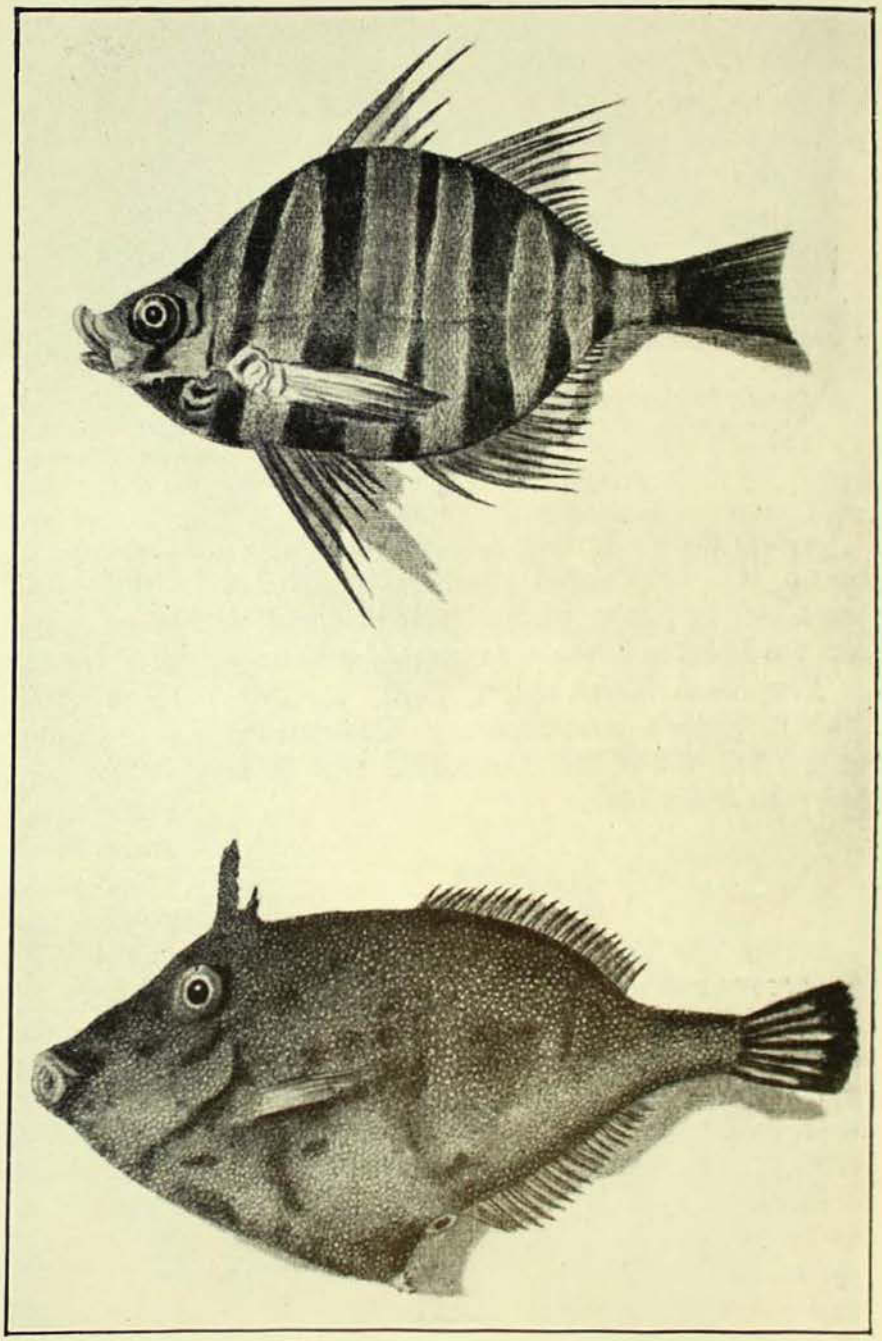
When we returned to the boat, we found that our people had caught with a seine a great number of small fish, which are well known in the West Indies, and which our sailors call Leather jackets, because their skin is remarkably thick.

The name was immediately adopted for the New South Wales fish, as, in the first publication dealing with the new colony[1], Tench wrote :—

The French once caught near two thousand fish in one day, of a species of grouper, to which from the form of a bone in the head resembling a helmet, we have given the name of light horseman.[2] To this may be added bass, mullets, skait, soles, leather-jackets, and many other species, all so good in their kind, as to double our regret at their not being more numerous.

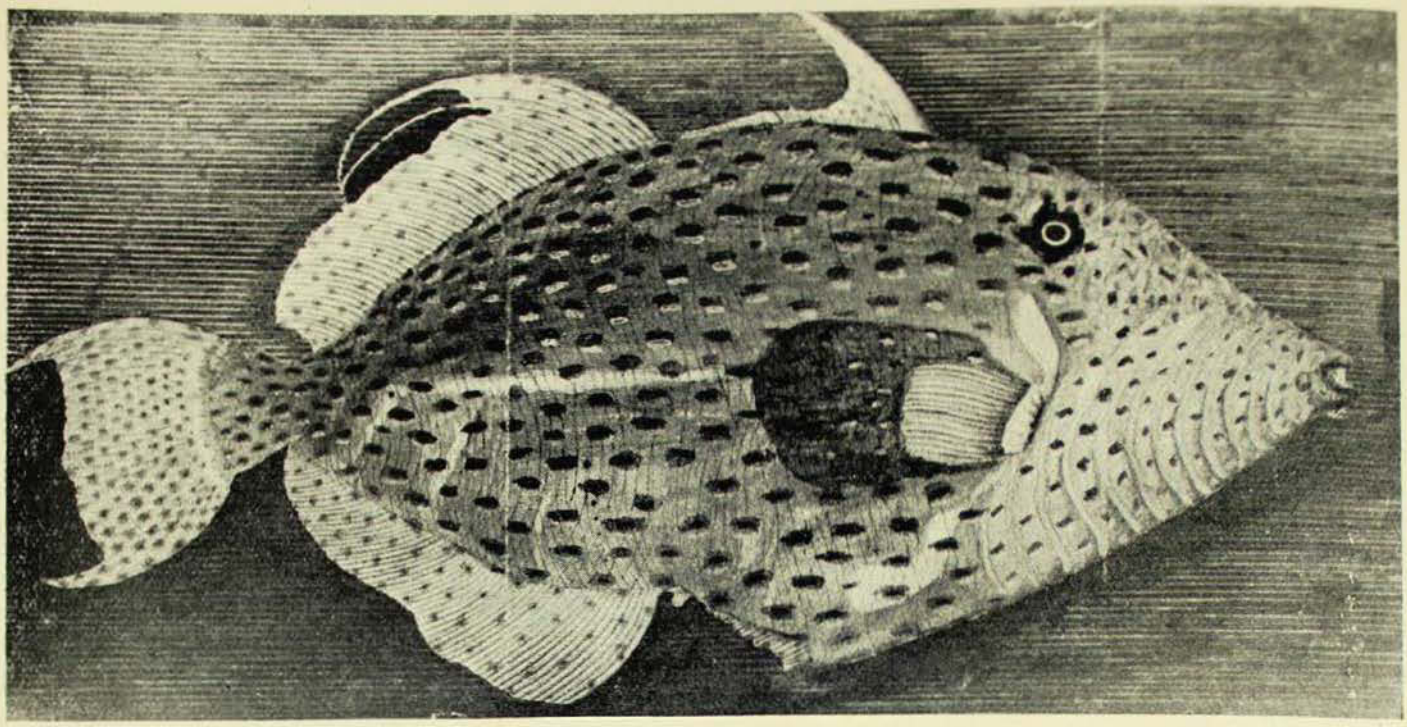
[1] Tench, Narr. Exped. Botany Bay, 1789, p. 179.

[2] The Snapper (*Pagrosomus auratus*), unfortunately not caught by the thousand around Sydney nowadays.



These pictures, taken from White's "Voyage to New South Wales," 1790, were the first to show the common species they illustrate. The Old Wife (Enoplosus armatus), shown in the upper figure, is a pretty yellow and black fish which can be easily distinguished from Captain Cook's Leatherjacket (Cantherhines granulatus), a relative of the fishes called Old Wives by ancient authors.

[*Miss S. Stone*, del.



George Forster's drawing of an Old Wife, or Trigger Fish (Balistes vetula), painted at the Cape Verde Islands, when he was there aboard Cook's vessel, the "Resolution." From the original in the Australian Museum Library.

[*G. Forster.* del.

Captain Cook's Sydney Leatherjacket was called the Granulated Balistes (*Balistes granulata*) by Shaw, whose description of it was published in White's *Journal of a Voyage to New South Wales*, ed. 1, 1790, p. 295; Miss S. Stone's contemporary illustrations of this fish and of the Australian Old Wife are reproduced here.

THE OLD WIFE.

Among the drawings made by George Forster and now in this Museum is a fine painting of a fish, the only one in the series, made at the Cape Verde Islands when Cook's vessel, the "Resolution," was there, in 1772. This is labelled "No. 55 a Fish called Old Wife of St. Jago," and represents a Trigger Fish or File Fish, which is noteworthy as belonging to the same order of fishes as the Leatherjacket. Forster had not then settled down to his routine work and made good pictures of interesting natural history objects and thus this fish fell under his eyes.

While Leatherjackets have no other name in Australia, except Hookbiters and Leatherjohnnies, for the American Leatherjacket several alternative names are available and in use. The so-called Leatherjacket of California is a trevally-like fish (*Oligoplites saurus*), whilst the name is also applied to a Trigger Fish (*Balistes carolinensis*) or Old Wife, whose rough skin is used for scouring and polishing in place of sandpaper. At Lord Howe Island the name Leatherjacket is applied to a Mado (*Atypichthys latus*).

The term Old Wife was used for the File Fishes and Leatherjackets by ancient writers, and a fish similar to the one drawn by Forster was figured as such in the accountof Dampier's voyage to New Holland. In 1655 Moufet wrote "Old Wives (because of their mumping and sour countenance) are as dainty and wholesome of substance, as they are large in body" and Bosc, in 1816, noted that the Old Wife was so called because when caught it grinds its teeth and grumbles like an old woman.

In Australia, the name Old Wife is only applied to a very different, pretty yellow and black striped fish (*Enoplosus armatus*), which was described and illustrated in White's *Voyage* at the same time as the Sydney Leatherjacket.

CHARACTERISTICS OF LEATHERJACKETS.

As their name indicates, Leatherjackets are covered with tough skins, and these are nearly always beset with countless little prickles or spines, which when examined

under a microscope, are seen to adopt many strange and beautiful forms. This skin can easily be peeled off, however, leaving in no time a clean fish ready for cooking.

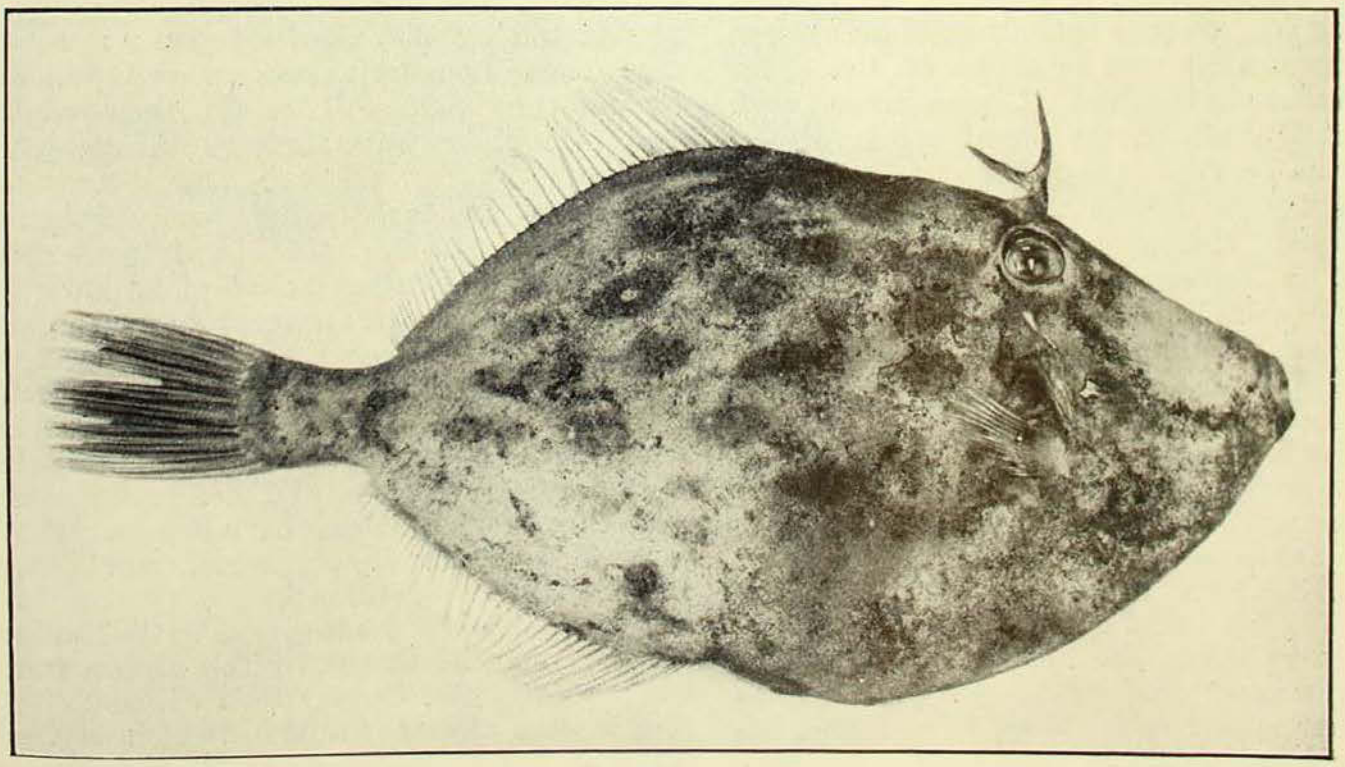
Leatherjackets have no ventral fins, but a flap, often supported by a spine, marks the situation in which these occur in most other fishes. They swim with flickering undulations of the long simple dorsal and anal fins, steered, rather than propelled, by the heavily built, fan-like tail. Often a woodlouse-like parasite attacks Leatherjackets, eating its way into the flesh, but the hardy fishes are apparently able to withstand injuries which would kill more highly sensitive creatures.

Male Leatherjackets often have a bunch of bristles or spines ornamenting each side of the tail. In one species these form long spikes, whilst another has long patches of bristles from which it derives the name Toothbrush Leatherjacket.

The colours of these fishes vary greatly and young ones may be quite unlike their parents. A little long-snouted tropical species is blue with orange spots and yellowish fins, and a Sydney species often has a horse-shoe mark on its sides. A dying Leatherjacket goes through a brilliant series of colour changes impossible to describe, but which would have delighted those Roman epicures who had their Red Mullets served alive that they might feast their eyes before they filled their stomachs. As regards size and shape, Australia can produce queerly contrasted Leatherjackets, some long and thin like the Bearded Leatherjacket (*Psilocephalus*) which is capable of leaping when taken from the water, and others round and tubby, like the green or brown Pygmy Leatherjacket (*Brachaluteres trossulus*) of the Sydney wharf-piles.

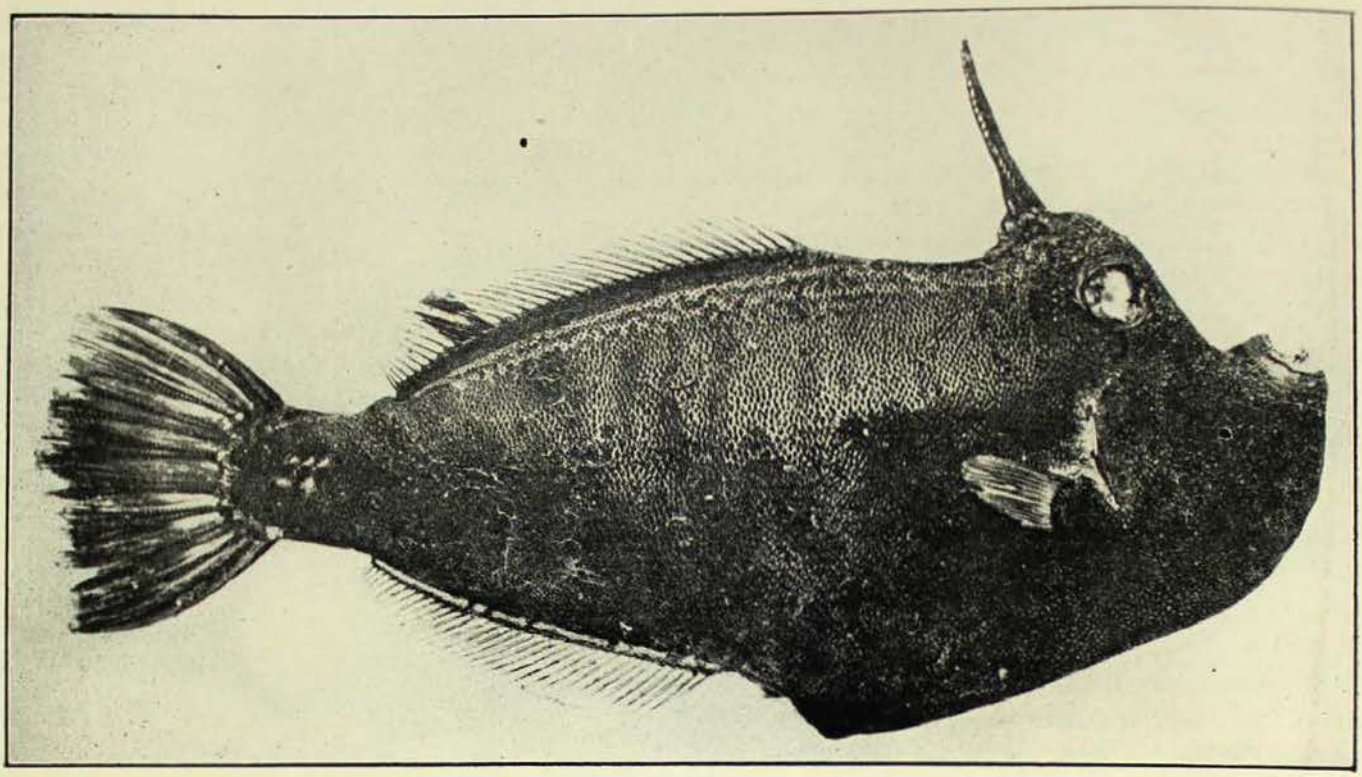
HOOKBITERS.

Leatherjackets have strong beak-like teeth with which they can crush shellfish and crustacea and gnaw the growths off wharf-piles; they can also bite through fishing lines and small hooks and are therefore unpopular with fishermen. When a Hookbiter is caught it is often skinned alive and returned to the water, to be immediately eaten by its fellows, which desert the hooks baited for more acceptable fishes, or a cork is



The Mosaic Leatherjacket (Cantherhines mosaicus) is caught by trawlers in Australia. This specimen has an abnormal dorsal spine which is forked instead of single.

[Photo.—*G. C. Clutton.*



Fishes seem to be able to withstand injuries which would kill more sensitive animals, but the bite which evidently caused the deformed head of this Yellow Finned Leatherjacket (Meuschenia trachylepis) appears only to have affected its beauty.

[Photo.—*H. Barnes.*

impaled by the dorsal spine and the fish, floating helplessly, is eaten by its fellows. This cruel practice reminds us of an ancient custom which used to obtain on the River Thames in England of pressing a cork tightly down on the dorsal spines of the Ruffe or Pope (*Acerina cernua*) and returning the fish to the water. This was termed " Plugging a pope." Arthur Adams in his *Narrative of the Voyage of H.M.S. 'Samarang'* " relates that he had " seen seamen practise a rather cruel experiment on the poor *Diodon* [Porcupine Fish], which they term 'sprit-yard-sailing.' This consists in passing a thin piece of wood across the skin of the back, which prevents the fish from sinking, and at the same time enables it to make use of its fins . . . Jack . . . laughs, and calls it his " little steamer."

The first dorsal spine of a Leatherjacket is very strong and hollowed out behind at its base, to receive a peg from a second much smaller spine. These two spines are raised or depressed simultaneously, and, when the first is erect, it cannot be laid down again until the second spine which locks it, is depressed first. Woe, therefore, to the voracious fish whose mouth or gullet is penetrated by this rigid weapon ; it is even said that Leatherjackets when swallowed by another fish will retain their vitality and bite their way through their captor's flesh.

Perhaps an early injury was responsible for the forked dorsal spine shown by the deep-water Mosaic Leatherjacket pictured on the preceding page. Sometimes specimens with two long dorsal spines are found, and such a specimen is in this Museum from Watson's Bay, but such examples are freaks. Likewise an abnormality is the Leatherjacket with a deformed head depicted here ; it had probably been bitten by some large fish and outlived an injury which would have killed a higher vertebrate.

Balistes was the name given to the Leatherjackets and File Fishes by the early naturalists ; this name, Cuvier tells us, came from the Italian *Pesce balestra*, which is itself derived from some fancied resemblance between the movement of their great dorsal spine and that of a cross-bow.

THE FILE FISH.

The flanks of a File Fish or Trigger Fish are very hard and not covered with spines as are those of Leatherjackets. Like the scouring surface of a file, they have embossed rows of diamond-shaped studs, perhaps modified scales, arranged in close-set series.

File Fishes are mostly restricted to tropical waters and are as brightly hued as most coral fishes, their brilliant colours often being drawn out in gay ribbon-like stripes to bedeck their cheeks and muzzles, as may be seen in Forster's excellent painting, which represents the typical *Balistes*.

FOOD VALUE.

Leatherjackets when of sufficient size are excellent as food. In New South Wales we do not eat Captain Cook's Leatherjacket (*Cantherhines granulatus*), which is, sad to say, a nuisance to everybody because it gets caught in the nets by its dorsal spine, but the yellow-finned Chinaman Leatherjacket (*Cantherhines ayraudi*) and a rock-inhabiting kind with very spiny integument (*Meuschenia trachylepis*), are popular as food. The chief commercial species in New Zealand is the Kiriri (*Cantherhines convexirostris*). The consumption of the flesh of the tropical Trigger Fishes (*Balistes* and allies) is, however, sometimes accompanied by symptoms of acute poisoning known as *ciguatera*, but the offensive alkaloids are said to become weaker in the more northern species of America. The Toadoes and Porcupine Fishes, which are cousins of the Leatherjackets and Trigger Fishes, are very poisonous, and it is believed that the seat of toxic power lies in the ovaries and liver. There are several cases of persons being poisoned by the little Toado (*Spheroides hamiltoni*), which is common around Sydney, and untold numbers of cats have died as a result of eating specimens which have been left behind by fishermen—sometimes for that very purpose.

Review.

Open-Air Studies in Australia. By F. CHAPMAN, A.L.S., F.G.S., F.R.M.S. J. M. Dent and Sons, Ltd. 10s. 6d.

This is an extremely interesting collection of essays concerning matters of which the keen observer would be curious to know something. Many of these have already appeared in the pages of the Melbourne *Age* and *Argus*, but in this volume they have been somewhat amplified. As the author remarks in his preface " popular essays dealing with the wonders of scenery and rock structures are not numerous," a fact which makes this collection in one cover more than ordinarily welcome. The problems of coral islands, reefs, buried rivers and their alluvial gold are dealt with fascinatingly. The author, who is well known as the palaeontologist of the National Museum, Melbourne and honorary palaeontologist of the Geological Survey of Victoria, besides being lecturer in palaeontology at the Melbourne University, is a distinguished geologist. These essays are eminently suitable for students and teachers of natural history, and those interested in the secrets of soil and scenery. The book is profusely illustrated with many plates, and if the figures are, perhaps, some-what smaller than usual, they more than compensate for this by their sharpness and clearness of reproduction. Sir Edgeworth David, K.B.E., C.M.G., D.S.O., F.R.S., contributes a eulogistic foreword.

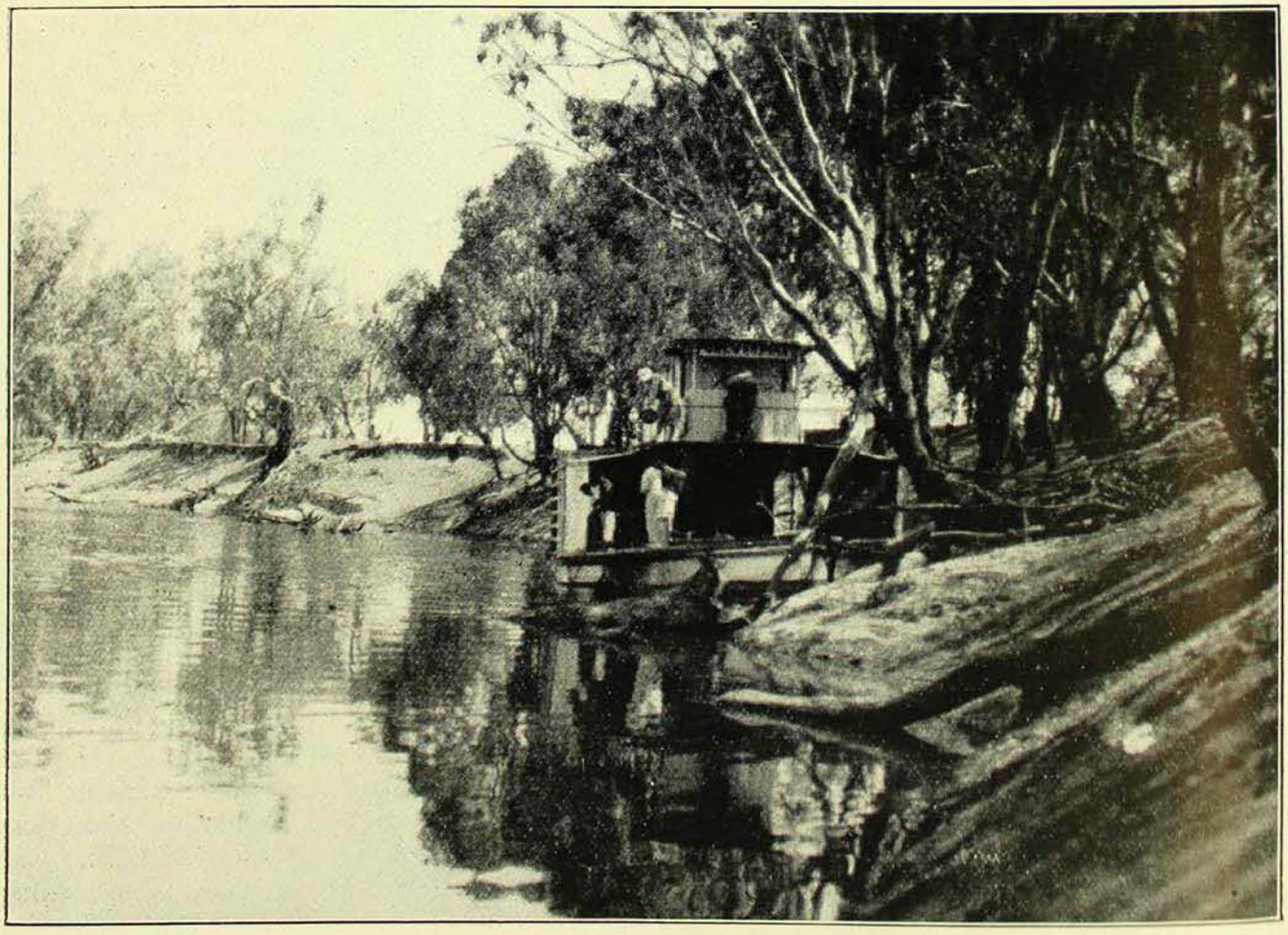
F.D.McC.

A Naturalist on the South-West Plains.

By Keith C. M'Keown.

IT is proposed in this article to survey, necessarily very briefly and incompletely, the wild life occurring in that portion of the great plains of south west New South Wales between the Murrumbidgee River and the Cocopara Range, of which the Murrumbidgee Irrigation Areas form the centre. Here in days long passed wandered the natives of the Wiradjuri tribe, hunting the kangaroo over the sun-burnt plains ; searching for mussels in the shallows of the Murrumbidgee, and making their camps by the Tuckerbil Swamp, where one may still find their nardoo-stones and discarded stone axes. Following in their footsteps came the white man with his sheep ; the sheep-stations to give way in their turn to fruit and rice growing, and the many-fold activities of an irrigation settlement, when the life-giving water had been conveyed by channels from the Murrumbidgee River, to bring new fertility to the semi-arid grassland.

For the purpose of giving a clearer idea of the environment of the wild creatures inhabiting this district it will be convenient to divide it into four sections : (a) the plains, with which may be included two ranges of hills, the Cocopara and part of the Macpherson Ranges ; (b) the country fronting the Murrumbidgee River ; and (c) the swamps,



A typical view on the Murrumbidgee River, near Whitton, New South Wales.

[Photo.—*K. C. M'Keown.*

Red Gum (Eucalyptus rostrata) seedlings, showing phenomenal growth consequential upon floods.
[Photo.—*K. C. M'Keown.*

all of which have been comparatively little altered by man ; and (d) the irrigation areas, where the original state has been changed beyond measure by man for his own purposes in the course of settlement, with far-reaching effects on the fauna of the district, which has had to adapt itself to, or give way before the march of progress.

THE PLAINS AND THE RANGES.

The plains can perhaps be appreciated fully only by the born plainsman, for to the mountain-born there always seems something depressing in their unchanging monotony as they stretch away to the horizon. In summer the sun-burnt terra cotta soil is startlingly brilliant as it quivers under the glaring sunlight, producing illusions, born of the mirage, of spreading lakes and reflected trees ; but when the rains have fallen the green grass springs with amazing rapidity, and small blue and white daisies, yellow everlastings, and Darling Pea, cover the plain in an unbroken carpet over which one can drive for miles. Trees grow but sparsely, and among these the needle-wood (*Hakea*), box (*Eucalyptus spp.*), boree (*Acacia pendula*), and cypress pine (*Callitris robusta*) predominate. These trees provide food for a scanty population of insects, most of which show some adaptation or specialization against the arid or semi-arid conditions. The boree (*Acacia pendula*) is the host of an exceedingly interesting assemblage of insects, which exploit almost every portion of the tree : various moth and beetle borers infest the trunk and branches : the bag moths (*Teara*) suspend their homes among the topmost twigs, small gall-gnats (*Cecidomyia*) abort the immature seed-pods into a mass of twisted tubes, each containing a small maggot-like larva, many of which fall a prey to a host of small parasitic wasps, so that one frequently breeds out more wasps than gall-gnats. The larva of one of the small Lycaenid butterflies (*Ialmenus ictinus*) feeds upon the foliage ; the peculiar slug-like larvae are as-

siduously attended by a swarm of mound ants (*Iridomyrmex detectus*), a case of cupboard love, as the butterfly larvæ secrete a sweet fluid, much relished by the ants, which in their turn provide the caterpillar with a bodyguard, freeing it to a great extent from the attacks of enemies. Perhaps the most curious and interesting of all the insects infesting the boree are the gall-making thrips, which distort the foliage of the tree into strangely shaped galls, those of *Kladothrips rugosus* crumpled and rugose, while those of other members of the genus are smooth and bubble-like; these galls are hollow in the centre, and in this cavity the colony of insects lie closely packed together. The gall-making habit is almost entirely confined to the Australian species of thrips, and has evidently been evolved by the small, soft-bodied insects as a means of protection against the heat and the drying winds of the Australian summer. Many species of coccids are also to be found infesting the boree.

The birds frequenting this area are of considerable interest; here one finds the Wood Swallows (*Artamus*), which when the Plague Locust (*Calataria terminifera*) is abroad in its myriads, may be seen in great swirling clouds over each locust swarm, devouring the insects unceasingly from daylight to dark. Ground Larks (*Anthus australis*) and the Rufous Song Lark (*Cincloramphus rufescens*) abound in the grassland, and in the scattered clumps of trees White-winged Choughs (*Corcorax melanoramphus*), Babblers (*Pomatorhinus temporalis*), and the Twelve Apostles (*Struthidea cinerea*), together with galahs (*Kakatoe roseicapilla*) and the ubiquitous crow (*Corvus cecilae*) are always in evidence. The Red Kangaroo (*Macropus rufus*) and the emu (*Dromaius novae-hollandiae*) are now seldom seen except when driven in by severe droughts further west. The bustard or Plain Turkey (*Eupodotis australis*) and the curlew (*Burhinus magnirostris*) have, alas, gone for ever since the advent of the fox and the domestic cat gone wild.

On the hills the geological formation is mainly a conglomerate of large, rounded, water-worn pebbles, formed in long past ages, supporting a vegetation consisting chiefly of eucalypts of various species, wattles (*Acacia spp.*), with an occasional magnificent specimen of kurrajong (*Brachychiton populneum*). In the larger trees, the

Clusters of larvae of the large Steel Blue Saw-Fly (Perga dorsalis), which infests the eucalypts.

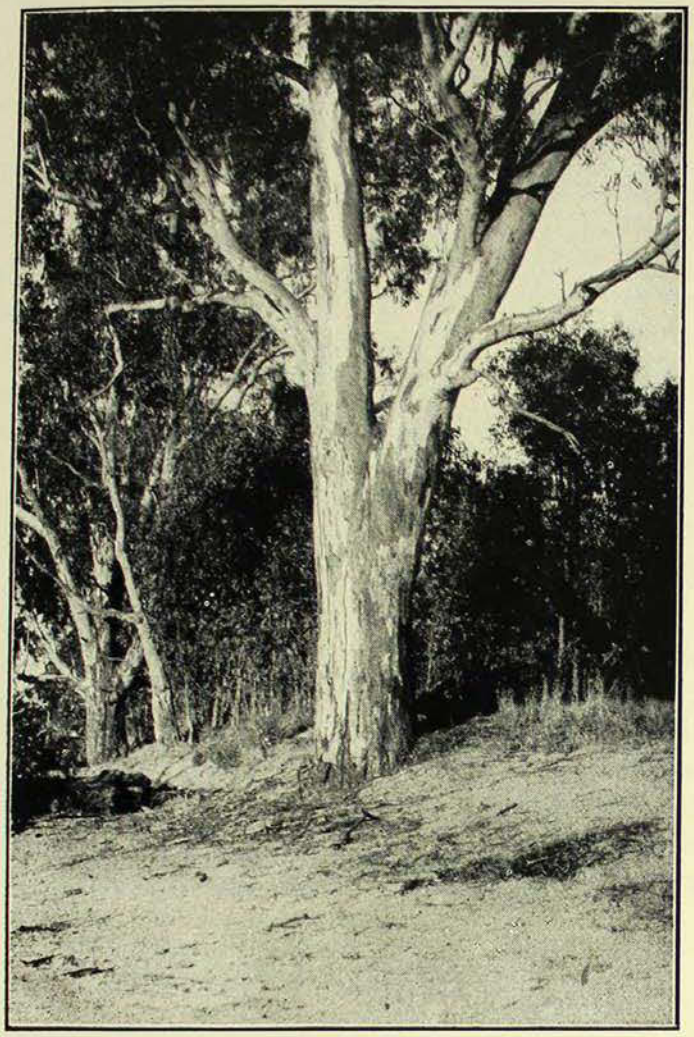
[Photo.—*K. C. M'Keown.*

opossum (*Trichosurus vulpecula*) may be found, and if one is lucky the echidna (*Tachyglossus aculeatus*) may be seen, but the latter is fast becoming extinct, being apparently unable to face the encroachment of the cultivated areas on to its haunts.

Crested Bell-Birds (*Oreoica gutturalis*) make the sheltered gullies ring with their clear notes, and here also is another of Australia's sweet singers, the Rufous Whistler (*Pachycephala rufiventris*).

THE MURRUMBIDGEE RIVER.

The main feature of the river frontage country are the eucalypts, especially the fine Red Gum (*Eucalyptus rostrata*). Following the flood of the Murrumbidgee River in 1916, wherever the land had been submerged by the flood-waters there sprang up a phenomenal growth of Red Gum seedlings, the equal of which has not been known since the coming of the white man, nor, judging from mature trees existing, did its like occur even in past centuries. This growth of seedling gums extends for many miles up and down the Murrumbidgee, in some places forming



Representative vegetation on river frontage country. [Photo.—*K. C. M'Keown.*

an almost impenetrable thicket of saplings. The control of some of these areas of natural reafforestation has been taken over by the Forestry Commission of New South Wales, and the trees have been thinned in accord with the latest theories of sylvicultural management, and should become in future years a source of considerable revenue to the State. This thick growth of trees and its proximity to permanent water provides a paradise for birds, and the shady bush tracks resound with the notes of our Harmonious Shrike Thrush (*Collurcincla harmonica*), which is generally considered to be one of Australia's most melodious singers. Peaceful Doves (*Geopelia placida*) coo in the thickets, and the tree tops echo the screeching of the White Cockatoos (*Kakatoe galerita*). The undergrowth provides cover for Yellow-tailed Tits (*Acanthiza chrysorrhoea*), Red Capped Robins (*Petroica goodenevii*), and a host of other small birds. I know of few areas more attractive to the bird-lover. As may be expected, where the growth of vegetation is so luxuriant insects are very numerous, especially the vividly coloured foliage-feeding beetles of the genus *Paropsis*. The curious slug-like stinging larvae of the Mottled Cup Moth (*Doratifera vulnerans*), and the black, bristly larvæ of the large Steel Blue Saw-Fly (*Perga dorsalis*) are in evidence on nearly every tree, the latter massed in large clusters on stem and branch in the daytime, moving only to raise their heads and eject a brownish-green fluid, smelling strongly of eucalyptus, as a defence against enemies. Many acres of young trees are literally stripped of foliage by these insects, and, also, by the caterpillars of case moths, the Ribbed (*Thyridopteryx herrichii*), with its beautiful white, silken case, and the Faggott Case Moth (*Entometa ignoblis*), which has its shelter covered with longitudinally placed sticks, of which one is invariably about half as long again as the others and projects beyond them from one end. Hiding among the leaves of the Gum trees one may find the astonishingly leaf-like long-horned Tree Grasshoppers, of which *Ephippitytha* 32-*guttata* is, in some seasons, comparatively common. They emit a curious crackling chirp when disturbed, or when seized by some bird in search of a meal. The protective colouration of these insects is really marvellous, and it is only necessary for them to remain motionless and in the broken light filtering through the leaves for them to become almost invisible to the untrained, and sometimes even to the trained eye.

The goanna (*Varanus varius*), the Brown Snake (*Demansia textilis*) are plentiful in this type of country, and nearer the water the Black Snake (*Pseudechis porphyriacus*) and the tortoise (*Chelodina longicollis*) are frequently to be found.

Mammals generally are scarce, with the exception of the Grey Opossum (*Trichosurus vulpecula*), which, in spite of illegal snaring and shooting, still seems to hold its own. Water Rats (*Hydromys chrysogaster*) frequent the river banks, and the opened shells of the fresh-water Mussel (*Diplodon australis*), marking the scene of their banquets, are common. On very rare occasions, those

A tree-grasshopper (Ephippitytha 32-guttata), an excellent example of protective colouration.

[Photo.—*K. C. M'Keown.*

" red-letter days " to the field naturalist, I have seen an occasional platypus (*Ornithorynchus anatinus*) disporting itself in some secluded billabong.

THE SWAMPS.

Until recent years the swamps included in our survey were filled with water only in seasons of exceptional rainfall, and more often than not were almost, or completely dry, but now, owing to their use for the disposal of drainage water from the irrigation areas, they have become permanent, and provide a home for many interesting creatures, but also, unfortunately, a field for the so-called " sportsman " who possesses a gun, and consequently must find something—anything with fur or feathers—to destroy. White Fronted and Pacific Herons (*Notophoyx novae-hollandiae* and *N. pacifica*), stilts (*Himantopus leucocephalus*) and three species of ibis, the White (*Threskiornis molucca*), the Straw-necked (*Threskiornis spinicollis*), and the Glossy (*Plegadus falcinellus*), wade in the shallows, ducks of many species, Black Swans (*Chenopis atrata*), and pelicans (*Pelicanus conspicillatus*), frequent the more open water or fly overhead, water hens (*Gallinula tenebrosa*), rails (*Hypotaenidia philippensis*), and dotterels (*Charadrius melanops*), search for food along the shore and among the patches of nardoo. Clumps of reeds hide the bittern (*Botaurus poeciloptilus*), whose hollow booming at night puzzles settlers on the nearby farms as to the nature of the large animal which frequents the swamp. Brown Hawks (*Ieracidea berigora*) police the reed-beds from the air, and may be seen dashing through the densely packed flocks of starlings (*Sturnus vulgaris*) which nightly camp in innumerable thousands in the reeds; time and time again the hawks will dash and wheel among the terrified starlings, and it is seldom that several of the glossy-feathered birds do not fall a prey to the aerial raiders.

The water itself teems with numerous species of aquatic insects, dragonflies (*Odonata*), caddis flies (*Trichoptera*) in their cases of twigs and shells, water beetles and many other fascinating things, including that primitive crustacean, *Apus*.

The frogs will not permit themselves to be overlooked, and on summer nights the air throbs to their united croaking, which from a distance sounds like the noise of some busy factory. There are frogs in thousands, from the big green and gold *Hyla aurea* to the tiny members of the same genus which sit on the trees uttering their piping, bird-like notes.

THE IRRIGATION AREAS.

On the irrigation areas, where the land is under intensive cultivation, only those creatures remain which can adapt themselves to the changed conditions and live in close proximity to man. The introduced starling (*Sturnus vulgaris*), and the sparrow (*Passer domesticus*) play havoc with fruit and grain crops, and an endless warfare has to be waged by the settler against imported insect pests: it is remarkable how few of the native insects have proved detrimental to man and his crops.

White and Straw-necked Ibis, together with Pacific and White-fronted Herons patrol the channel banks and the rice fields, destroying the yabbie or crayfish (*Parachaeraps bicarinatus*) which tunnel in the sides of the canals or in the rice field checkbanks, allowing the water to seep away. Peewits (*Grallina cyanoleuca*), Willy Wagtails (*Rhipidura leucophrys*), and Welcome Swallows (*Hirundo neoxena*) are very numerous everywhere, but the bird which has availed itself most fully of the changed conditions is the beautiful little Fairy Martin (*Hydrochelidon ariel*), for it is present throughout the irrigated area in

A Praying Mantis (Archimantis latistyla) in its natural surroundings.

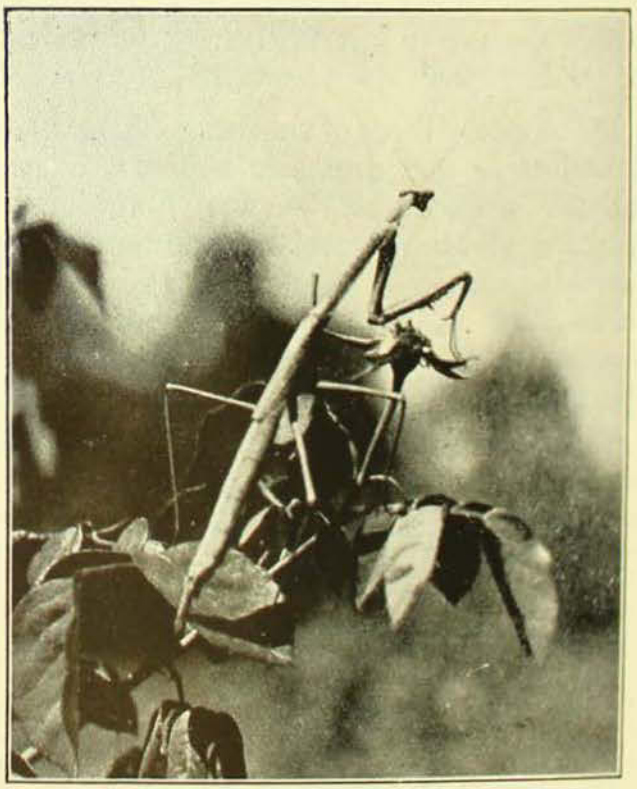
[Photo.—*K. C. M'Keown.*

thousands, and every bridge and culvert over an irrigation channel is crowded with its bottle-shaped nests, and they are also massed under the verandahs of many of the houses in the towns. Other insectivorous birds of many species guard the orchards and are of incalculable value in keeping in check many insect pests, and it is strange that their services, rendered without fee, are so little appreciated, and their persecution by small boys and settlers from southern Europe still continues in spite of protests and the teaching of nature study in the schools.

A common insect in the orchards and gardens is the mantis (*Archimantis latistyla*) lurking among the leaves with its forelegs clasped to its breast in a false semblance of prayer, awaiting only the opportunity to seize and devour some passing insect. The curious papery egg-case of the mantis is frequently found attached to twigs of fruit trees or the posts of fences. This insect is a friend of the fruitgrower, and should not be destroyed.

Rice growing is now a flourishing industry under irrigation and the waters of the rice fields abound with aquatic insects, and towards the evening of a summer's day the small Harlequin or Chironomid Flies may be seen hovering over the surface of the water in dark clouds, to enter the houses later in the evening and swarm round the electric lights to the annoyance of the inmates ; Harlequin flies do not bite, however. Mosquitoes breed freely in drainage channels and rice fields, and are rapidly becoming a problem of outstanding importance, and any effort for their control will call for community action.

In this short article it has been impossible to more than indicate a few of the curious and beautiful creatures which inhabit the south west plains of our State, but I hope I have been able to show in some way the wealth of this wild life, and, perhaps, induce others to take an interest in it and the problems so closely bound up with it.



Mantis (Archimantis latistyla) awaiting its prey. The photograph shows clearly the spined raptorial forelegs.

[Photo.—*K. C. M'Keown.*

Review.

Birds and Green Places. By ALEC H. CHISHOLM. J. M. Dent & Sons, Ltd., London, 1929 (Angus & Robertson, Ltd., Sydney), 15/-.

The author is a well-known naturalist and student of birds, a keen observer , and an accomplished and graceful prose writer. These qualities, not often found in combination, make the work under review an attractive one not only to the avian expert, but to the, we hope, much larger class of readers who love Australia's birds, and appreciate a well-written nature book redolent of the bush and the open air.

The work is concerned mainly with various birds of Queensland, " a sparkling band," which the author considers to have been generally neglected. Some of the chapters have already appeared in print, including the whimsical " What I found," first published in this MAGAZINE, but most are now printed for the first time.

In " Mystery Birds of the Jungle " we have a fascinating and dramatic account of the author's experiences in the Macpherson Range, and his persevering and successful efforts to obtain a glimpse of the Rufous Scrub Bird and the Olive Whistler, two elusive sprites of the woodland rarely seen by human eyes.

The common Australian parrots are familiar to all, but the reader will be interested in the account of the rarer forms, and will lament with the author the saddening fact that several species, particularly of the ground-living varieties, are verging on extinction. Thus it was only after a five years' search that Mr. Chisholm was at last rewarded by a sight of the rare Paradise Parrot.

A long chapter is headed " Australia's Mocking Birds," and this is one of the most interesting in the book. The author claims not only that Australia has more bird mimics than any other country, but that in the lyre birds and bower birds she possesses mockers surpassing in ability and found elsewhere. No one will hesitate to award the palm to the lyre bird as a mimic, but the abilities of the bower bird are, perhaps, not so well known ; possibly their gifts in this direction have been overshadowed by their extraordinary habit of constructing " playgrounds," which the author regards as one of the minor wonders of the world.

The prominent note in this inviting book is the aesthetic in bird life, but the author has not scorned to turn aside and reflect on other aspects, such as the effect of insectivorous birds on vegetation, the association of certain species of birds and trees, adaptation to environment, and the economic value of the wedge-tailed eagle.

The book is well printed, and contains two fine coloured plates, the work of that well-known bird artist, Mr. N. W. Cayley, besides a large number of striking photographs of the author and others.

C.A.

Notes and News.

During the meeting in Sydney of the Australasian Medical Congress, from the 2nd to the 7th of September, a special display of specimens interesting to medical men was made at the Museum. The exhibits included a series of primitive human skulls, venomous snakes, fishes, and spiders, a platypus dissected to show its poison gland, disease-bearing insects and molluscs, and other specimens. The display was examined by a number of medical men.