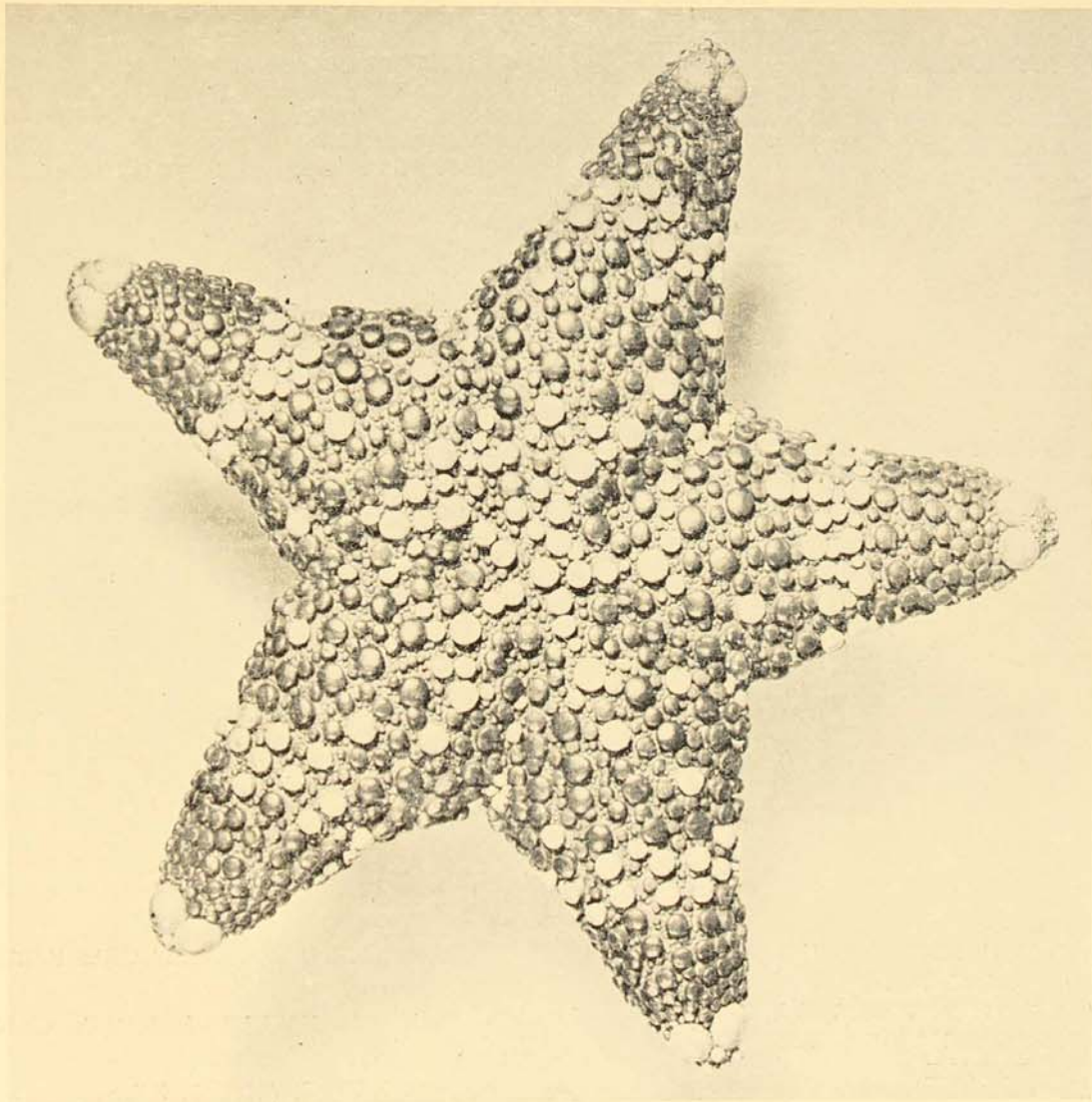


*The*  
**AUSTRALIAN  
MUSEUM  
MAGAZINE**

Vol. X, No. 5.

Price—TWO SHILLINGS.



Firebrick Seastar.

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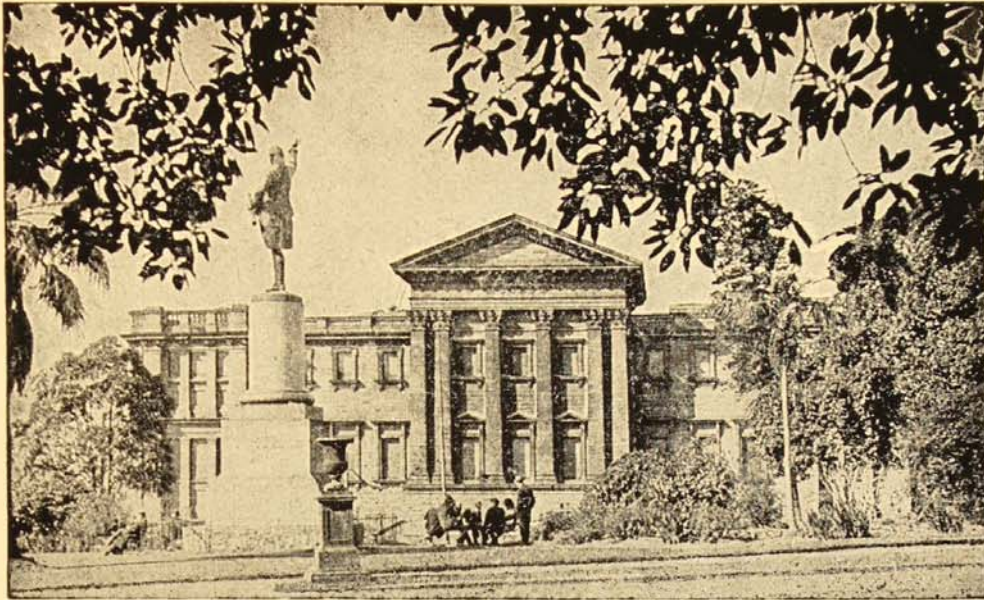
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# THE AUSTRALIAN MUSEUM MAGAZINE

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*(Photography, unless otherwise stated, is by Howard Hughes.)*

● OUR FRONT COVER. The Firebrick Seastar, *Asterodiscus truncatus*, is one of the largest and most strikingly coloured seastars taken in temperate waters off the Australian Coast. It frequently appears among the animals which trawlermen regard as useless and therefore as rubbish.

As soon as the seastar dies the colour fades and because of this there is no record in scientific writings of either its colours or of its colour pattern. The specimen illustrated has had its colour pattern and shades restored by an artist who worked from a field sketch, and from a colour transparency of the live creature. The three predominant shades are pale mauve, orange and lemon yellow. A more detailed description of the colour pattern appears elsewhere in this MAGAZINE. *Asterodiscus* inhabits sandy bottom areas on the continental shelf off southern Australia.

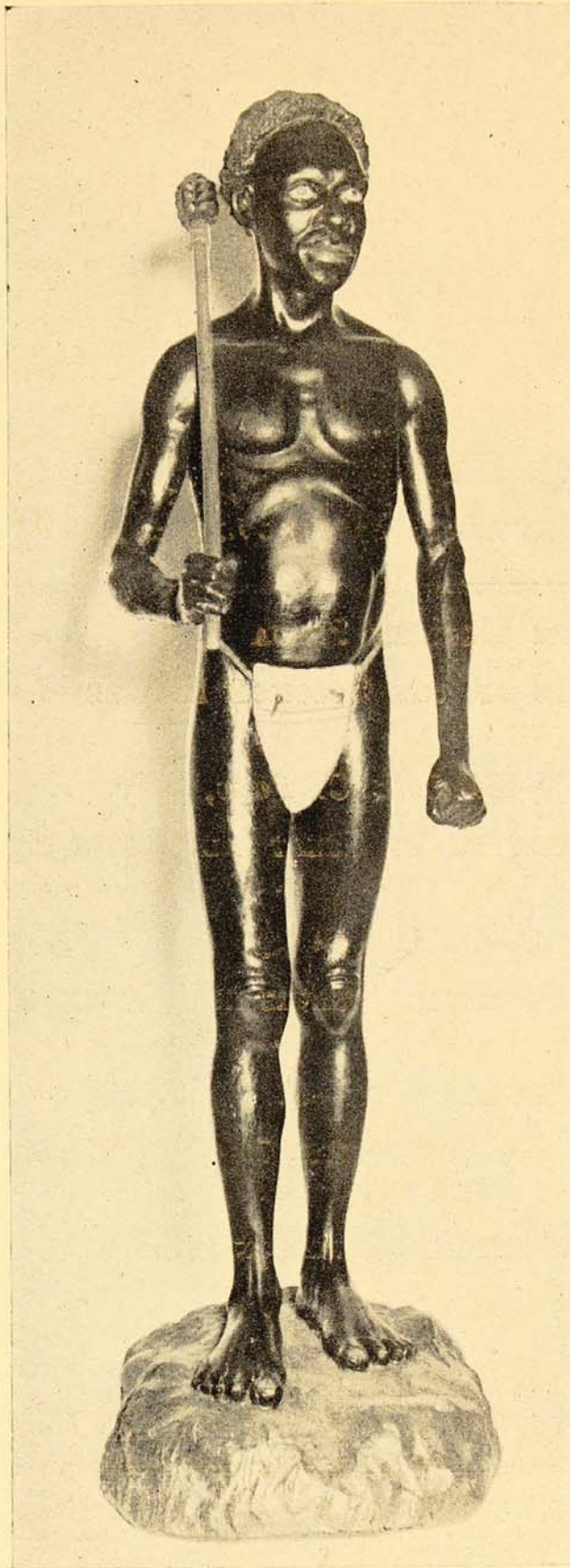


Figure of a native from western Papua, representing the Papuan-type, to be incorporated in an exhibit depicting the Races of Man in Oceania. He is carrying a stone-headed club and is wearing a bailer-shell pubic-cover.

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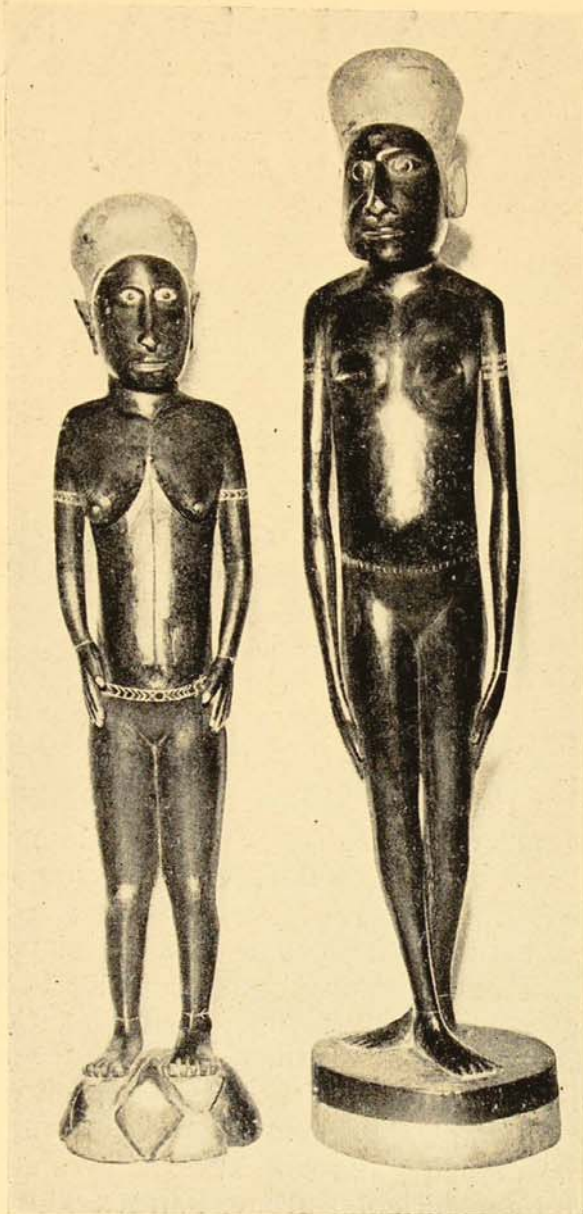
## The Human Sculptures of the Solomon Islands—I

By FREDERICK D. McCARTHY.

THE sculpturing of human and animal figures reached a high level of attainment throughout Melanesia. Generally speaking, naturalism is to be seen more frequently in the animal than in the human figures, but in certain types of carvings the sculptors of the northern Solomons sought to reproduce the human features more faithfully than elsewhere in Melanesia. Conventionalization and stylization are characteristic features of the majority of Solomon Islands' sculptures. The Australian Museum possesses a representative series of both kinds of carvings which will be described in this article.

The black hardwood sculptures from Bougainville and Buka Islands in the northern Solomons constitute an outstanding type because of their simple naturalism, due to the inspiration being ordinary human beings and not anthropomorphic spirits, and because of their highly polished surfaces. The treatment is in rounded contours. Frankness and realism are marked features in the execution of these sculptures, for nothing is eschewed by the craftsman. The body is naturally proportioned although it is elongated or crudely designed in some of the figures. The arms form a crescentic band from the shoulders to the outspread hands on the hips. The legs are usually straight with the feet slightly

apart, but in one girl they are crossed. The head, posed vertically, is slightly longer and larger than normal. Its smooth rounded top is painted to represent the short reddened hair of the people, and it slopes upwards and outwards from the face to a bulbous and convex top. Below it the rounded contours of the face lead downwards to the prominently protruding lower jaw and chin. The mouth and nose are normal in shape and size, and the eyes are shown by a lenticular groove painted white. The red hair is separated from the black face by a white line similar to the one painted around the hair-line of adolescents during their initiation and puberty rites. Although the faces on these carvings are rather stiff and on some rather lifeless, their range of expression embodies expectancy, misery, secrecy, the suspicion of youth and the uncertain fear of the wild—all of which are to be seen on the youths and girls during the above ceremonies. The five figures in our series range from 2 feet to 2 feet 6 inches high and stand on a base from 1 to 2 inches thick, both figure and base being carved out of the one block of wood. They are from the Kieta district of Bougainville, three of them being from Roroana village. One is of a youth holding a steel axe, on the handle of which a snake is carved.



Two female figures from Kieta District,  
Bougainville.

The finest example of the type in the collection, and an outstanding piece of Melanesian sculpture, is a beautifully finished statue of a man 2 feet 1 inch high on a base 2 inches thick. The figure displays much more vitality, structural integration and originality than any of the others, and indicates the high standard attained by these oceanic negroid craftsmen. The red top of the head, and the white features, hair-line and ornaments on the black face and body produce a well-designed contrast in the use of colour. His expression is the stony stare of a boy. The neck is rather longer than usual, and it rises from very broad and powerful shoulders and body with which the puny arms and legs form

another striking contrast. The leglets, serrated girdle and necklet, the breast-design, and the elaborate armlets indicate a person of very high rank in the community. The precise function of this fine specimen is not known.

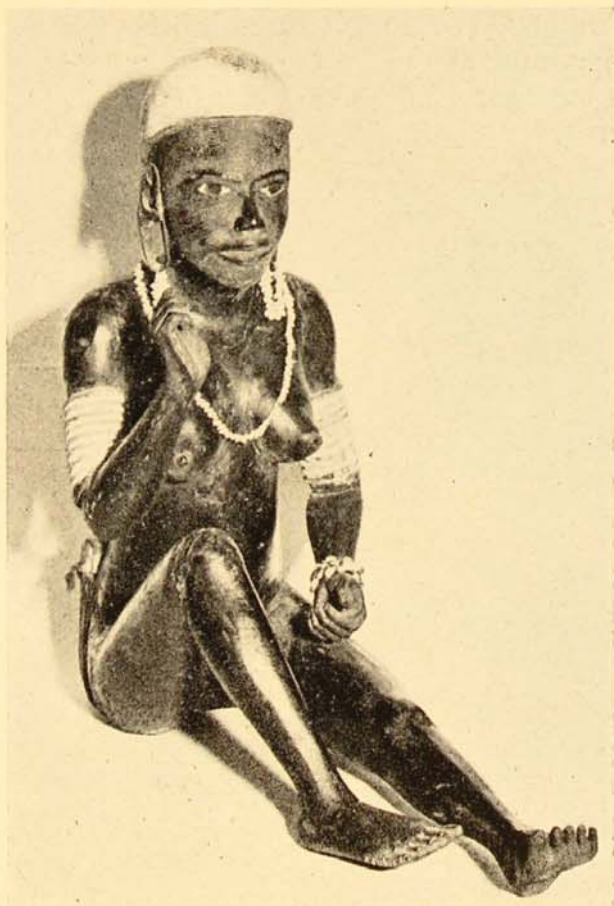
These sculptures vary greatly in artistic merit from crude representations to splendidly designed and executed carvings by highly skilled craftsmen, specialists trained by their own father or mother's brother, and paid for their work in flying-fox or porpoise teeth currency. The carvings represent real human beings and every character and detail is faithfully portrayed. Being so realistic in conception they raise no technical problems for the sculptor unless his approach is creative, as in the case of the beautiful male figure mentioned above.

The function and cultural setting of these sculptures differ considerably from the inspiration of the spirits of the dead, so important and widespread a motive to art throughout Melanesia. Very little is known about their real significance in the culture of the sculptors and their function appears to vary in different localities. The native families of the northern Solomons are organized into lineage groups consisting of the mother's relatives, many of whom live in the one village. There are also matrilineal clans, each of which possesses a bird or other animal totem, and a club-house exclusive to the initiated men in which sacred objects are made and stored, clan guests from other villages are received, boys undergoing initiation sleep, and the men spend their leisure time. Neither of these social groups inspires art but they control its production and function in the ceremonial life of the people.

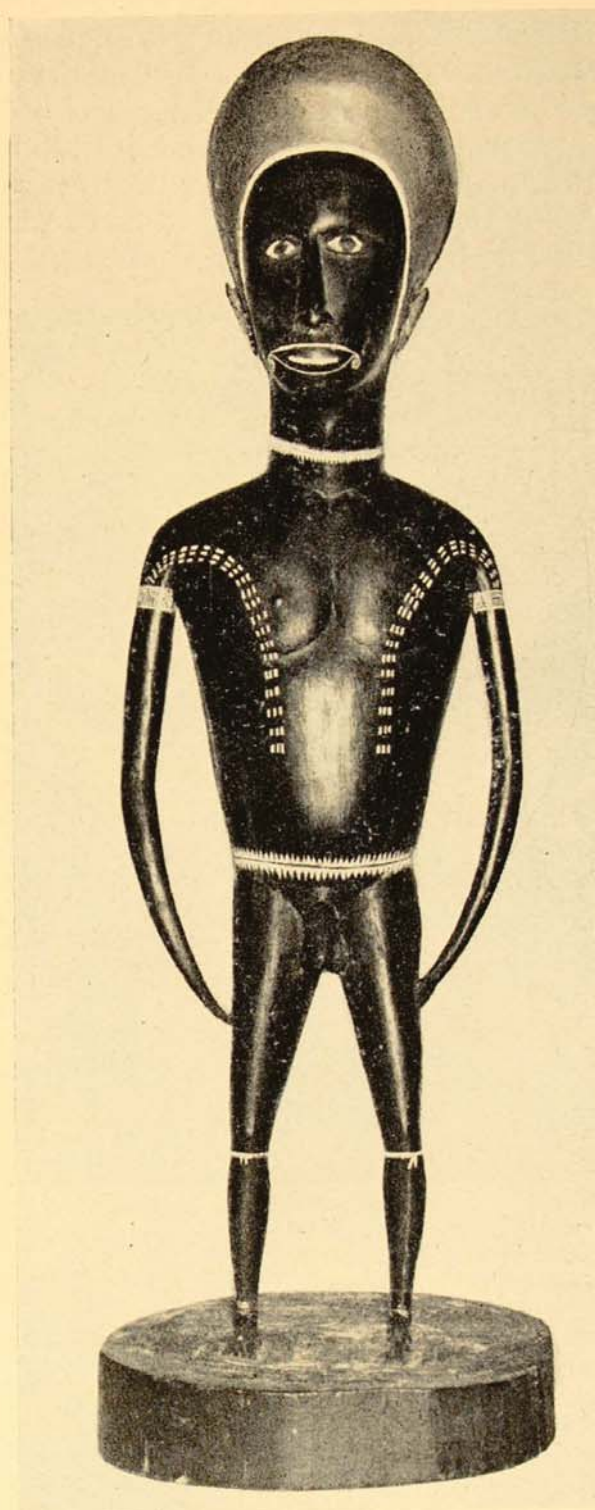
Boys and girls are betrothed in infancy and a long series of gift-giving and goodwill rites are carried out until the marriage takes place. At the marriage of a woman of *tsunaun* rank, which has the highest status among the lineage groups, she is escorted to her husband, the couple living in his mother's house at first, by a man carrying a wooden carving, known as *kaisa*, of a woman on a pole—the purpose of the carving is to ensure that the newly wed

wife will conceive and that her first-born will be a girl, which the sculpture represents, to establish within the wife's lineage ownership of property and relationships of children resulting from the marriage. The carving is stored in the club-house of the husband's clan until the child grows up, when the figure is destroyed—the child would die should a woman see this carving during the latter period.

A most interesting use of the sculptures is at Saposia in Buka Strait during the puberty ceremonies for a girl, when a glistening black life-size or even larger wooden figure of a woman, decorated with various ornaments appropriate to the ceremony, is obtained by her family from a carving specialist. It is kept in the family's hut and is displayed during these ceremonies and also at the girl's wedding, after which it is burnt. The unusually fine sitting figure illustrated is probably in this category. It is a well-posed sculpture in which the features and expression of the subject are faithfully reproduced. The face bears a natural look of expectancy, and is decorated with a design of concentric circles



A life-size figure of a girl from Rubiana, New Georgia.

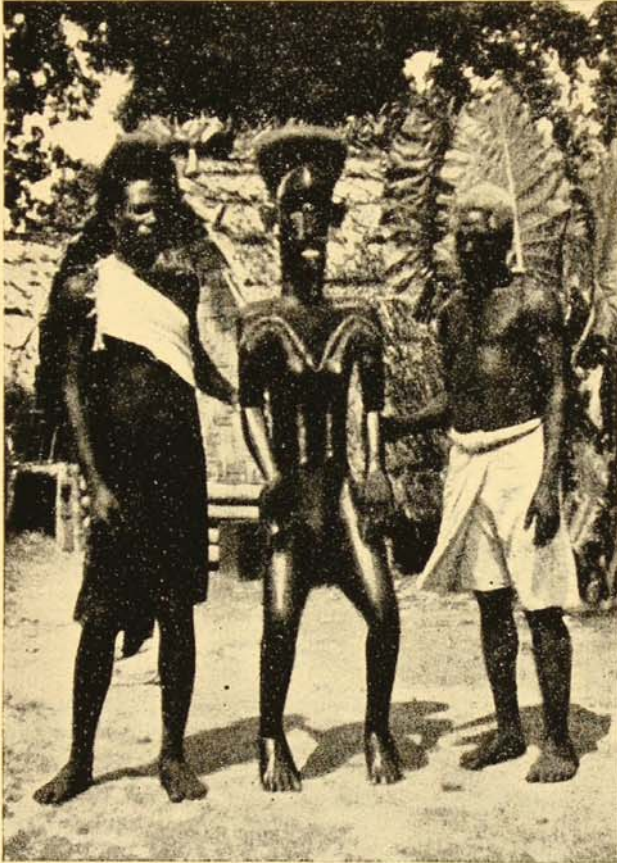


An unusually fine sculpture of a man from Kieta, Bougainville.

and diamonds and bands of parallel crescents which is cut into the face of living people in the form of cicatrices. The body is of normal proportions, and is notable for the fine posing of the arms; the upraised right one forms a  $\nabla$  opposed to that of a  $\Lambda$  of the leg below it, the left one bent to

run parallel with the leg. The legs, however, are short and badly proportioned. There are nine or ten white bands representing the valuable clam shell rings on the arms, also strings of small shells on the wrists, neck and perforated ears; the hair forms a white convex top marked off sharply from the face by a horizontal rim.

Wooden sculptures are displayed in each of the three main parts of the boy's initiation into the *Upi* cult, during which they wear a special domed hat from which the ceremonies derive their name. It is an age-grade rite associated with the secret life of the men and is of a type characteristic of Melanesia. One type of sculpture, the *urar*, consists of figures of a man and his wife who is crying because her son is being taken away to begin his period of isolation from the women in the bush. These are crude but realistic sculptures, with a large mouth, a white design painted on the face, and human-hair attached to the head. Each one wears a *upi*. The boys are ceremonially killed and returned to life as initiated men during this ceremony. The *urar* figure is made in great secrecy by old men in the bush. Each one is named, the sound of a bullroarer is its voice, and after the ceremony, when up to six or more of them are displayed, it is burnt.



Female figure, above life-size, used in girl's puberty ceremonies at Saposa, Buka Strait.

After Blackwood.

Three children's heads produced about forty years ago at Rubiana, New Georgia, by skilled carvers commissioned by the late Captain A. H. Middenway.





The information supplied with three of the small black sculptures in our collection from Kieta is that they were kept in the men's club-house as a record of the victims killed in raids on other villages. Cannibalism and revenge were two of the main reasons for these raids.

Also in our collection are four heads, three girls and one boy, in black polished hardwood, which form an interesting comparison with those already described. This series was carved about forty years ago by men who were highly skilled specialists in wood carving, all of whom are now dead. They were commissioned by the late Captain A. H. Middenway to carve a series of figures, most of which he presented to the museum in Suva, Fiji. In each piece the subjects have been reproduced in a

most life-like manner, including the earlobes distended by cylindrical ornaments, and the inlay pearl-shell design featured in the central and southern Solomons.\* There is a freshness and animation in these faces which are almost good enough to form anthropological records of the physical characters of the native children of Rubiana, New Georgia Island, where they were carved. They are not as well finished as the older carvings which had to satisfy traditional standards, but they form a valuable record of the art of the Solomons in recent times when the craftsmen work in the white man's style.

\*The Shell-Inlay Decoration of the Southern Solomon Islands, AUSTRALIAN MUSEUM MAGAZINE, Vol. VIII, No. 5, 1943, pp. 154-9.

## NOTES AND NEWS

RECENTLY a crocodile measuring about thirteen feet in length caused considerable consternation among bathers at Kemp Beach, Rockhampton, Queensland, and, as is usual with similar happenings, zoologists were asked the whys and wherefores.

It was suggested that the unwelcome saurian may have been the harmless Johnston's Crocodile, an inland fresh-water species, and that it may have been washed out to sea during heavy floods. However, the fresh-water species does not attain a greater length than 8 feet, so the 13-foot specimen at Kemp Beach must have been the Estuarine or salt-water crocodile *Crocodilus porosus*, a species known from Malayasia, through New Guinea to the

Solomon Islands and northern Australia. It grows to approximately 22 feet in length, is the species hunted in the north for its hide, and is a dangerous man-eating type.

The interest to the zoologist lies mainly in its appearance so far south, even though many years ago it was recorded from the Mary River. Just how it reached the Kemp Beach area from its northerly haunts will remain unknown. The long southward swim can hardly be regarded as a voluntary effort on the part of the crocodile and it is most probable that it was washed to sea from a far north river during recent heavy floods, and was caught in a fast-moving ocean current.

J.R.K.

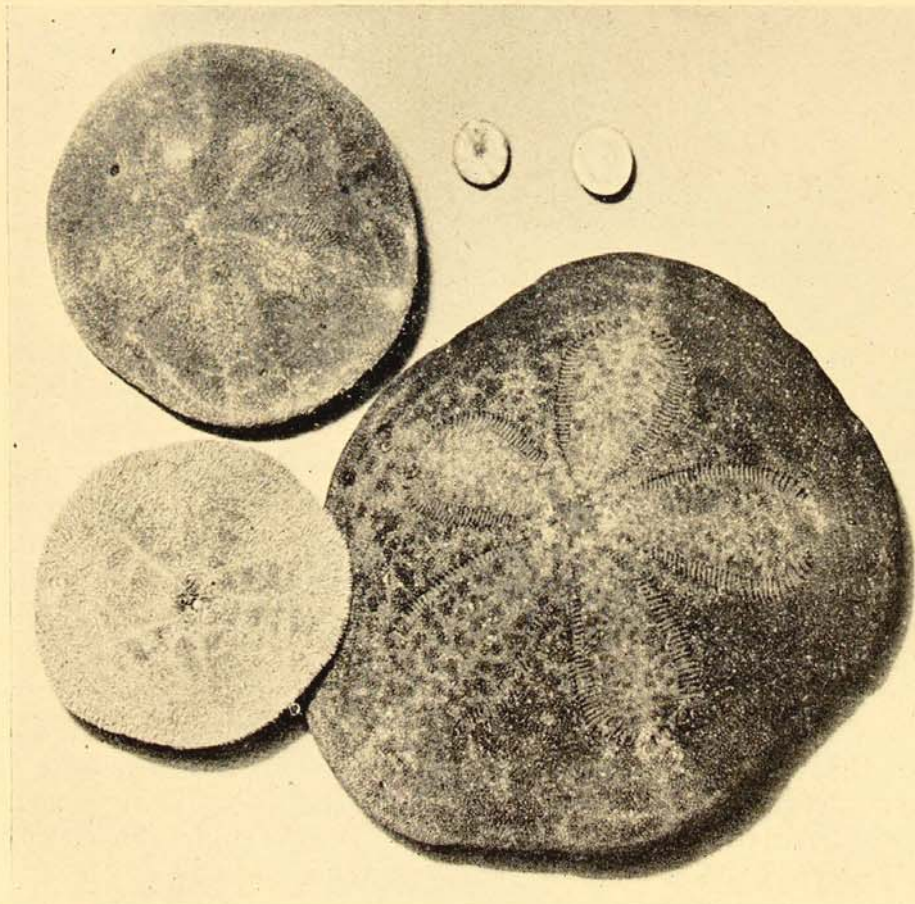
## Trawlermen's Rubbish

By ELIZABETH C. POPE, M.Sc.

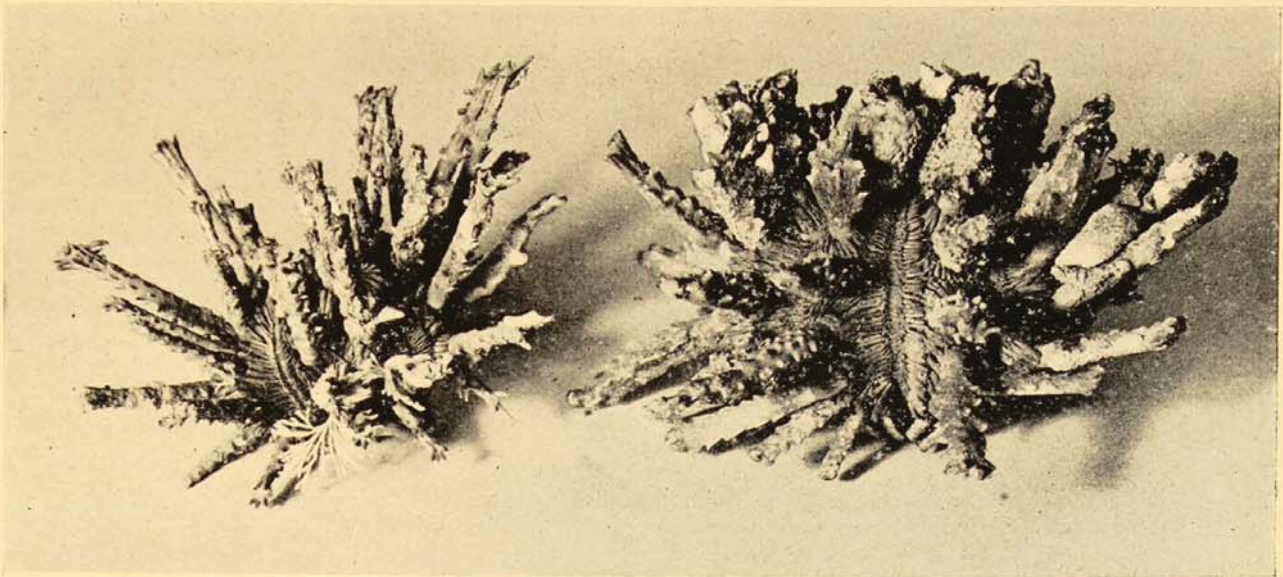
JUST as one man's meat may prove to be another man's poison, by the same token what may be rubbish to one fellow can be quite valuable to another. This fact was brought home to me very clearly on the one occasion that I went out on a small Danish seine trawler from Twofold Bay, in southern New South Wales. The animals which interested the zoological enthusiasts most were the very ones which the deckhand was heaving over the side as useless. Only the edible fish of suitable size would have been kept had we not intervened and grabbed some of the "rubbish" to bring ashore for sorting and subsequent preservation for the Museum's collections. The beauty of colour and shape of the Fire-

brick Seastar, for instance, was quite lost on the fishermen and the conical red hermit crabs which ran about bumping their shelly homes on the deck were considered only from their nuisance value.

One rather exciting aspect of collecting among this so-called rubbish from the trawl is the glorious uncertainty of what will turn up next. One has feelings matched only by those of a child who has paid its shilling and is rummaging in a lucky-dip barrel at a fete. Indeed, some of the Museum's most valuable invertebrate specimens were trawled up from various points along our coasts—some by zoological expeditions and others by trawler captains who took some interest in



Green Button Sea Urchins (*Clypeaster australasiae*) of varying sizes ranging from half-inch juveniles to large adults. Note the clear petaloid pattern of pores on the largest specimen and the mouth in the centre of the lower left-hand one.



The Thorny-spined Sea Urchin, *Coniocardis tubaria*, is often overgrown by clinging and encrusting growths like the light-coloured bryozoan on the left- and the lumpy sponge growths on the right-hand one.

natural history. The latter seem, unfortunately, to be a dying race. On a trawler, therefore, one is always hoping to have the luck to collect yet another rarity or at least additional specimens of a rare species. It is probably quite safe to claim that each year many valuable and even rare animals must be heaved overboard, in ignorance, with the other rubbish from the trawl.

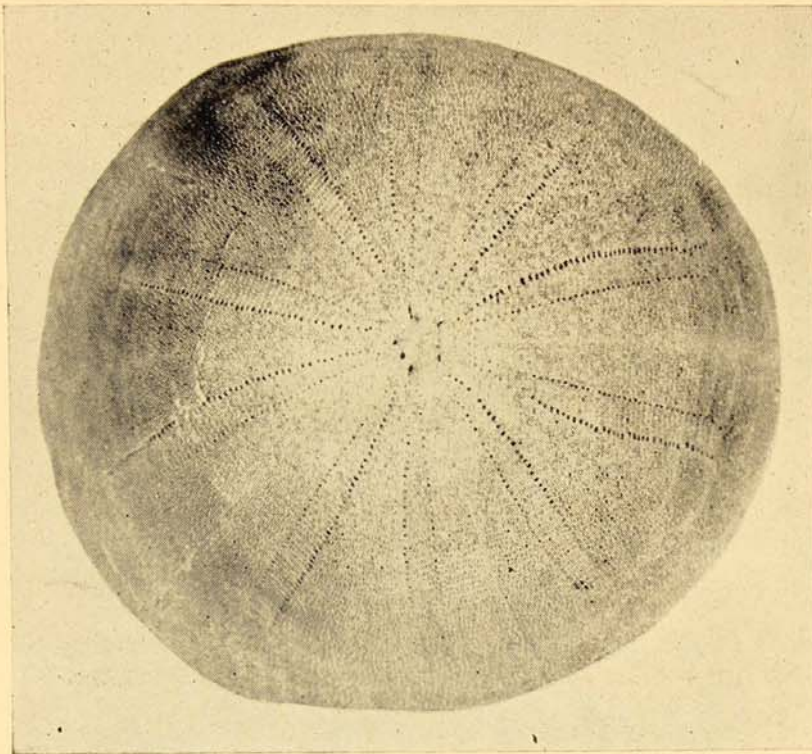
Some of the hardy perennials appearing in the trawler rubbish are very interesting creatures—just as interesting in their way as the rare ones, and yet the seamen who handle them know little or nothing of their structure and habits. Some of them are well worth consideration. One of the commonest creatures in trawler rubbish is the smallish sea urchin, shaped somewhat like a flattened solar topee, which the men call Green Buttons. These urchins are known to the scientist, however, as *Clypeaster australasiae* and differ quite considerably in shape from the more conventional types of urchins with globular bodies. Instead of the usual covering of fairly prominent spines their hat-shaped bodies are bedecked with spines so small and numerous as to appear like a fine fur. Nevertheless, their bodies are constructed after the usual five-rayed plan of the ordinary urchins and this fact is born out by the evidence of the beautiful five-rayed petaloid pattern of

holes or pores which pierce the upper surface of the body through which the tiny tube-feet project in the live animal.

Green Buttons may range in size from half an inch or less across up to 5 inches or even more and, while the small ones are rounded and flat and look like buttons, the larger ones gradually lose this rounded shape. They become more pointed towards their front ends for, unlike most of their group in the echinoderms, they show a definite preference for travelling with one end always in front. But while we can think of them as having definite front and back ends, we cannot really consider that they have a head, as do the majority of creatures which progress in this way, for there is no part of their body where sense organs are concentrated together to spy out the land, as it were.

The mouth in *Clypeaster* is situated in the middle of the lower, flattened surface and since the digestive organs are always full of sand we deduce the fact that their home is on the sea floor and that they scoop up sand and ooze from its surface and extract particles of nutriment therefrom, as other detritus feeders do.

Among the other kinds of sea urchins which may turn up in the trawl is *Goniocardis tubaria* which has rather distinctive, thorny spines, many of which may become so coated by growths of sponges,



A unique sea urchin, *Anomalanthus tumidus*. This specimen appeared in trawled "rubbish" and is the only one of its kind in the world.

bryozoa, barnacles and tubes of worms as almost to be obliterated. The urchin may thus become a walking menagerie, for while some kinds of urchins can keep their spines practically clear of growths by means of the workings of small, pincer-like structures called pedicellariae, *Goniocidaris* does not seem to have this ability.

Another pleasing echinoderm appearing in trawler rubbish is the Firebrick Seastar, *Asterodiscus truncatus*, notable chiefly for its distinctive covering of knob-like tubercles and its colouring. The delicate shades are, however, fugacious and disappear rapidly as soon as the creature dies and for this reason they have not yet been recorded in scientific writing. We were fortunately able to make a colour sketch of it and to take a colour photograph of the fine specimen which is illustrated on the cover. After preservation, an artist has restored the original shades and colour to this specimen so that it may be seen by future workers. Delicate mauves and orange are the predominating shades on the raised knobs, but underlying their more superficial pattern is a general lemon yellow shade due to the fact that the smallest types of spines are of this hue. The two large, rounded knobs on the tip of each arm are mauve and then follow alternate,

wide bands of orange and then mauve tubercles across the arms till the centre of the seastar is reached where mauve coloured knobs seem to predominate and to have orange ones scattered at random among them.

On rare occasions delicate sea lilies—those peculiar stalked echinoderms belonging to the group called crinoids—may be brought to the surface by the trawl but rarest of all is the peculiar sea urchin called *Anomalanthus tumidus* which is illustrated here. Quite obviously it is related to the Green Button type of urchin but close examination of the illustrations will reveal its unique structural differences and the peculiar pattern of the pores on the upper surface.

Only one specimen of *Anomalanthus* is known in the world and that is the one illustrated here, but there is always the hope that a few more will turn up among the trawlermen's rubbish. The value of a living specimen of this species would be hard to gauge since it is of great interest both to those concerned with fossil studies and those who deal with present-day creatures, for it is a primitive type and may well be considered worthy to rank with living fossils like the platypus. At least

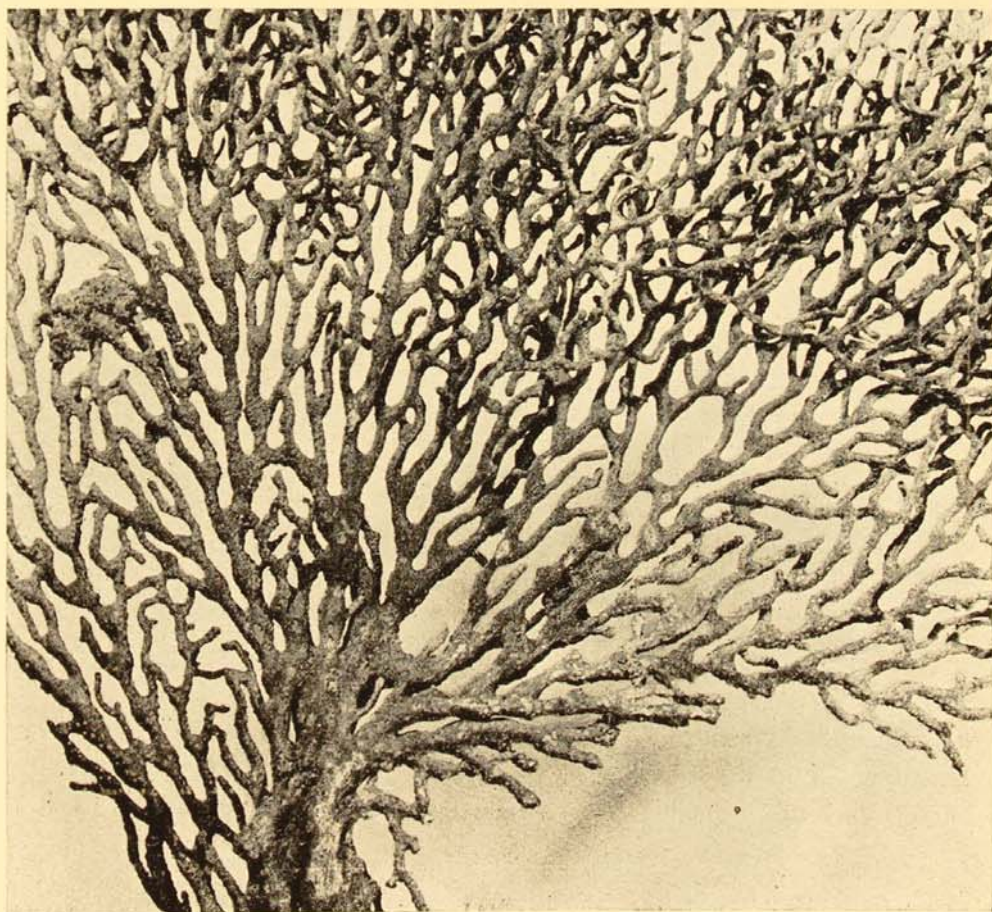
two authorities on the group have expressed doubts as to whether it were a living, modern species and only a year or so ago we were requested to examine the specimen very carefully to see if it could be a well-preserved fossil. While it was exposed to the moist atmosphere during this examination, the hard test (or body covering) fell apart and it was possible to examine the interior so that we were able to state with certainty that the specimen had definitely been alive when captured and was not a fossil.

Although the animals we have mentioned so far as conspicuous in trawler rubbish were all members of the major group echinodermata, they form only a small part of the rubbish and many other kinds of creatures may also be found on the deck of the ship after all the edible or useful fish have been stowed away. They range from solitary corals like *Flabellum australe* and worms of various kinds to fish which are not considered worth eating or which, for some reason, are not of commercial value.

An occasional specimen of the orange-coloured Aleyonarian Coral, *Mopsella ellisi*, whose delicate shape is rivalled only by certain plants and sponges, may turn up at any time and, whereas the colour of a true coral fades when the animal dies, that of an aleyonarian will remain for all time. The well-known Organ Pipe Coral, *Tubipora musica*, and the Blue Coral, *Heliopora*, are also aleyonarians which retain their hues when dead and they are well known to travellers in tropic seas, but the delicate, orange *Mopsella* is less known although just as pleasing.

Many mollusc shells appear in the trawler rubbish, some being inhabited by their original owners, but many, it must be admitted, have been appropriated by hermit crabs who consider the smooth, durable shells as ideal coverings for their vulnerable hinder parts. Many a conchologist would welcome the chance to pick over trawlermen's rubbish for though the shells which house hermit crabs are generally somewhat battered, those which are alive are generally in very good condition and

The Orange Mopsella, *Mopsella ellisi*, is one of the most colourful aleyonarian corals which turns up in trawler "rubbish." It is a colonial animal and each of the small pores on the branches houses a polyp.



are of types not common on the strand. Scallops, cowries, volutes and carrier shells are common in the trawls.

Barnacles, sponges and various smaller types of crustaceans are also frequently seen and even an occasional Giant Tasmanian Crab, *Pseudocarcinus gigas*, may turn up in the trawls down south. It must, however, be admitted that these enormous crabs are not thrown overboard as a rule but are eaten by the crew and thus but rarely is a specimen brought back to port.

As an example of the fish which, for some reason or another, are regarded as rubbish we may cite the Rough Perch or Thetis Fish, *Neosebastes thetidis*. It apparently

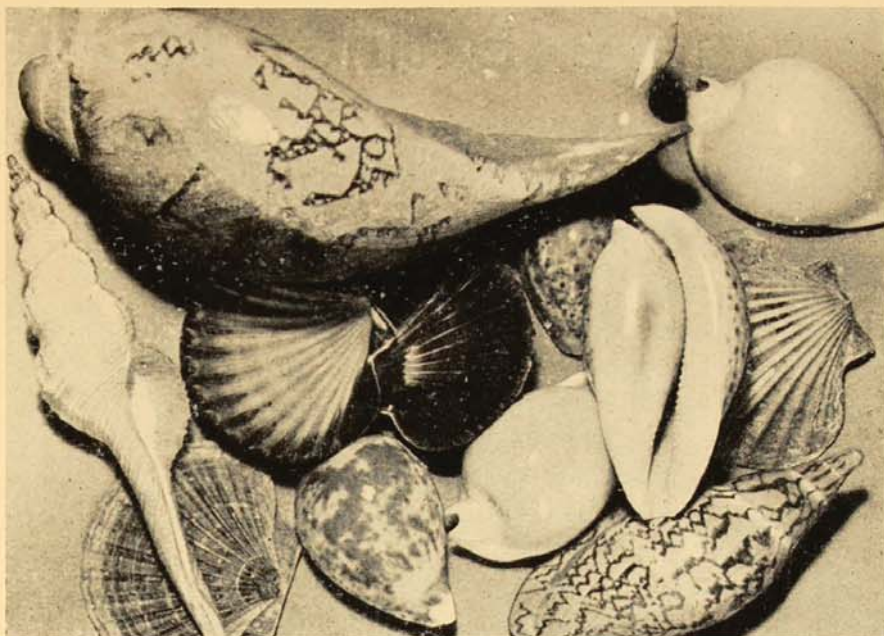
turns up quite frequently in trawls but is always cast back as being of no value for food, although in the opinion of Mr. G. P. Whitley it is not a poisonous species and there should be no reason for not eating it. Perhaps the formidable spines of the dorsal fins and on the side of the head account for the men's dislike of this fish. *Neosebastes* also seems to suffer from decompression troubles when brought up from the depths in a trawl. Evidence of this may be seen in the bulging eyes of the specimen illustrated and also in McCulloch's statement that when brought to the surface this fish often has the abdomen distended by gases (presumably in the swim-bladder) so that it floats upside down. Its colouring is reddish-brown with several



The small Rough Perch or Thetis Fish, *Neosebastes thetidis*, often appears in trawls but is not used as a food fish. Also to be seen in the photograph are rays, flathead, a Jackass Fish and part of a shark.

Photo.—W. E. Phegan.

Molluscs always form a major part of trawlermen's trash. Some of the commoner kinds which appear in local trawlers' catches are illustrated here.



darker cross bars on the upper part of the body and pink below. The fins show green and yellowish bands across them so that it is quite a striking-looking fish.

The roll of names of the animals which figure in trawlermen's rubbish could, of course, be expanded till it was as long as that of a fashionable club or school and one could spend a lifetime studying them. We cannot hope, however, to do more here

than call attention to the wealth of animal life which appears in commercial trawls and to remind our readers that it represents but a tiny fraction of the diverse creatures which make their homes in the sea.

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For photographs of some of the hermit crabs which appear in trawler rubbish see "The Endless Househunt," AUSTRALIAN MUSEUM MAGAZINE, Vol. IX, No. 4, 1947.

## NOTES AND NEWS

**T**HE Invertebrate Department of this Museum was recently visited by Professor L. R. and Mrs. Richardson, of Victoria University College, Wellington, New Zealand. They were returning from a trip to America and during their short stay in Sydney paid several calls to this Department. The Professor was able to examine the reference collections of crabs and leeches and to determine the identifications of several New Zealand species about which he had been doubtful. As he had visited many museums and universities during his travels his suggestions and comments were both interesting and stimulating and his visit was very much enjoyed.

Miss Elizabeth Pope, of this Museum, and Miss Isobel Bennett, University of Sydney, have just returned from a field trip to the southern part of the New South Wales coast and Mallacoota Inlet, in Victoria. During this trip they continued their ecological survey of the shore and made a special study of the geographical distributions of the common shore animals and plants between tidemarks. The preliminary surveys of the Victorian shore animals is now completed as a result of this trip, and it is hoped that the results of this work will soon be available to those interested in biogeography.

# A Strange Extinct Marsupial of Great Size from Queensland

By H. O. FLETCHER.

THE Australian marsupial fauna is one of the most interesting and important in the world. The ancestral forms arrived in Australia about ninety million years ago, either during late Cretaceous or early Eocene times. Not long afterwards the Australian continent was severed from neighbouring land masses and the more highly specialized placental mammals which were rapidly evolving in other parts of the world thus had no means of access to Australia.

The Australian marsupials therefore at no time were involved in a struggle for existence against vicious and predatory carnivores or other competitors. They basked in a land of plenty with nothing to retard their evolutionary progress, and it is not surprising to find that by Pleistocene times they had developed into giant, cumbersome creatures. Some of these extinct forms which roamed the Australian continent, perhaps no more than 200,000 years ago, would, if alive to-day, rank in the forefront of the world's strangest and bizarre animals.

In the year 1887, several fossil mandibles of a giant marsupial were collected from Pleistocene deposits on the Darling Downs, Queensland. This creature, which received the name *Nototherium dunense* De Vis, possessed the bulk of a rhinoceros, walked on all fours and lived entirely on the luxurious vegetation of those days.

Many years later seventy fossilized fragments of bone were collected from a depth of about seventy feet at Brigalow, Darling Downs, Queensland. These fossil remains were forwarded to the Queensland Museum where, under the supervision of the late Director, Mr. Heber Longman, they were

reconstructed to form an almost complete cranium. It was recognised as being similar to the fossil remains described as *Nototherium dunense* De Vis, but some additional strange characters on the new material proved to be of great interest.

There was found to be an extraordinary development of the zygomatic arches apparently associated with large cheek pouches which must have given this ponderous creature a most ludicrous appearance in life. The maximum width of the skull (680 mm.), exceeds the maximum length (634 mm.), a feature not usually characteristic amongst mammals.

The conclusion of Mr. H. Longman was that this giant marsupial was a specialized offshoot from the *Nototherium* group and he described it as a new genus *Euryzygoma*, retaining De Vis's name *dunense* as the specific one.

A restoration of this strange marsupial, one-fifth natural size, was recently made by Mr. Wilfred Morden and is exhibited in the Queensland Museum, Brisbane.

It appears to be an irrevocable fact that any animal group which attains great size and bizarre characters is headed for extinction. This has been the case throughout geological history and the giant Australian marsupials were no exception. Their great bulk and slow movement prevented them from successfully meeting a changing climate from luxurious to semi-arid conditions. They were totally unsuited to meet and overcome the threat of thirst and hunger and were forced to await death and extinction. The smaller and more agile marsupials were able to survive and they constitute the marsupial fauna of to-day.



# The Satellite of Sharks

By G. P. WHITLEY.

"The great grey robber-shark, his black fin hoist,  
Like pirate's sail, and slimy belly of pearl;  
A spear-blade gleaming as it cuts the blue,  
The little fishes fly save one bold sort  
Striped motley, with long snout, which is the slave  
And lick-plate of the shark, seeking for him  
Food, that the little fish may leavings eat;  
No shark so hungry that will swallow him."

Edwin Arnold, *The Voyage of Ithobal*.

THE Pilot Fish is an open ocean fish of very wide distribution, though commoner in some places than others (not depending on the number of sharks in those seas). It is often seen swimming about ships in warmer seas, following them for many miles, or accompanying large marine animals, especially sharks, turtles, whales or devil rays, and some curious stories have been invented to account for such associations. Young ones have been found in floating boxes, amongst blue-bottles (*Physalia*) with *Nomeus*, and near the tentacles of jellyfishes or in drifting weeds. As Badham's "Fish Tattle" relates, "some suppose it to gratify a social instinct, as when a dog escorts a gay barouche." One or more pilot fish may swim in a shark's vicinity, often keeping at certain distances like aircraft in formation flying. The legend of the origin of the name pilot fish is that it leads a ship to within sight of its landfall and then leaves it in safety. In this respect they are miniature counterparts of dolphins or porpoises or of the late lamented Pelorus Jack. A commoner story credits the pilot fish with leading sharks to their food (as if the shark is not well enough endowed with sight and smell to find its own) or away from danger. It is then said to be rewarded for its services by security from attack and by the scraps left from the shark's meals—either before or after digestion, as Budker delicately phrased the outcome of this supposed "gentlemen's agreement." It is likely that only the pilot fish's speed saves it from being swallowed by its

"host"; no pilot fish has yet been found in a shark's stomach.

On a "Voyage to Siam," made in 1685, according to Arnold<sup>1</sup>, a Devil Ray was seen, 6 degrees from the Equator, which had, between its "horns", a small grey fish which the sailors called the Devil's Pilot because it leads the Devil Ray and "pinches" it if fishes are seen,<sup>2</sup> when the Devil rushes off like an arrow in the direction of its prey.

Small pilot fishes precede little sharks and large ones accompany the giants so perhaps they grow up together, unless they change from a small host to a larger as they grow, a switching of loyalty not usually ascribed to pilot fishes which seem lost if their giant associate is hoisted from the water. Delightful drawings of graceful pilot fishes adorn Hesselberg's *Kon-Tiki and I*, and he tells how these fishes deserted captured sharks for the *Kon-Tiki* raft until there were sixty or seventy of them, some of which swam 4,000 sea miles. The pilot fish is not, however, a sort of bloodhound for the shark, and probably not a commensal or parasite. The relationship is unexplained though interesting suggestions have been put forward, especially by Gilchrist whose paper seems to have been generally neglected. The egg of the pilot fish is peculiar for, as Gilchrist<sup>3</sup> has shown, it bears a long, tail-like filament and he thought that this served to attach the eggs to sharks or ships and might explain, in a hitherto unsuspected fashion, why the pilot fish accompanied these large objects. Thus maternal anxiety might explain why the pilot fish darted away from the shark to investigate anything strange, instead of, as used to be

<sup>1</sup> Arnold: *Natur und Volk*, 74, 1944, p. 104.

<sup>2</sup> "Weil er ihn leitet und kneipt, wenn er Fische bemerkt; dann schießt der Teufel wie ein Pfeil darauf los."

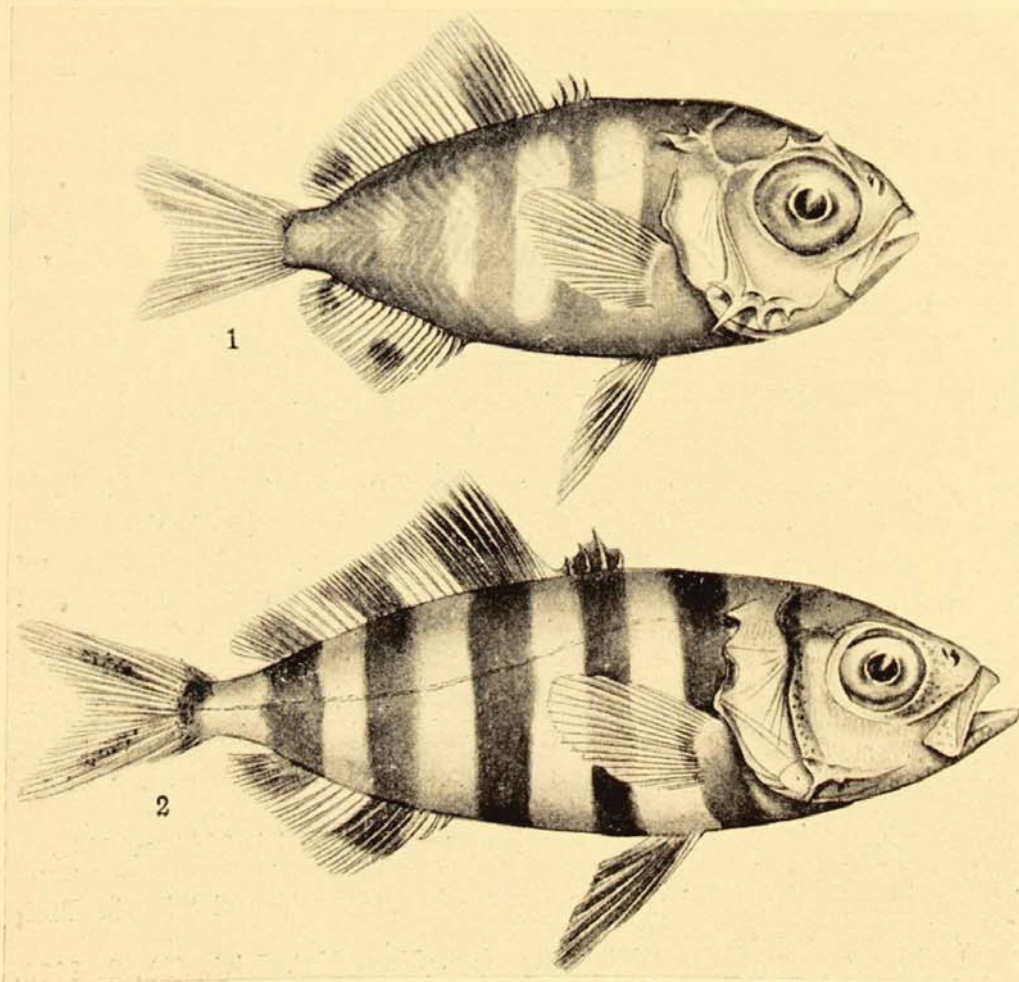
<sup>3</sup> Gilchrist: *Ann. Mag. Nat. Hist.* (9), 2, 1918, p. 114, fig.

thought, to guide the shark to its food. It would be interesting to know if both male and female pilot fishes have this instinct, reminiscent of the parental care of eggs in male blennies. Gilchrist remarked, ". . . the explanation that the pilot feeds on the fragments of the food of the shark is not in accordance with the fact that small fish have been found in its stomach. The objection applies to another conjecture that it feeds on the excrements of the shark, and still another that it feeds on the parasites on the skin of the shark. According to actual observation, the shark is not at all disconcerted by the absence of the pilot, but the pilot is said to be greatly agitated by the loss of the shark . . ." Van Beneden found in the stomachs of pilot fishes pieces of fish, small crustacea, bits of fish skin or seaweed, and even potato peelings thrown overboard. The mystery is still no nearer solution when we consider Barnard's<sup>4</sup> observations on pilot fish eggs: "A ripe

<sup>4</sup> Barnard: *Annals S. African Museum*, 21, 1927, p. 561.

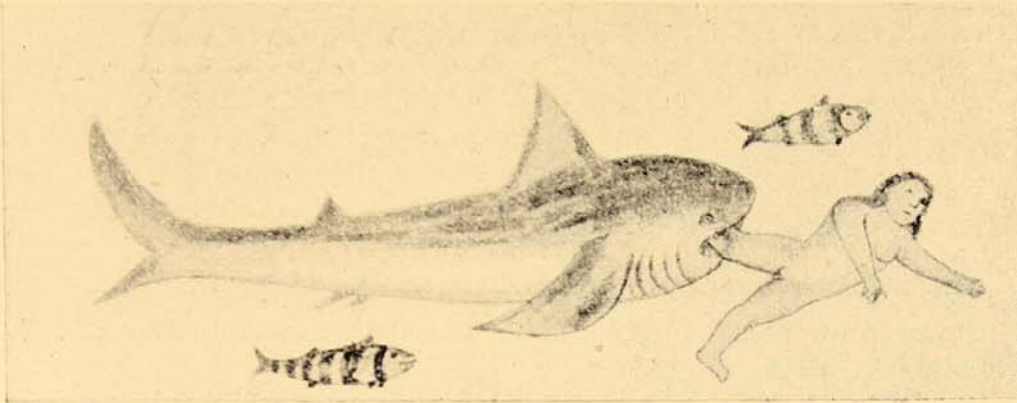
female received at the Museum was found to contain eggs which possessed no filaments, but, on the other hand, possessed an oil-globule and floated in sea-water. They were, therefore, typical pelagic eggs. No explanation of these opposing observations has yet been given, and the question can only be solved by the examination of further material."

The pilot fish is a plump-bodied mackerel-like fish with small scales, a keel each side of the butt of the tail and only four or five more or less separate short spines in the front dorsal fin. The general colour is dark-blue above and paler below with iridescent reflections. The body has about five dark vertical bars which extend somewhat on the fins. The tail-fin is blackish, tipped white, as are the front and back rays of other fins. Young ones have spikes on the head and have even been regarded as distinct genera (*Xystophorus* and *Nauclerus*). It grows to a length of 2 feet. Although sometimes confused with the



Beach-stranded juveniles, 22.5 and 42 mm. long, of the Pilot Fish from New South Wales show the absence of scales and keels along the tail in the young and the gradual loss of spines on the head with growth.

A. R. McCulloch, del.



A 17th-century drawing by Edward Barlow of a shark attacking a man and accompanied by pilot fishes.

After Basil Lubbock, Barlow's *Journal*.

sucking fishes,<sup>5</sup> the pilot fish is easily distinguishable because it has no sucker on top of the head. The best known species is *Naucrates ductor*, but the Australasian pilot fish has been named *N. angeli* because of its slightly different shape, colour, proportions and numbers of fin-rays. Ours has been found from south Queensland, New South Wales, Victoria, Tasmania, and northern New Zealand to South Australia.

To-day it is classified alongside the Yellowtail Kingfish, the Runner, and the trevallies, but in the time of Linnaeus it was grouped with such diversities as the sticklebacks, butterfly cod, and flying gurnard. The pilot fish was apparently known to the ancients as pompilus and the earliest accounts of it are those of Pliny (A.D. 23 to 79), Plutarch, Aelian and Oppian, in whose writings were born the curious

beliefs about this fish which are still current. Even before them, apparently, a poet had written:

"Pilot-fish, who giv'st to sailors pleasant sailing,  
Grant my sweet companion escort from a-stern."  
Erinna (fl. 350 B.C., *Oxford Book of Greek Verse*).

The earliest picture I have traced is one in Edward Barlow's *Journal* of 1663 with the caption, "The True picture of A Shark the Most Ravnous fish that Swimes in the Sea and also of his pilat fish that goe alonge with him." Here a spirited drawing shows a man being attacked by a shark and has the pilot fishes swimming nearby, near the Equinoctial Line, Atlantic Ocean, between Madeira and Rio de Janeiro.

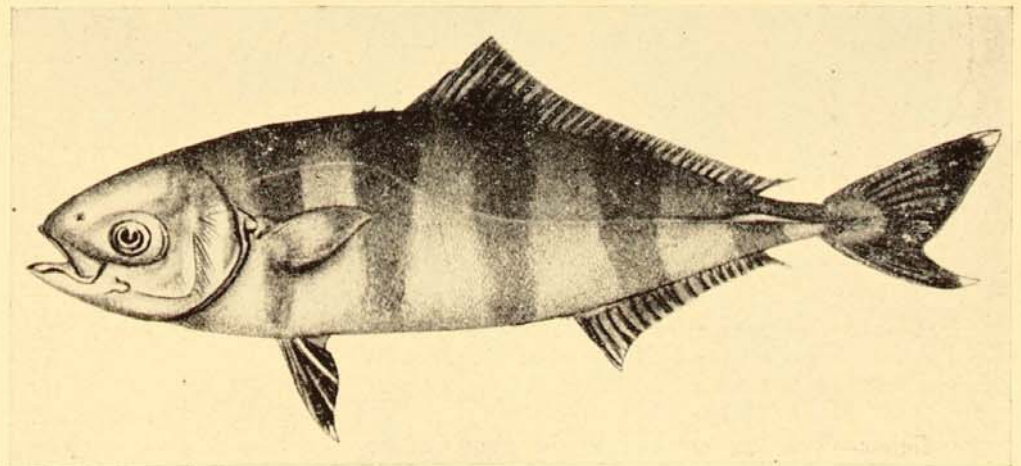
Many early voyagers mention pilot fish in their journals and ponder the curious company they keep but there is perhaps more philosophy or moral reflection than science in their observations.

The earliest known picture of Australian pilot fishes was an aboriginal one made by the Depuch Islanders who made a silhouette of their subject by removing the

<sup>5</sup> Whitley, AUSTRALIAN MUSEUM MAGAZINE, X, 1, 1949 (March, 1950), p. 17.

The Australasian Pilot Fish (*Naucrates angeli*).

After Griffin.



hard red outer coating of a rock to expose the natural colour of the greenstone below according to the outlines they traced.

At Mabuiag in Torres Strait the natives called one constellation of stars *baidam* or the shark. Two small stars in front of the shark's nose were called *wapi*, pilot fish. They also made a string figure or "cat's cradle" to represent the pilot fish and these interesting ethnological items, recorded by Haddon<sup>6</sup>, are illustrated here.

In Hawaii, Tinker says pilot fishes are called "annexation fishes because they appeared there in numbers at the time of the annexation of the Hawaiian Islands to the United States."

Although the pilot fish has been "known" to sailors and naturalists for centuries, surprisingly little is really known about this enterprising fish and the reasons

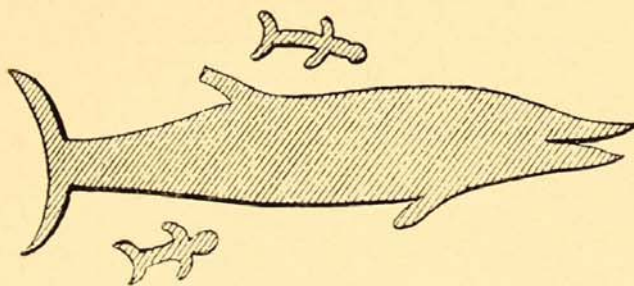
<sup>6</sup> Haddon: *Cambridge Anthropological Expedition to Torres Straits*, iv, 1912, pp. 220, 340, figs. 215, 295.

for its curious behaviour. We are hardly farther forward than the old Greek poet (in the days when sharks and whales were not clearly separated in men's ideas) who put into the following verse the popular beliefs on the pilot fish,

"Bold in the front the little pilot glides,  
Averts each danger, every motion guides;  
With grateful joy the willing whales attend,  
Observe their leader and revere the friend . . .  
Between the distant eyeballs of the whale  
The watchful pilot waves his faithful tail,  
With signs expressive points the doubtful way,  
The bulky tyrants doubt not to obey,  
Implicit trust repose in him alone,  
And hear and see with senses not their own;  
To him the important reins of life resign,  
And every self-preserving care decline."

Oppian's *Halieuticks*.

However the pilot fish may (or may not) lead a shark or whale, one cannot but suspect that for centuries these little satellites have also led naturalists into a good deal of unproved theorising and perhaps indeed have led them well and truly astray into the bargain. Oh, for a pilot to point us to the truth!

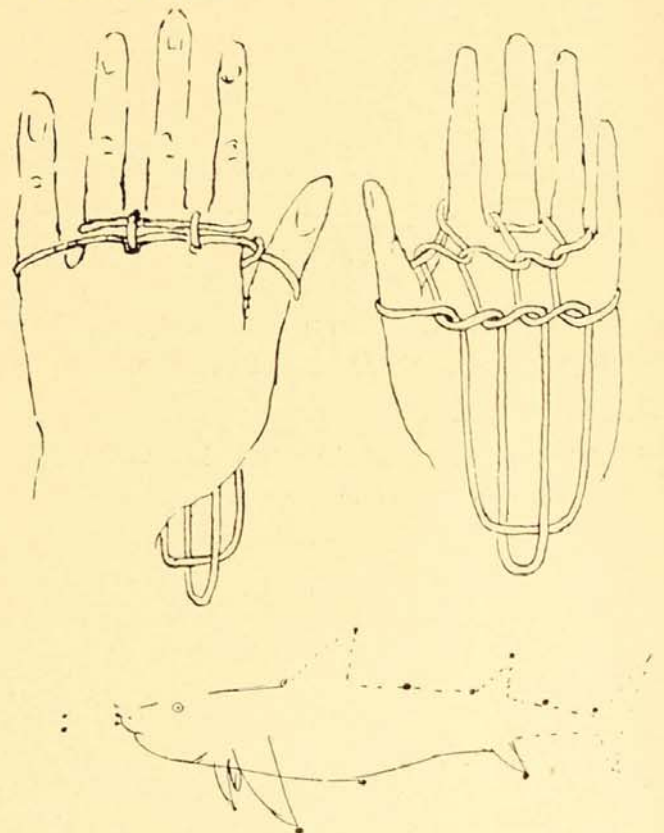


Top—An aboriginal picture of a shark with its pilot fishes, Depuch Island, North-western Australia.

After Stokes.

Below—The egg ascribed to the pilot fish by Gilchrist has a long tail.

After Gilchrist.



Top—An Australian "cat's cradle" representing the pilot fish.

After Haddon.

Below—Pilot fishes (the two little dots in front) and a shark form a heavenly constellation in the minds of Torres Strait Islanders.

After Haddon

# The Mystery of the "Limestone" Caves in National Park

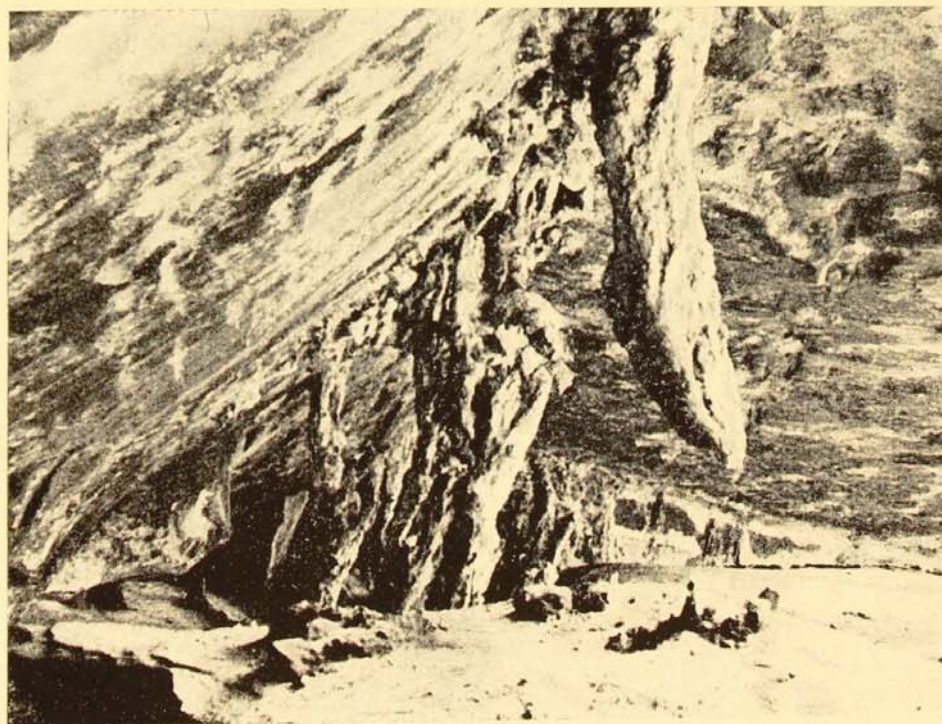
By J. F. LOVERING.

**F**EW people know that in the popular National Park, within twenty miles of Sydney, caves with all the features of the well-known tourist caves at Jenolan can be seen. The caves have long been known to members of the bush-walking fraternity and the most famous and largest is found on the south bank of Palona Brook, about half a mile upstream from the intersection with the Lady Carrington Drive in National Park. Other caves have been reported in the same area.

The cave on Palona Brook is really better described as a rock-shelter, being only about 25 feet deep and 25 feet high and completely open to the air. The most remarkable thing about these caves is that they occur in the Hawkesbury sandstones, which are so prominent around the Sydney district, and not, as at Jenolan and other places, in limestone. Nevertheless, all the typical structures such as stalactites, stalagmites and shawls are to be seen,

though not developed to any great extent. What these caves lack in actual brilliance and extent they make up in their unusual mode of occurrence.

Caves in limestone areas are formed by circulating ground waters dissolving the calcium carbonate, of which limestone is largely composed, and so gradually increasing the size of the cave. At the same time the water with the dissolved calcium carbonate may collect on the roof and then evaporation of these collected drops will allow the calcium carbonate to come out of solution and form a solid deposit. This process continues till a long, pointed stalactite is formed, growing from the roof. Often a similarly shaped stalagmite will grow up from the floor directly underneath the stalactite as the drop falls to the floor. Shawls are formed as a drop gradually runs along the roof and, as with the other structures, are often brilliantly covered by iron-bearing solutions. More complete



General view along the Palona Brook cave. The main feature is the curved stalactite.



Typical stalagmites and stalactites found in the cave.

descriptions of the mode of formation of these structures may be found in previous articles in this MAGAZINE.<sup>1</sup>

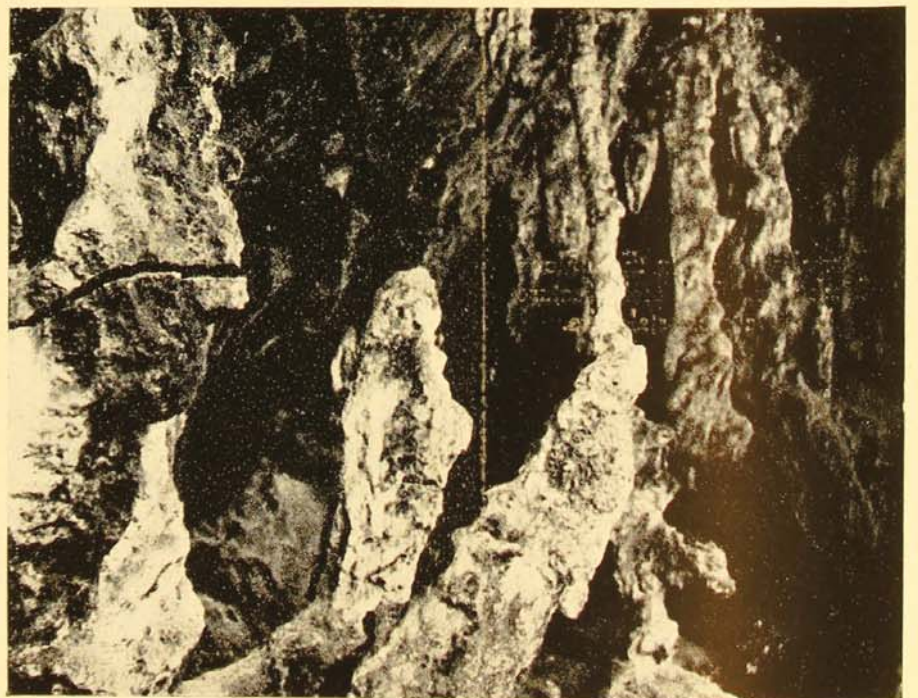
Now, for such structures to form in the sandstone caves of National Park we would need some supply of calcium carbonate to be dissolved by the groundwaters and then re-precipitated as stalactites and other

<sup>1</sup>Anderson, C., A Visit to Belubula Caves, AUSTRALIAN MUSEUM MAGAZINE, ii, 1, 1924, pp. 12-17.

Hodge-Smith, T., A Limestone Cave in the Museum, AUSTRALIAN MUSEUM MAGAZINE, vi, 2, 1936, pp. 39-46.

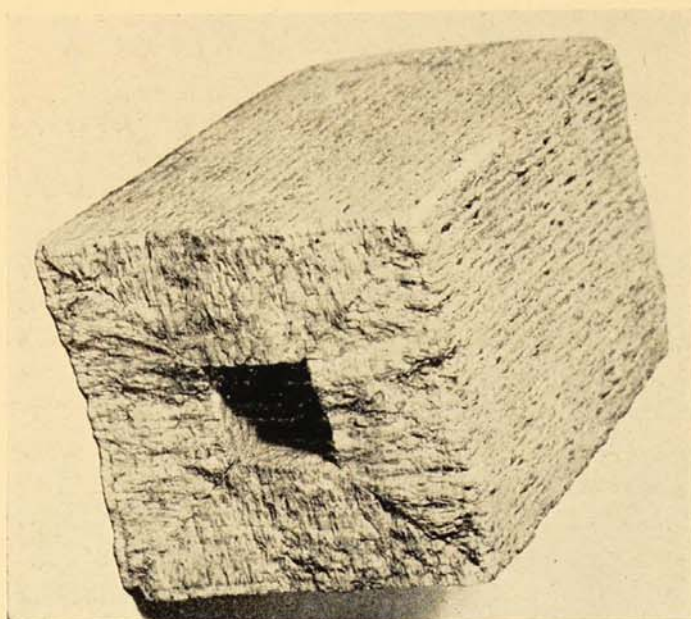
structures in caves and ledges previously formed by normal erosional processes. If you have ever looked closely at a piece of this Hawkesbury sandstone you will see that it is mostly made up of tiny sand grains (worn grains of the mineral quartz) cemented together by some white or yellowish clayey material. Neither of these materials is free calcium carbonate and so ever since the discovery of this cave the origin of the calcareous material which provided the calcium carbonate for the various formations has remained unknown.

Stalactites and stalagmites often join to form vertical pillars. One has cracked, possibly by a local movement of the earth's crust.



Dr. G. D. Osborne<sup>2</sup> has suggested that as limestone beds are not known in the Hawkesbury sandstone formation, the calcium carbonate has been derived from a now-eroded mass of Wianamatta calcareous sandstone as such sandstones are known to occur elsewhere. However, consideration of already known evidence shows that the calcium carbonate could have been derived from the Hawkesbury sandstone itself, probably originating from a calcareous cement.

The published history<sup>3</sup> of the Birthday shaft of the Balmain colliery at Sydney throws much light on this subject. Between the 442 feet and 768 feet levels, the ground waters flowing into the shaft are very rich in calcium carbonate and contain traces of the mineral barite (barium sulphate). So rich are these waters in dissolved material that within a fortnight a 2-inch pipe leading water from the 768 feet level to the bottom of the shaft became almost completely blocked with a solid, fibrous, radiating mass of the mineral calcite (calcium carbonate). Wooden pipes 3 inches square were then used to replace the iron pipes and at frequent intervals these pipes were taken to pieces and the mass inside removed. The photograph shows the structure of a portion of this incrustation. It is interesting to see the perfect mitre jointing of the mass as the fibrous crystals growing at equal rates 90 degrees to the walls meet along the diagonals. Another point of interest is the manner in which the outside of the incrustation has preserved, with delicate exactness, the grain of the wood of the pipes. Even marks of saw cuts are easily made out.



The incrustation in the wooden pipe from the Balmain Colliery. See how the grain of the wood has been preserved on the sides and the perfect mitre joining of the section.

The most interesting piece of information to be got from this occurrence is that the normal-looking Hawkesbury sandstone source beds of the calcium carbonate bearing waters have such a restricted vertical thickness. No water from strata above the 442 feet level or below the 768 feet level shows any appreciable dissolved material. A point of resemblance in the National Park cave is that the waters bearing calcium carbonate seem to have issued from a horizontal fissure at the back of the cave and about 25 feet above floor level. No calcareous structures are found in other caves above the level of this fissure while poorer structures are found in caves on the same level on the other side of the brook. Perhaps these sandstones at National Park correspond to those between the critical levels of the Birthday shaft but a complete correlation is difficult as any limiting lower level, below which caves do not contain stalactitic structures, is not yet known. It is fairly apparent that much research has yet to be done on the Hawkesbury sandstones before the mystery of the origin of the "limestone" caves of National Park is solved.

<sup>2</sup> Osborne, G. D., A Review of some Aspects of the Stratigraphy, Structure, and Physiography of the Sydney Basin, *Proc. Linn. Soc. N.S.W.*, lxxiii, 1-2, 1948, pp. i-xxxvii.

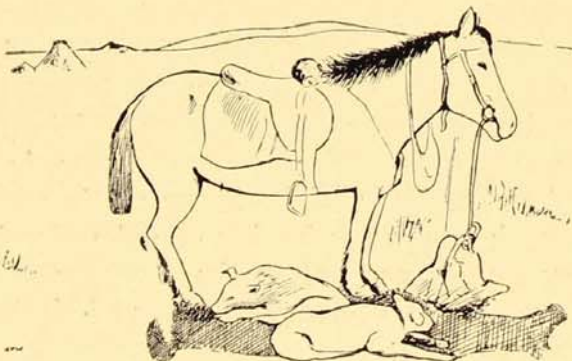
<sup>3</sup> Rae, J. L. C., Pittman, E. F., and David, T. W. E., Records of Rock Temperatures at Sydney Harbour Colliery, Birthday Shaft, Balmain, Sydney, N.S.W., *Proc. Roy. Soc. N.S.W.*, xxxiii, 1899, pp. 207-224.

# A Naturalist at North-west Cape\*

By G. P. WHITLEY.

IT is fairly easy, if you have the time, to travel from Perth to Geraldton or even to about three hundred miles north of the capital of Western Australia, but beyond that there are no railways, roads are incomplete, boats few and far between, and aeroplanes are the usual mode of travel. North-west Cape, that jutting peninsula at the tropical "corner" of Western Australia, about 870 miles from Perth, was first visited by me by taxi from Carnarvon to Point Cloates, and after that journey of 180 miles, it was refreshing to rest at Ningaloo and begin by collecting shells amongst the fine soft, compact, grey sand near the homestead. The beach led to a turquoise and greenish calm lagoon, well beyond which was a reef which I called the Little Barrier Reef. It is more than 100 miles long. Beyond was Frazer Island, with its lighthouse and a wreck, the home of thousands of seabirds. Inland sandhills stretched to the north and the grey, inhospitable-looking ranges which form the spine of North-west Cape, a region now being explored as a possible last resort for Australian oil.

A nine-mile pony ride along the beaches and around the limestone headlands brought one to the famous Point Cloates whaling station. Ornithologists have



My travelling companions take a siesta while the billy boils.

\* Drawings by Author.

observed how a man on horseback can approach birds more closely than one on foot and from the saddle one obtains a good idea not only of what specimens are washed up on the beach but what is in the water as well so that it is a pleasant and lazy method of beachcombing and one can cover so many more miles than by walking. Whitish oval objects in the water proved to be green turtles feeding over the rocky or weedy reef and here and there garfish, mullet, or small whaler sharks were seen in the shallow water, where Grey "Snapper" (*Lethrinus fletus*) fed upon seastars.

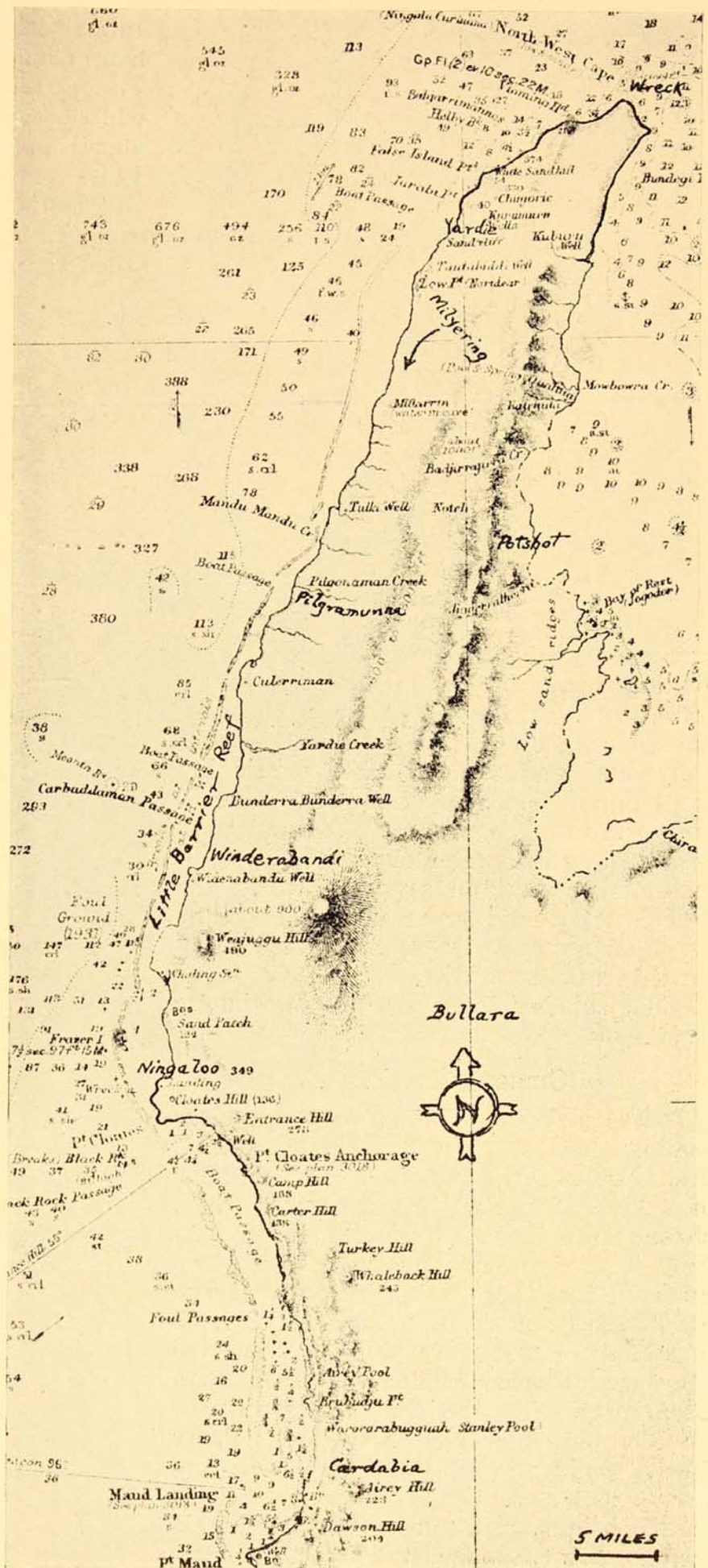
The sharks curiously enough, were very timid and the slightest splash caused them to scoot away. I even entered the water and waited for them to approach but even though I kept quite still they always veered off rather than come within ten to fifteen yards of me. They work slowly parallel to the beaches with the flowing tide and I have seen one bite or nose the hindquarters of a shovelnose ray away from its food.

The Point Cloates Whaling Station, once the scene of tremendous activity by Norwegians and others who caught and landed and boiled down the Humpback Whales<sup>1</sup> about 1915-1928 was, at the time of my visits in September, 1944, a scene of desuetude and desolation but in 1950 to 1951 its activities, long dormant, are resumed as Australians exploit the unfortunate Humpback Whales on their annual breeding migrations from Antarctica.

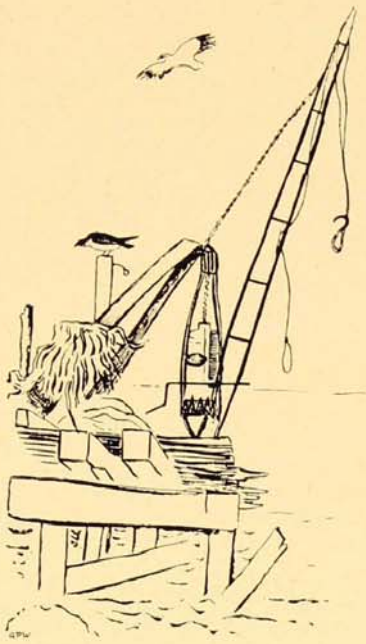
When I was there, chattering eagle hawks nested on a crane, a lizard quickly dashed its autograph across the sand, and white cockatoos mingled their screams with the creaking of old iron swaying in the wind. They roosted upon rafters under

<sup>1</sup> See THE AUSTRALIAN MUSEUM MAGAZINE, Vol. IV, No. 4, October-December, 1930, p. 123.





Map, based on Admiralty chart, of the North-west Cape peninsula.



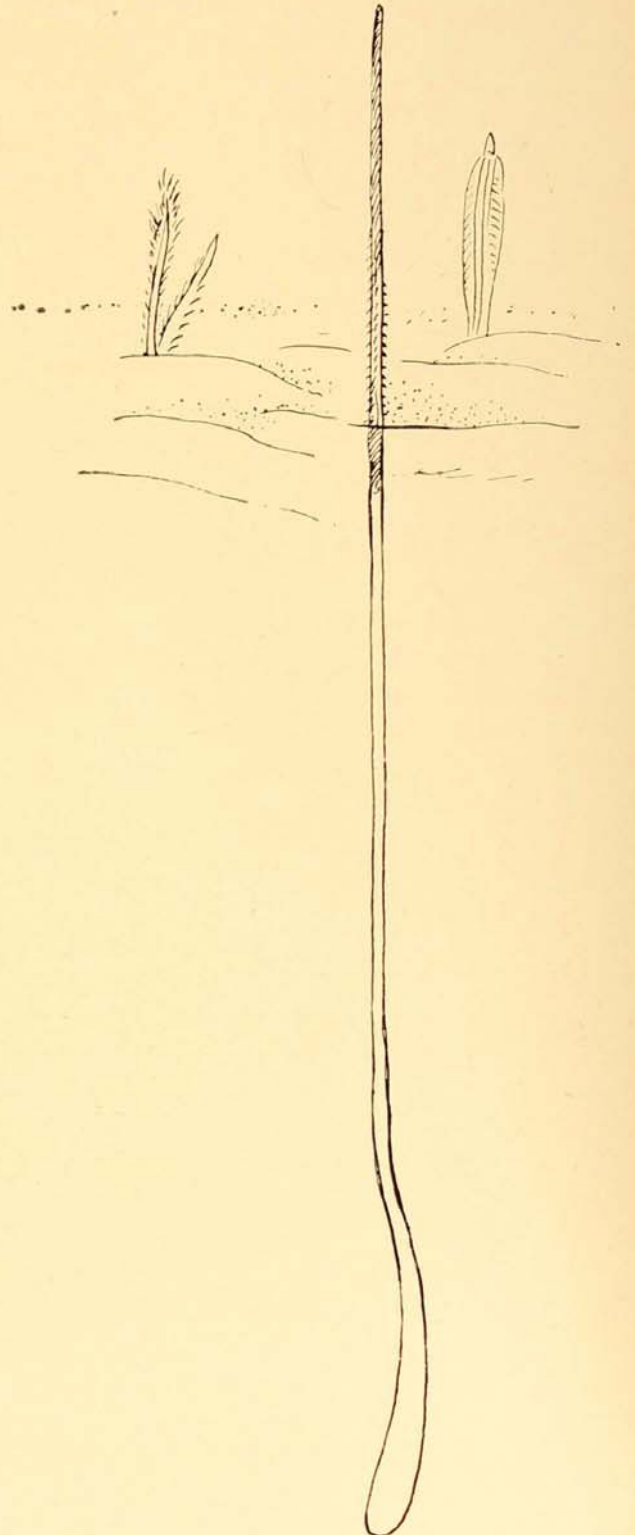
Eaglehawks with nest on abandoned jetty at Point Cloates in 1944.

erazily unsteady shreds of galvanized iron, shading them from the actinic glare of the brazen sky. Huge coils of rope, drums, casks, blocks, pipes, a stove-in boat, a yoke, a flywheel and various other debris lay silent and deserted or creaked in decrepitude, gradually gravelling the sand with rust. The green water champed the sand, swallows fussed and scythed around the broken jetty, and great vats and boilers stood empty and lifeless as the long discarded shovels nearby. A bastion of bleached whales' bones bore mute testimony to slaughter long ceased.

#### CURIOUS SEA PENS.

It was pleasant to wade in the gin-clear shallows not far from Ningaloo. My kind host, Mr. Maurice MacBolt, had told me of a kind of "grass" in the water which shrank into the sand when touched. At first, I thought this might be some sea-anemone like those living in the sand-flats at Broome but when he compared it to a miniature mangrove shoot I suspected the lure of some hidden fish such as a Stonelifter. At the first opportunity I paddled in knee-deep water off Party Beach and noticed at intervals several brown, stick-like objects which receded into the sand when touched. After breaking several, I managed to extract one complete and was amazed to find it was an

animal known as a Sea Pen, but much more elongate than any I had seen before. The exposed part was brown with a whitish top (tipped by filaments of green algae) paler where buried and eventually white at the sunken, muscular "root." One could walk over them and feel them give way underfoot, only to rise again when the danger was past.



The curious Sea Pen, about one-third natural size.



The old deserted lighthouse, near Ningaloo, is the roosting place of kestrels, geckoes hide under the old kerosene tins, and snakes glide over the sandhills.

There was an old pharos on a hilltop behind Ningaloo and one could trudge over sandhills to its ruins under the hot sun, disturbing green snakes with rusty brown tails (*Demansia psammophis reticulata*) or watching the more energetic dogs chase emus through the scrub. Kestrels made querulous clamour as one approached the deserted lighthouse-keeper's house, contrasting with the chirruping of crickets or grasshoppers, the buzz of flies and the distant rumble of the surf. Flies and small black ants seemed to be the only tenants. No, a rabbit bolts from some fallen masonry. The lighthouse is of sandstone, dated 1910, but its light is no more, and its staircase is gone. The frayed and mummified body of a kestrel, fallen from its former nest lies ingloriously upon the floor, a relic more pathetic than the ruined pharos itself for a building can be restored, a bird not. A shrill cry wafts down the empty shell of the lighthouse and a mate of this calling kestrel echoes the sound from a distance. And another. They wheel and circle one another. Mobs of little finches with red bills fly away and some emus walk sedately to the mill trough well below, and Gurloo, a grey weevil-like beetle, makes a squeaky noise by moving its body up and down. Nephila the spider plucks the silent harp-strings of her web, hanging in a cornice. A hover-fly intrudes—just a buzz visible . . .

I did not visit the spine of inland hills but sheep musterers told tales of strange trees there, seven-foot long goannas known as Bungaroos, orange moths with long beaks, and they suggested that treasure might be found there left by the early Dutchmen.

#### SCARING THE CRAYFISH.

Willie the aborigine was an adept at catching crayfish under rocky ledges, and showed me how he poked around crevices under water until he felt the antennae, then worked his other hand down to grab the body. Often his hands would be scratched or bitten by the crayfish, and I feared for stonefish and butterfly cod spines as I tried to imitate his methods. At one stage he said he had been bitten by a "snake"—probably an eel. Mr. MacBolt speared an octopus on his gidgee or fish spear and, tied to a stick, the creature was poked under ledges to scare the crayfish out. Curiously enough the crustacea seemed frightened of the octopus and could then be speared or netted in a shallow scoop of wire-netting. Even an imitation "octopus" or "squid" made of a cut rubber-tyre and tied to a pole has the dread effect of making the crayfish forsake their shelter. When under water, I noticed that one can hear the crackling noise made by the crayfish.

A curious parallel came to mind.

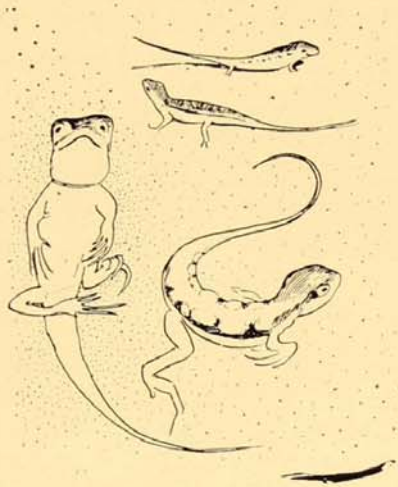
Respecting the little octopi or "ink-pots" of Liguria, D. H. Lawrence (*Sea and Sardinia*) remarked:

Alessandro caught inkpots: and like this. He tied up a female by a string in a cave—the string going through a convenient hole in her end. There she lived, like an Amphitrite's wire-haired terrier tied up, till Alessandro went a-fishing. Then he towed her, like a poodle, behind. And thus, like a poodly-bitch, she attracted hangers-on in the briny seas. And these poor polyp innamorati were the victims. They were lifted as prey on board, where I looked with horror on their grey, translucent tentacles and large, cold, stony eyes. The she-polyp was towed behind again. But after a few days she died.

And I think, even for creatures so awful-looking, this method is indescribably base, and shows how much lower than an octopus even is lordly man.

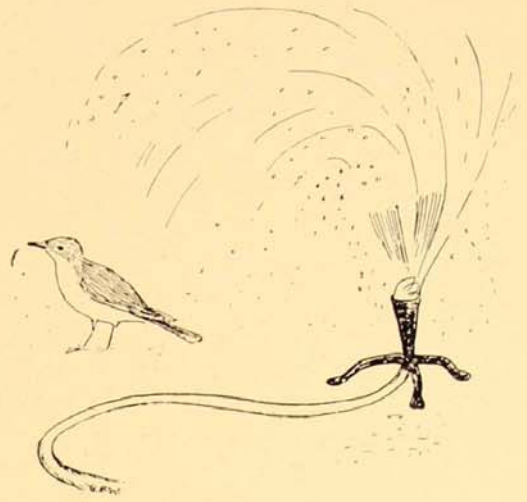
## BLIND GUDGEON.

I left the kind hospitality of Ningaloo on October 18, 1944, for a car trip as the guest of Mr. and Mrs. Eric Payne up the coast, past the charming Yardie Creek (Jacob Remessens Rivier of the old Dutch maps) where fresh water and sea unite in a fishy lagoon shaded by mangroves—a delightful picnic spot where I had once speared a shark in the cause of science. Forty miles or so due N.E. of Point Cloates there were precipices and ranges and creeks with stony beds. This country was evidently more rivery in olden days and



A little lizard known as Jubby to the aborigines.

probably has been drying up since the Pleistocene as the rivers never run nowadays. Kangaroos started from behind great humps of spinifex as we visited various windmills on Mr. Payne's station. My greatest thrill on this trip was to find fish in the freshwater well bored into coral and limestone at Milyering, 20 miles S.W. of Vlamingh Head. They belong to a species of Gudgeon not only unlike every other known gudgeon in character but having no eyes whatever. I later named this blind fish *Milyeringa veritas* because, like Truth, it was found at the bottom of a well. About a dozen could be seen near the water surface like pale grey tadpoles, but Mr. Payne said there were sometimes three times as many in the well. Possibly they fed on ants, lizards, slaters and other little animals dropping from the opening. The fish were never pumped into the tank and have not been seen in any other well. They had been observed at Milyering for at least 20 years.



On a hot day, a ground lark appreciates the water sprinkler on the lawn at Ningaloo homestead.

From Yardie Station I left by mail-truck to travel around the peninsula to Exmouth Gulf, where I stayed at Potshot (so called because the Japanese had dropped some bombs there), but now known as Learmouth after the famous Australian airman. At the Bay of Rest I was able to collect a number of fishes, including a plentiful mullet (*Moolgarda pura*)<sup>2</sup>.

<sup>2</sup> See THE AUSTRALIAN MUSEUM MAGAZINE, Vol. IX, No. 10, January-March, 1949, p. 342.



An ailing, fly-blown ram, sheltering from the wind, takes no notice of the emu coming to the mill-trough for their morning drink. Eagle and kite in background.

Here the beach was of soft sand and stones with but few shells and those large and broken. Ghost crabs were absent. The heat was so great that it burst seed-pods on bushes with a noise like clothes-pegs falling to the ground.

At noon on October 22 a 'plane took off for the South and soon we were up to 10,000-10,500 feet to avoid the bumpy air-pockets. "Unexplored", I thought, as I looked down at the Indian Ocean, the "Little Barrier Reef" and the sandy beaches near Point Cloates; the word "un-explored" could be inscribed in letters 10 miles high upon this scene and be barely noticed, so seldom is it visited. How little we know of the fish of the sea and the

creatures of the land in this out-of-the-way corner of Australia. My own collections were pathetically small. The 'plane sped on, over the "Breakaways" and cultivated areas towards Geraldton, but too far inland for me to see the sea and my old haunts at Shark's Bay. In five hours I was back in city life again in Perth and the next morning worked prosaically at the Museum.

MARINE LIFE.

My next trip to North-west Cape was made by sea in the lugger "Isobel" from Perth en route to Derby.

Tuna were feeding on anchovies and yellow-nosed albatrosses wheeled over the sea as we worked north in a heavy swell and a few mutton birds appeared as we crossed the Tropic of Capricorn. We stood well out to sea to clear the Little Barrier Reef which commences near Maud's Landing. Turtles, some of them mating, were encountered out at sea. Off Frazer I., two types of trevally took our lures (*Caranx papuensis* and *Ferdauia clauszooni*, both species at that time being unknown in Western Australia), also three "albacore" or large-sealed tunny and whales and pike were sighted.

On September 8, 1945, I went ashore at Point Cloates Whaling Station. I had visited this place a year ago, when it was largely falling into desuetude but since my last encounter, a willy-willy had done further damage. The jetty, incomplete then, has now quite disappeared and two eagle hawks which used to nest on it appear to have built afresh on top of a dredge-conveyor over the flensing platform. Most of the iron girders are skewed or twisted, very rusty, and a crane has crashed from platform to beach. Hardly a wall or roof is left anywhere, and the big dining hall is flattened to the ground. A small well is sanded up but there is some water in the main water-holes, also dead sheep. Two out of three large gasometer-like tanks are buckled. The digesters are still in order and the platform, for the most part, sound, but a double-ender boat has been lifted bodily on to the slipway. Much machinery and tools, ropes, chains, etc., have disappeared and



"Roly-poly" spinifex grass and "Munula," the Ghost Crab, at Point Cloates.

there are banks of seaweed and cuttle-bones 100 yards inside the remains of buildings. The two launches on the beach will never go to sea again. The smoke-stacks and boilers seemed to be undamaged; I did not then know that machinery, preserved with whale oil, was hidden away deep inside some of them.

Even the white cockatoos, which split the air with their cries when I was here last year, have deserted this desolate place now. Two eagle hawks or ospreys and two kestrels and some swallows were the only birds seen.

Some of our best fishing was off North-west Cape proper, where there is a wrecked steamer perforated with shell-holes where she had been used for target practice. As we passed the wreck the colour of the sea-water changed from blue to greenish, significant of the natural boundary between the marine faunas of north-western and south-western Australia. The tench-golden sides of the "albacore" glinted in the early morning sunshine as they played about the surface with other fishes eager for our lures and before breakfast we had caught:—

- 4 Narrow-barred Spanish Mackerel (*Cybium*) weighing 92 lb.
  - 3 Yellowtail Skipjack or Trevally (*Ferdauia*) weighing 25½ lb.
  - 1 Striped Tuna (*Katsuwonus*) weighing 10 lb.
  - 9 "Albacore" or Large-scale Tunny (*Grammatorycnus*) weighing 89 lb.
  - 1 Mackerel Tuna (*Euthynnus*) weighing 12 lb.
- Total weight, 228½ lb.

The measuring, weighing, and detailed examination of these fine specimens took me some time. The Muiron Islands were just visible on the horizon and tide-rips agitated the surface waters. We anchored in Exmouth Gulf north of Mowbowra Creek but the wind increased from south to south-west and the lugger rolled abominably all night, slipping her chain but fortunately not dragging her anchor. Next day the weather was worse, the anchorage untenable, and, the upper reaches of Exmouth Gulf being incompletely charted, I decided to head for Onslow. "Isobel" dipped her bowsprit into the rough green sea, but was forced to make back to the lee of North-west Cape. Eventually we left for Onslow but for a long time the hot, mysterious highlands of the North-west Cape Peninsula stood well up on the horizon as a perpetual challenge to any aspiring naturalist, their desolation in stark contrast to the overwhelming hospitality of the few human beings on the stations there. The haze and dust behind North-west Cape was not seen again by me (and then for the last time) until November, 1945, on the return trip in the lugger. Mutton birds were plentiful but fish were shy of the hook. We rounded the Cape into the long ocean swell, haunt of the Yellowfin Tuna, the Spanish Mackerel and the Flying Fish. Petrels and terns were seen flying south, increasing in numbers towards Frazer Island. And then, with lightning, rain, and darkness, we bade *au revoir* to North-west Cape to return to the banalities of civilization.

# Australian Insects, XLII

## COLEOPTERA, 19.—THE STAPHYLINIDAE AND OTHERS.

By KEITH C. McKEOWN.

TWO families of small and inconspicuous beetles, the Scaphidiidae and Scydmaenidae, must be included here in order to complete the roll; the third, the Staphylinidae or Rove Beetles, makes up in numbers for the generally black and funereal garb of its members. The family does, however, include some quite large insects and some are surprisingly brightly hued, especially when viewed in comparison with their more soberly attired relatives.

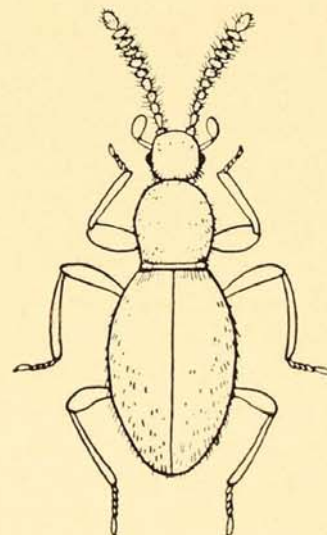
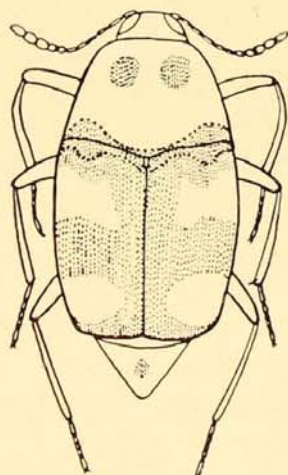
Of the Scaphidiidae there are but twenty-two Australian species and these, retiring in habit, are little known. The family is closely allied to the Burying-beetles (Silphidae) but differs from them chiefly by the placing of the legs, the number of exposed segments of the abdomen, and the number of joints in the foot, which is five throughout. The terminal segment of the abdomen is very long and conical. The antennae vary considerably according to the species, but several of the terminal segments are often thickened. The principal genera in Australia are *Scaphidium* and *Scaphisoma*. In the first-mentioned the wing-covers are shortened, while the

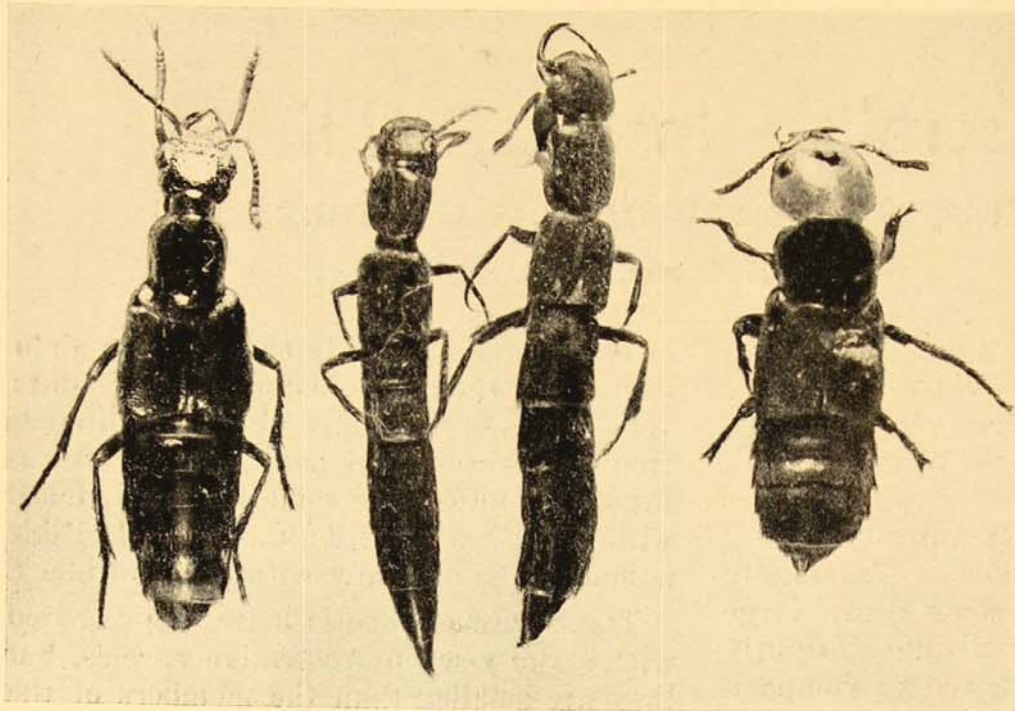
latter has them entirely covering the abdomen. Of their life-histories and habits, very little is known. The adult insects frequent flowers and bark; the larvae, as far as is known, are somewhat cylindrical with short legs. *Scaphidium alpicola* Blkb. is marked handsomely with red and black.

The Scydmaenidae is better represented with seventy-seven Australian species, but they are smaller than the members of the previously mentioned family—the majority might, in fact, be described as minute. The elytra—to speak of them as wing-covers is misleading, since the hindwings, which they were apparently designed originally to protect, are lacking—completely cover the abdomen. The antennae are moniliform, that is, like a string of beads, with the segments gradually increasing from base to tip. The tarsal joints are again five throughout. On the question of their life-history, our ignorance is profound—nothing whatever seems to be known concerning them—nor has the larva been definitely identified. Belonging principally to the genera *Scydmaenus* and *Phagonophana*, members of both have been found in the nests of ants, and it appears likely that

*Scaphidium alpicola*—a typical Australian member of the family Scaphidiidae, and *Phagonophana alacer*, a New Zealand Scydmaenid.

After Tillyard.





Some of the larger Staphylinid or Rove Beetles—*Actinus macleayi*, *Pinoophilus grandiceps*, and the "Devil's Coach Horse" (*Creophilus erythrocephalus*.)

the association is a friendly one, similar to that which has been noticed frequently before, and will be further discussed in these articles on the Coleoptera. *Phagonephana kingi* King, *Ph. macrosticta* Lea, and *Ph. latipennis* Lea are perhaps our finest species.

The Rove Beetles (Staphylinidae) are well-known throughout the world, and form one of the largest beetle-families, nearly 700 being known from Australia. The insects are slender, and more or less cylindrical or flattened in form. Their most striking characteristic is that the wing-covers (elytra) are excessively abbreviated—to an even greater degree than the traditional Eton jacket—exposing more than half the abdomen. A few species are, however, exceptions to this rule. The abdomen is flexible, and is often capable of being turned upwards over the back. This "terrifying attitude" is certainly of defensive value, for the effect is one of threat, reminiscent of that of a scorpion or of some stinging insect. In the Rove Beetles it is purely "bluff"—the insect bears no sting and is incapable of inflicting injury. Recently, from the Wagga and other country districts, one small, brightly-coloured species, *Paederus cruenticollis* Germ., has been blamed for causing elongate, inflamed bites accompanied by dermatitis. The evidence is inconclusive, however, and it

appears unlikely that this insect is responsible for the reported injury. The larvae of Rove Beetles are active, long-legged, and scavengers in decaying animal and vegetable matter, substances frequented also by the adult beetles. Several species appear to be carnivores as well as scavengers, preying upon fly maggots which infest these malodorous materials and in this they may be of some benefit apart from their role of sanitary inspectors.

The commonest, if not the largest, of our Rove Beetles is the "Devil's Coach-horse", *Creophilus erythrocephalus* Fabr. The popular name has apparently been "inherited" by the Australian insect from its European relative, *Staphylinus olens*. Our insect measures upwards of half-an-inch in length, is relatively broad and of a uniform blue-black colour with a bright orange head. It is distributed throughout Australia and is found almost everywhere, frequenting the decaying carcasses of animals, droppings, and the primitive sanitary conveniences sometimes found in country districts. A. D. Imms, writing of the European beetle, says, "The assumption of a threatening attitude when alarmed is adopted by some insects as a means of protection. Thus the Devil's Coach-horse curves its hind-body over its back and holds



its mandibles wide apart, snapping vigorously at any object presented to it. Earwigs do very much the same thing under like circumstances. The hind-body is bent over the back and the forceps are held widely open ready to seize any real or imagined enemy . . . In the case of the Devil's Coach-horse the threatening attitude is accompanied by the exudation of a foetid secretion from glands near the anus." Imms' description closely agrees with the behaviour of our insect. The Devil's Coach-horse will devour and thrive on fly maggots.

Few of our Australian species are more striking than *Actinus macleayi* Oll., of north Queensland; it is a beautiful insect of a rich blue, the head and thorax bright, metallic-coppery green, and the terminal segment of the abdomen red. It measures three-quarters of an inch in length. Of similar length, but more slender in form and of a uniform black, is *Pinophilus grandiceps* Mael. A pair of slender curved jaws standing prominently out in front of the head is a very distinctive feature. The common *Thyrecephalus lorquini* Fauv., in which the bright brown elytra show up distinctly against the black body, measures about half an inch in length.

*Cafius sabulosus* Fauv., *C. littoralis* Fauv., and other species of the same genus, frequent the ocean beaches where they may be found hiding by day under masses of kelp and other seaweed upon which, when in a decaying state, they apparently feed. They are small to moderately-sized insects with prominent rounded heads, and of a uniform glossy black colour.

*Quedius*, *Staphylinus*, *Xantholinus*, and *Othius* are among the others well represented in Australia.

*Paederus cruenticollis* Germ., previously mentioned, is a small, slender insect with steel-blue elytra and a bright red band across the abdomen. It usually frequents damp places; it is probably this factor that has contributed to its great prevalence in those districts which have recently been inundated by floods.

The genera *Calodera*, *Tachyusa*, *Homalota*, *Polylobus* and *Gyrophæna* include

minute dull-coloured beetles which are often found in ants' nests, where, if our species follow the habits of their overseas relatives, they are probably either the welcome guests or tolerated interlopers in the ant colonies, and in the latter case, they may even prey upon the ant larvae. No one appears to have studied the insects in Australia. *Termitophila* inhabits the nests of termites (white ants).

Some, at least, of the ant-nest frequenting Staphylinids of Europe are definitely of "unpleasant character". Writing of them, W. M. Wheeler refers to "a number of agile, carnivorous Staphylinid beetles belonging to the genera *Myrmedonia*, *Myrmoecia*, *Lamprinus*, *Quedius*, *Xantholinus*, *Megastilichus*, etc., which lurk in the less frequented galleries of the nests and avoid encounters with the ants. One of the most interesting of these genera is *Myrmedonia*, which is represented by numerous species on all the continents . . . The European species have been carefully studied by Wasmann (1886). The sooty *M. funesta* resembles its host, *Lasius fuliginosus*, in colour, and the same is true of the black and red *M. humeralis* which lives with *Formica rufa*. The beetles lurk about the burrows and feed on dead or disabled ants, but they also lie in wait near the entrance and destroy solitary ants that are returning to the nest. Wasmann has seen five or six *Myrmedoniae* fall upon a single ant, tear her limb from limb and then quarrel with one another over the fragments like a pack of hungry hounds. The ants detect these jackals and rush at them with open jaws, but the latter merely turn up their flexible tails and emit a disagreeable secretion. This causes the ants to start back, and the beetles escape . . . According to Wasmann (1892) *Myrmoecia fussi*, which lives with *Tapinoma erraticum*, resembles *Myrmedonia* in its behaviour. In this case, too, . . . [it] resembles its host, being shining black in colour and intermediate in stature between the worker and queen *Tapinoma*. It lurks in the unfrequented galleries of the nest and kills the ants at night when they lie huddled together and overcome with the cold. The *Tapinoma* worker, on meeting the *Myrmoecia*, turns

the tip of her gaster [rear portion of abdomen] forward and emits her strong-smelling venom." Of *Megastilicus formicarius*, which is common in the nests of *Formica exsectoides* in the United States, he tells that "when confined with the ants in a small artificial nest, it is invariably killed in the course of a few hours, but in the natural nests it adroitly eludes its host in the same manner as *Myrmedonia*, for, when an ant tries to seize it, it raises the tip of its flexible abdomen and seems

to emit a whitish fluid which causes the ant to start back, as if a flask of ammonia had been suddenly uncorked in its face, thus giving the beetle time to run away. *Megastilicus* is certainly too feeble to kill living *P. exsectoides* workers. It probably feeds on the remains of insects brought into the nest or the larvae of the ants." Perhaps, some day, a similar "rogues' gallery" of Australian species will be available to us.

## Obituary

### Dr. BERTRAM LINDSAY MIDDLETON.

**I**N the town of Murrurundi, New South Wales, on 16th October, 1950, there passed away at the age of 70 the well-known physician and insect-collector, Dr. B. L. Middleton.

Dr. Middleton's interest in natural history goes back to childhood days in Ireland where he made his first collections. After he had graduated in Arts, and later taken his M.D. at Trinity College, Dublin, he journeyed around the world serving as medical officer on various ships, but he continued to take an interest in the Lepidoptera, particularly those from Brazil.

He arrived in Australia many years ago, and about 1912 health reasons brought him to Murrurundi, a little town some 1,548 feet above sea-level, situated on Page's River, and about 219 miles north of Sydney.

The late Dr. Middleton played an important role in the life of his community, for he was associated with many activities, which suggest that his education and experience were directed into channels where they were of service.

His early days in Murrurundi were too fully occupied to indulge his hobby of insect collecting, and so his fine collection of butterflies and moths dates from 1928 to 1950. While the greater part of this

material was collected at Murrurundi, many of the moths were taken at Ebor, near Dorrigo, and from other localities in New South Wales and Queensland. He bequeathed the major part of his collection to the Trustees of the Australian Museum, who were recently notified of this bequest and asked to take possession of it as soon as possible to avoid the risk of flood danger, a request which was complied with.

Butterflies and moths constitute the collection, the latter predominating. All the specimens are well set and labelled. Perhaps the most outstanding in point of interest are the moths of the Family Hepialidae (Swift Moths) whose larvae tunnel in the trunks and roots of trees, while other forms are pasture pests destroying the roots of grass. Many of the specimens in this group were finer examples than those in the Museum collection. The chief value in the collection lies in its being largely taken in areas about which little has been previously known. Most collections have been made nearer the coast, and while the majority of the specimens in this collection are well known to science, nevertheless, they provide important links in the distribution of the various species. In addition, Murrurundi and Ebor are the type localities of a number of moths described by the late Dr. A. J. Turner, of Brisbane,

from material collected by Dr. Middleton: *Eutane middletoni* Turner 1941 (Arctiidae) from Murrurundi, and *Middletonia suavis* Turner 1947 (Boarmiadae) from Ebor recalling him.

During his collecting trips Dr. Middleton was often accompanied by Mr. A. P. Kemp of Murrurundi, and Commander L. Mosse-Robinson of Narara, near Gosford, the possessor of a fine moth collection obtained in that district.

Dr. Middleton published one paper on moths: "Notes on the Bent-wing Moth (*Leto stacyi* Scott)", which appeared in the *Australian Naturalist*, Vol. x, No. 8, April, 1941, pages 270-272.

The biographical information here detailed is based chiefly upon an extensive obituary which appeared in *The Quirindi Advocate*, 27th October, 1950, and from personal facts supplied by his son, Dr. Lucas W. M. Middleton.—A. M.

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## Scientific Films

THE scientific and educational value of films has developed to such a degree that the Sydney Scientific Film Society has been formed. Monthly meetings are held at which films in different scientific categories are screened. An aim of the Society is to provide a classified catalogue of available scientific films. Some 2,000 films have now been listed by the Society and those of an approved standard are to

be considered by an appraisal committee whose report will be appended to the catalogue.

The president of the Society is Professor P. D. F. Murray, Department of Zoology, University of Sydney, and the honorary secretary is Dr. A. R. Michaelis, of the Department of Aeronautical Engineering, also of the University.

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## Review

VISUAL DEVELOPMENT. By J. H. Prince, F.R.M.S., F.Z.S., F.B.O.A., F.S.M.C., Vol. I. (E. and S. Livingstone, Ltd. Edinburgh; 1949.) Pp. xii and 418, 190 illustrations. Angus and Robertson Ltd., Sydney. Price, £4 7s. 6d.

This is the first volume, complete in itself, of a work on what the author has himself termed "Ocular Naturalism". It presents a clear and very complete survey of the various aspects of vision in man and animals. It has also the merit that a great part of the observations on the comparative anatomy of the eye are based on actual observations (supported by drawings and photographs), made by the author himself. The book is divided into five parts, the first part being devoted to general problems such as those of perception, the retinal structure in man and animals, photochemical problems and physical problems such as retinal stimulation quanta. The second part is devoted to the evolution of vision, and includes chapters on nocturnal vision, pupillary function, tapeta and luminous organs. Wherever possible, as mentioned above, the author speaks clearly and simply from his own first hand experience, which involved fifty thousand miles of travel to see and obtain the eyes of the animals described. Much of the work was done in Sydney, at the University, at the Taronga Zoo Park, and at the Australian Museum. Part III is devoted to colour vision in man and lower

animals and its evolution. Part IV is concerned with night vision and dark-adaptation in man, and is a subject to which the author himself has contributed some of our knowledge. Part V is devoted to what may be described as the tag-ends which do not fit into the previous parts, including such subjects as the routine examination of the eyes of animals, the examination of sections through the microscope, and fundus significance. The book can be thoroughly recommended either to the advanced student, or to the general reader even, because of its clarity and simplicity. The writer has not failed to incorporate a clear survey of the most recent theories and studies in vision by Granit, Hartridge and others. A useful glossary and an adequate bibliography are included.

The reviewer does not profess to be an authority on the problems concerned, but the only aspect which the author does not appear to have touched upon is possibly partly outside the range he set himself, namely, on the problems of flicker as studied by Sherrington and others, and on visual after-effects by Gibson, Kohler, Wallach and others.

In general, the book covers a wide field thoroughly and simply, and is backed throughout by actual experience. In the preface, the author says, "Attempts at proving points and presenting new theories will be left to Volume II, when considerably more dissection has been carried out".

A. N. BURKITT.

