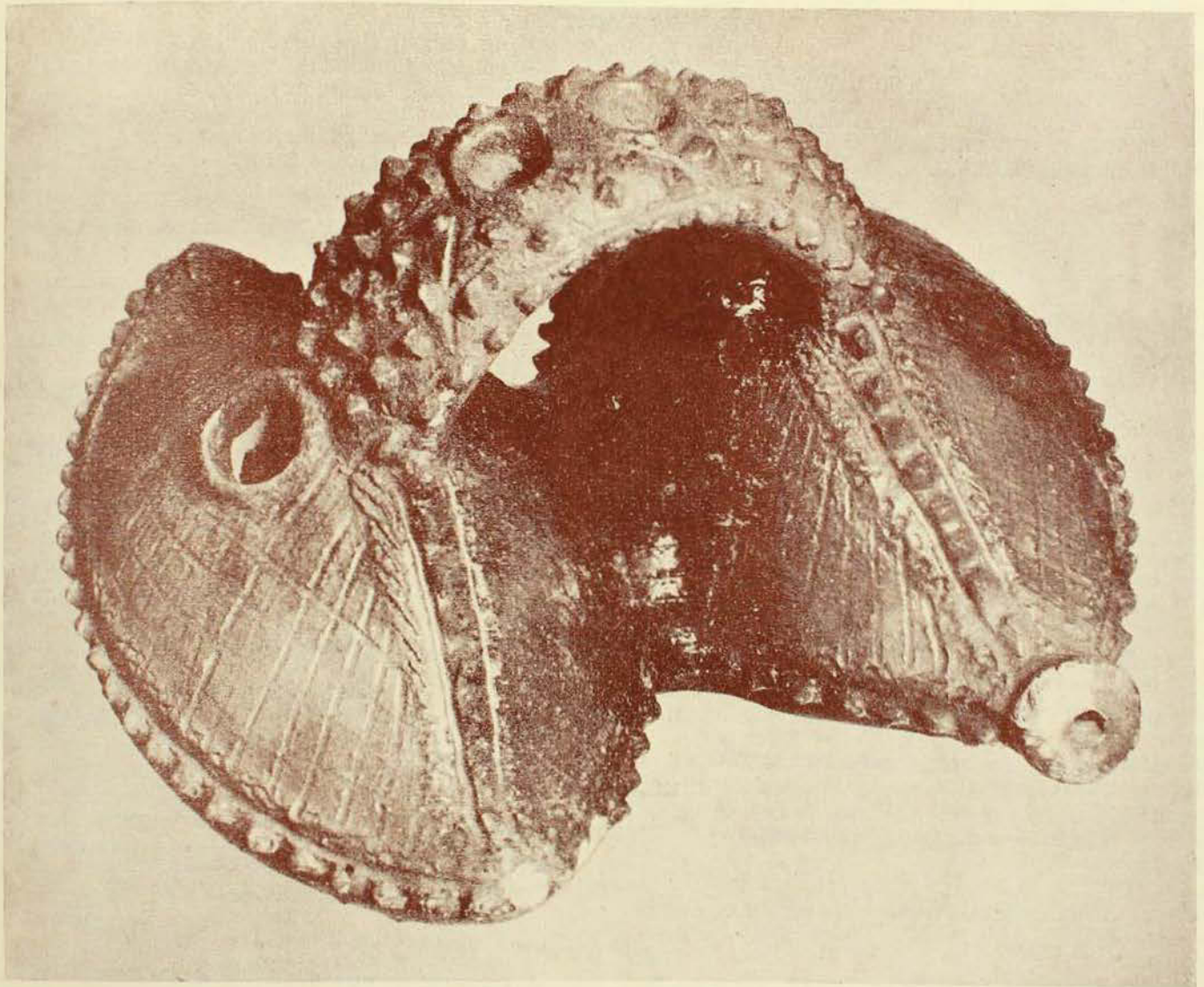


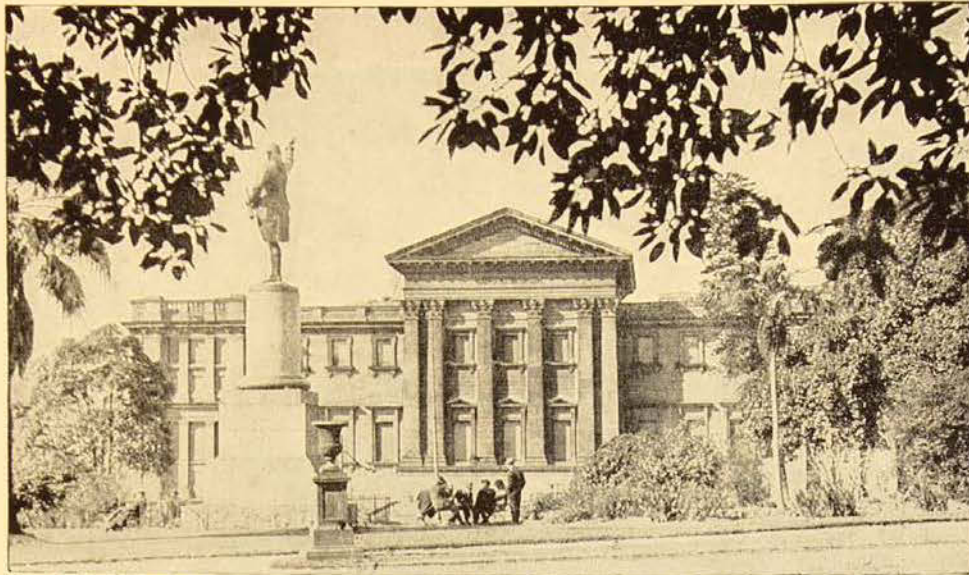
The
AUSTRALIAN
MUSEUM
MAGAZINE

Vol. IX, No. 6.

SEPTEMBER-DECEMBER, 1947. Price—ONE SHILLING.



Fijian Pottery.



THE AUSTRALIAN MUSEUM MAGAZINE

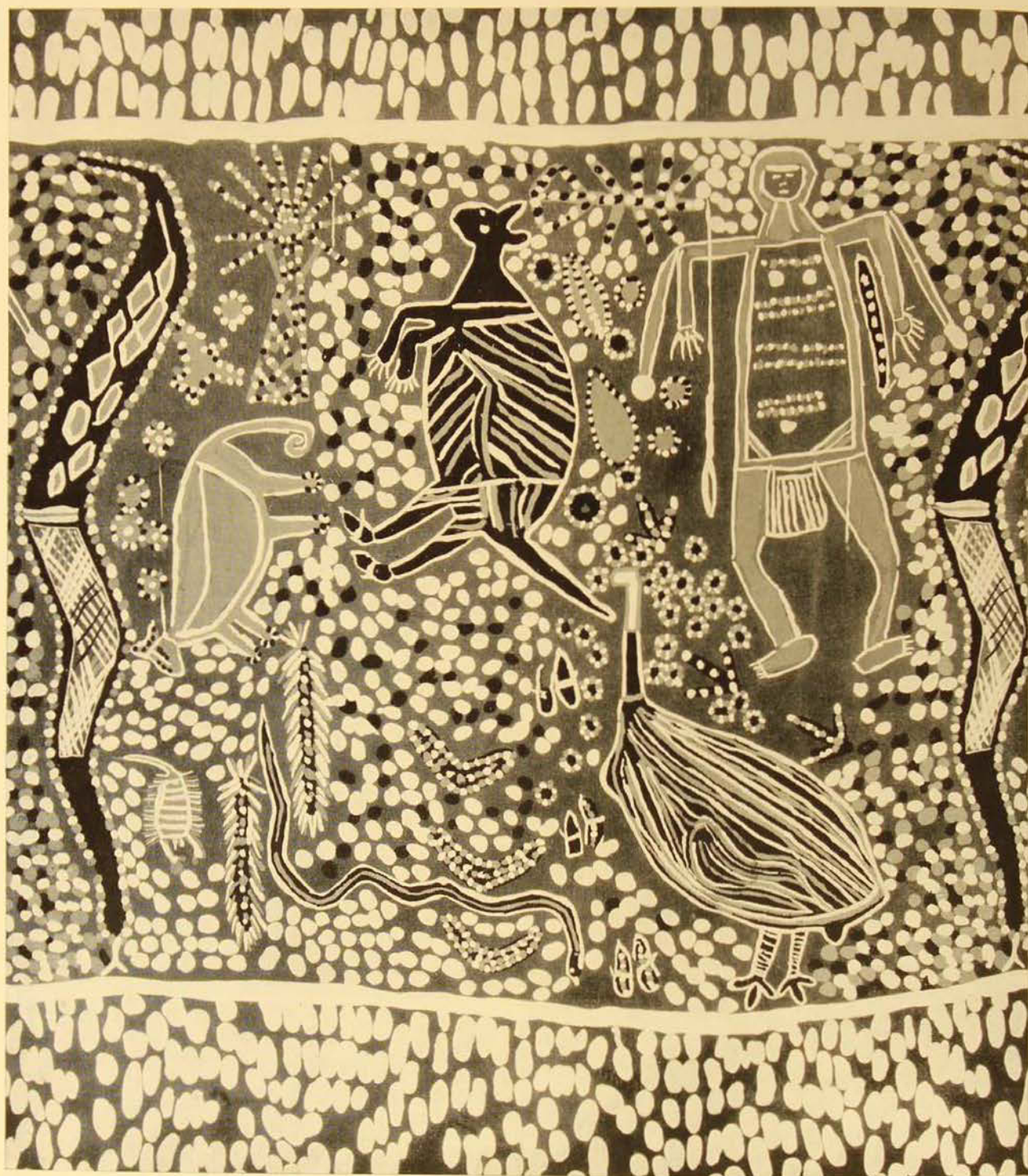
Frontispiece

ABORIGINAL ART	183
THE ANTIQUITY OF MAN IN AUSTRALIA, I— <i>F. D. McCarthy</i>	184
CORAL-BUILT LAND— <i>Frank McNeill</i>	190
THE SHEPHERD FISH AND ITS FLOCK— <i>Gilbert Whitley</i>	194
AUSTRALIAN INSECTS. XXXI. COLEOPTERA 8—THE CUCUJIDAE— <i>Keith C. McKeown</i>	201
ROCKS IN THE MAKING— <i>R. O. Chalmers</i>	204
LEFT OR RIGHT TURN— <i>Joyce Allan</i>	207
QUESTIONS I'VE BEEN ASKED— <i>J. R. Kinghorn</i>	211
MUSEUMS IN THE WORK OF UNESCO	216
REVIEWS	200
NOTES AND NEWS	189, 206, 210, 216

(Photography, unless otherwise stated, is by G. C. Clutton.)

● OUR FRONT COVER. Pottery-making was an important industry among the Fijian natives and their products are amongst the finest made by the Pacific islanders. Two methods were employed, that of shaping the vessel by constant patting with a wooden blade, and that of winding a long coil of clay to form the vessel to the required shape and size. The inside and outside surfaces were smoothed, simple line designs cut into the damp soft clay, the pot fired, and kauri pine gum rubbed over its outside surface as a crude glaze. The pots were used chiefly for storing coconut oil, water and food, and they were traded widely throughout the Fijian and adjacent islands. In shape they range from shallow and deep bowls to those in the form of a turtle, a cluster of fruit, a parallel series of two or more canoe hulls (as in the example figured on the cover) and other miscellaneous shape. This specimen, obtained in Samoa, was presented by Mrs. E. E. Corbett.

[Photo.—Howard Hughes.]



AN ARNHEM LAND GRAVE POST DESIGN.

This striking design is painted on a hollow log in which the bones of a dead man were kept for about two years prior to their removal to a cave. It represents the totems of the dead man and those who painted it. The totems comprise the wallaby and emu with their tracks, file-snake (large snake), red opossum, echidna, centipede, Yalka nuts (black with yellow and white border), and other indeterminate species. The man has a spear over one arm, a spear-thrower under the other arm, and small dilly-bags suspended from his shoulders. There are several boomerangs and two sacred headdresses of radiate shape. The panel is red and the figures are painted in pink, red, black, yellow and white.

(From "Australian Aboriginal Decorative Art.")

THE AUSTRALIAN MUSEUM MAGAZINE

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

Editor: A. B. WALKOM, D.Sc.

Annual Subscription, Post Free, 4/4

VOL. IX, No. 6.

SEPTEMBER-DECEMBER, 1947.

Aboriginal Art

IN 1938 the Trustees of the Australian Museum published *Australian Aboriginal Decorative Art*, by F. D. McCarthy of the Department of Anthropology of this Museum.

It had been prepared to meet a growing interest and to afford some authoritative information on this subject. The brochure met with a very ready response and in a short time the edition was exhausted. Then came a period of world dissension when minds, labour and supplies of materials had to be diverted from subjects of cultural interest to affairs concerning our very existence, and so the consideration of another edition had to be deferred. Happily, conditions are now such that it has been possible to prepare a second edition, revised and enlarged, which will appear almost simultaneously with this issue of the MAGAZINE.*

In his foreword to *Australian Aboriginal Decorative Art*, Professor A. P. Elkin says:

I welcome this contribution to the study of Australian aboriginal decorative art. For some years we have been concentrating on Australian social organization, economics and totemism. Now that we have a better understanding of these matters, we should turn our attention to aboriginal art, for the purpose not only of classifying, describing and grouping it, but also of relating it to those other aspects of native life. By doing the latter we shall arrive at its meaning. At various times during the past one hundred years, interest has been taken in aboriginal cave paintings and rock "carvings", an interest which is at present very marked, but little notice has been taken of such an apparently prosaic matter as the engraving or painting of boomerangs, shields, spears, articles of personal adornment and ceremonial objects. The reason may be that, apart from the last-named, there does not seem to be any glamour about artistic representation on articles of a temporary nature such as there is in the case of comparatively permanent cave paintings and rock carvings. But as an expression of man's aesthetic interest, and as an insight into primitive man's culture, the former are just as important and significant as the latter, indeed more so. Australian cave paintings and rock carvings belong, so far as we know the facts, to the life apart, the life of totemism and religion, and may be made or seen only by the initiated. This is true, also, of the painted or engraved patterns on the sacred symbols (*tjurunga* or *churinga*) which are used in totemic and initiation ceremonies. But we have been learning during recent years that the designs on some mundane objects—shields, shell pendants and others—also belong to the sacred world of mythology. The uninitiated may see them—but they cannot make them, and, of course, they do not understand their significance.

* "Australian Aboriginal Decorative Art", by F. D. McCarthy. Second Edition. 52 pages, two coloured plates, 42 illustrations. Crown 4to. Trustees of the Australian Museum, Sydney. To be published shortly.

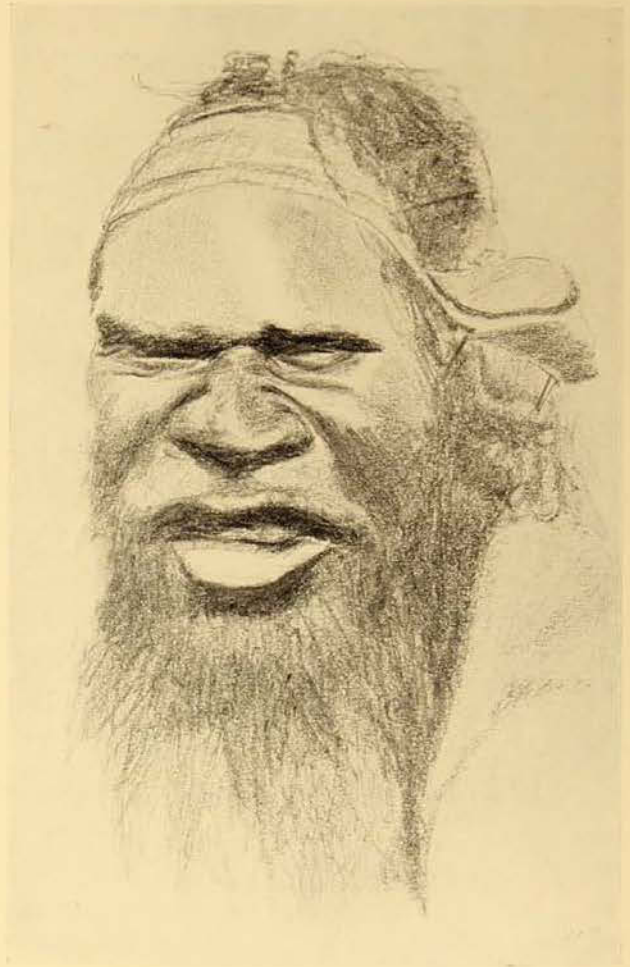
The Antiquity of Man in Australia, I

By FREDERICK D. McCARTHY

THE Australian aborigines possess a backward, nomadic way of life and culture, and embody in their anatomy primitive characters not found in other peoples. Their origin and antiquity have always been a puzzle, although we have detailed knowledge of their languages, religion, social organization and other customs. Many problems regarding the antiquity of this interesting race will remain unsolved until archaeological research is more fully exploited both in Australia and New Guinea.

It is generally believed that man has inhabited Australia for about twenty thousand years, although estimates vary from the four hundred years of Gregory, based on the sparse native population of Victoria, to the two hundred and fifty thousand years of Edgeworth David, based upon the Doone mine flake from Tasmania. Thus there is a very wide divergence of opinion about this time factor, and it will be interesting to compare the physical, geological and archaeological evidence, and the opinions of many famous scientists, to see what light they throw upon the problem.

We are dealing with two kinds of man in Australia, the extinct Tasmanians and the Australians, and opinions about their respective physical relationships and history are extremely varied. Hrdlicka and Howells believed the Tasmanians and Australians to be Australoids, forming one of the four great basic races of mankind. In this respect, Howells pointed out that the woolly hair and the slightly shorter and broader heads of the Tasmanians constituted their main differences from the Australians.



The Australian aborigines possess long head, wavy hair, low forehead, prominent eye-brow ridges, deep-set eyes, broad nose markedly depressed at the root, thick lips, pronounced facial protrusion, brown eyes, and dark chocolate-brown skin.

S. W. McCarthy del.

THE TASMANIANS

Sollas thought this now extinct people represented the only existing survival of a distinct race of man, whilst Haddon and others said they were an early Melanesian stock which arrived in Oceania, finally reaching Tasmania via Australia, ahead of the Australians with whom they intermixed. Huxley, Wood Jones and



The Tasmanians had Negroid features, a rounded head and face, thick eyebrow ridges, deep-set eyes, broad nose with deep root, thick lips, medium facial protrusion, and a dark brown to black skin. Their frizzly black hair was characteristic. The average height of the men was about five feet five inches, and their physique was apparently stouter than that of the Australian aborigines.

After Ling Roth.

Griffith Taylor, whilst agreeing with this opinion of their physical relationships, believed that they drifted to Tasmania from southern Melanesian islands, such as New Caledonia, and did not enter Australia at all. The craniological studies of Wagner and others, however, have revealed such pronounced Tasmanian characters in southern Australian skulls that the "drift" hypothesis is now no longer tenable.

The present wide distribution of the pygmy Negritos in New Guinea, Philippines, Malay Peninsula, and Andaman Islands is evidence of the basic importance of this human stock in the physical history of man in Oceania, and from the time of the anatomist Turner onwards the Tasmanians have been regarded as a negrito stock. In this respect,

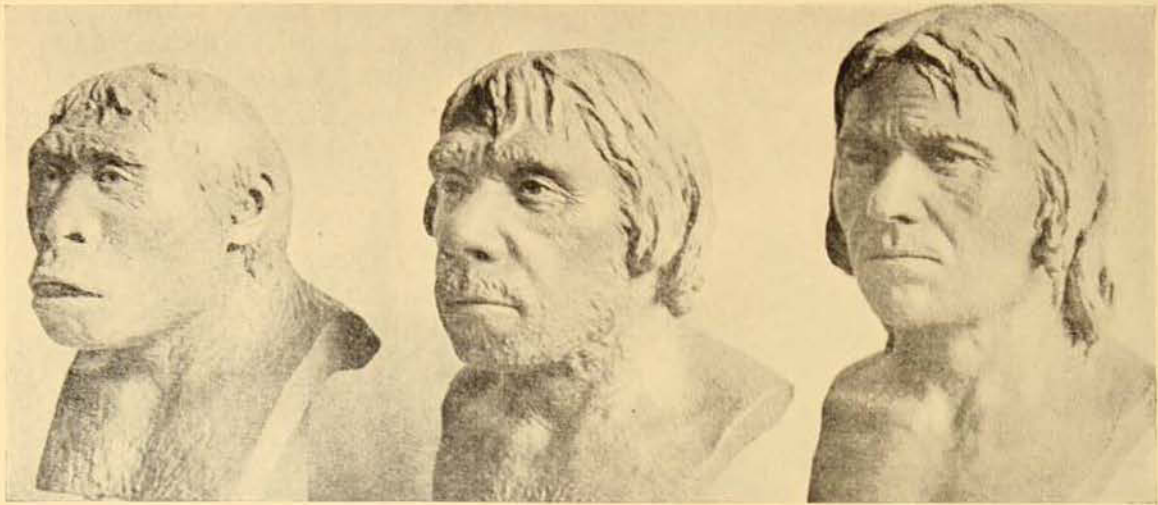
the discovery of a Tasmanoid people of short stature, light reddish brown colour and frizzly hair, who once inhabited the Atherton jungles of north-eastern Queensland, is of unusual interest; it is not quite certain whether they constitute a survival of the Tasmanians in Australia or a more recent link with the New Guinea pygmies.

It might be mentioned that no relics of any great age have been found in Tasmania. The flake from the Doone mine is believed to have fallen from the surface during sluicing operations and to have no claim to a great antiquity as Edgeworth David believed. Otherwise, the earliest types of stone implements known are mesolithic hand axes of late Pleistocene age related to the Kartan culture of Australia.

THE AUSTRALIAN ABORIGINES

Opinions regarding the physical history of the Australians are even more varied than those about the Tasmanians, but it is obvious that the former had a much longer history before they entered Australia than subsequently.

An early suggestion was that of Klaatsch who contended that the Australians evolved in Australia as the oldest form of mankind and thence spread northwards across Gondwana Land into Asia. Geologists were able to show, however, that Gondwana Land disappeared under the sea much too long ago for it to have been traversed by man, so another adherent, Schoetensack, substituted the old land-bridges between Australia and Asia as the pathway. It was plausibly explained by this school that although the Australian type continued unchanged in Australia it developed in Asia and elsewhere into the innumerable varieties of man existing in the world today. It is obvious, of course, that the existence of earlier kinds of man and of stone implements in Europe, Asia and Africa, much older than those found in Australia, abolishes this approach to the problem.

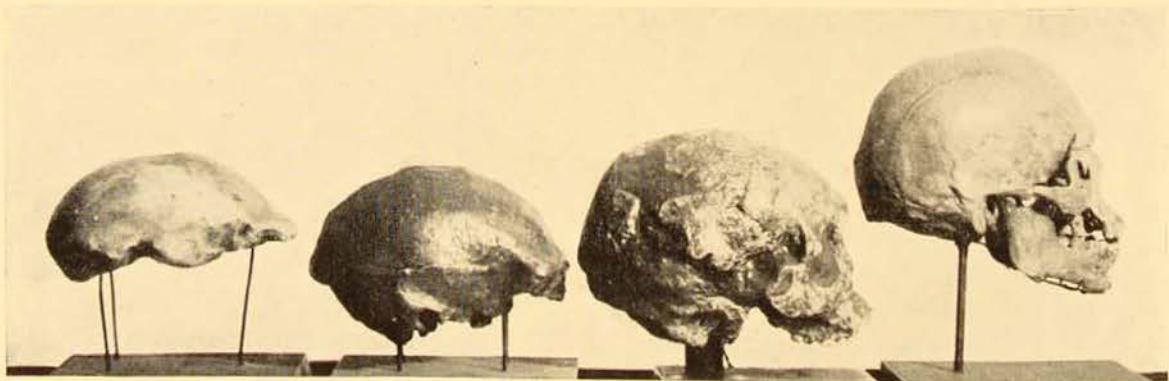


Restorations by Dr. J. H. MacGregor, of the American Museum of Natural History, of *Pithecanthropus* (left) from Java, and of the Neanderthal (middle) and Cro-Magnon (right) races from Europe, extinct types with whom the Australian aborigines have been linked by many authorities.

Courtesy of the American Museum of Natural History.

The opinion held for a long time, and supported by Sollas, Keith, Griffith Taylor and Hrdlicka, was that the Australians were a pure race evolved in Europe from either the Neanderthal type of middle Pleistocene times up to 50,000 years ago, or from the Cro-Magnon type in late Pleistocene times about 20,000 years ago. Hooton, basing his view upon the wavy hair of the Australians, went so far as to claim that they were originally a white Caucasoid stock in Europe which mixed with a dark-skinned Negroid stock of the Melanesian type prior to their arrival in Australia. Weidenreich, on the other hand, denied the European

origin of the Australians, and believed that they evolved through a line of primitive extinct kinds of man which inhabited south-east Asia and Java, and included *Homo wadjakensis*, *Homo soloensis*, *Pithecanthropus* of Java, and *Sinanthropus* of China. He stated that the "Australian is undergoing the same evolutionary phase at present as the late Pleistocene Cro-Magnon men of Europe passed through 20,000 years ago, and must be regarded, therefore as a younger branch of modern mankind evolved from Neanderthaloid forms". Howells, too, expressed the opinion that the Australian is the most archaic human race in exist-

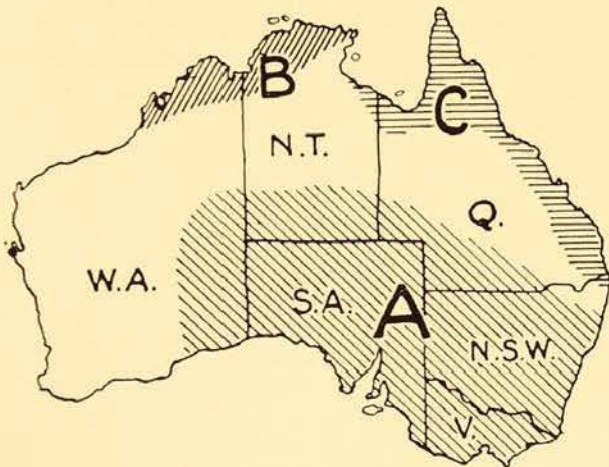


From left to right are shown skulls of *Homo wadjakensis*, *Homo soloensis*, and *Pithecanthropus*—the line of evolution with which Dr. Weidenreich connects the Australian aborigines. An Australian skull is shown on the right.

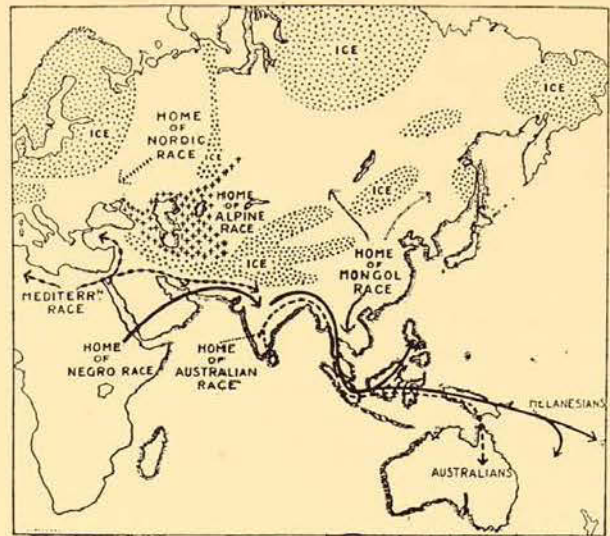
Australian Museum exhibits. Photo.—Howard Hughes.

tence—literally a living human fossil preserving the characteristics of Pleistocene man.

Another approach to the problem within the Oceanic region is the comparison of Tasmanian, Australian and Melanesian Negroid skulls. Wagner concluded that these human types all belong to the one family of mankind, and that each of them had developed distinctive features as a local type since their geo-

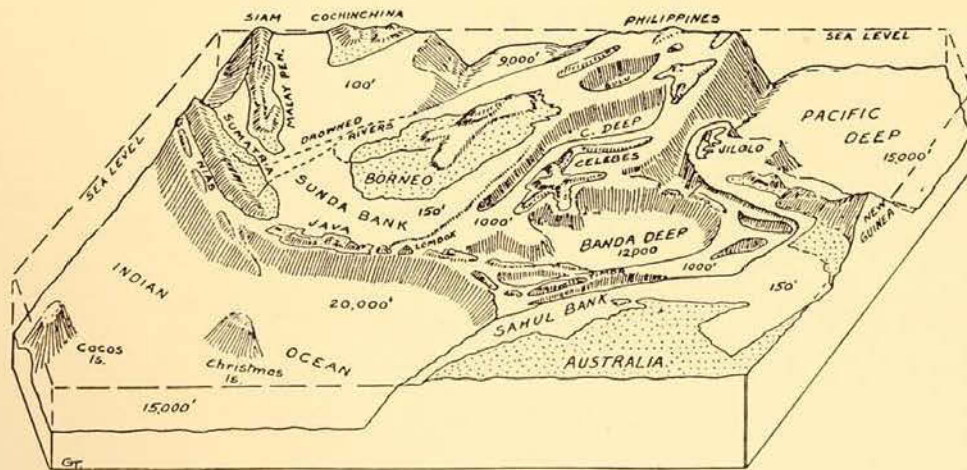


Dr. Fenner distinguished three varieties of aborigines in Australia: A, The Southern Australian with a long low skull, occupying the greater part of the continent, which is a fusion of the pure Australian and the extinct Tasmanians. B, The Northern Australian with a shorter and higher skull, found in western Arnhem Land. C, An Inter-mixed Australian and Melanesian-Negroid type living in Cape York and eastern Queensland.



Professor Elliot Smith's map of the distribution of ice in Asia during the Glacial period in Pleistocene times. It illustrates his tentative idea of the regions in which the various races developed their characteristics, and the migrations of some of them, including movement of the Australian aborigines, from southern India to Australia.

graphical separation. Hambly, furthermore, demonstrated a mathematical probability of Negro, Australian and Ambrym Island (New Hebrides) measurements forming a triangular connection in which the Negro influence is a very ancient one. He revealed also, the presence of pronounced Australoid features in the natives of Ambrym, New Caledonia, Gazelle Peninsula (New Britain), and



Map of south-east Asia and Oceania in Glacial times during the Pleistocene period. Banda Land included Sumatra, Java, Malay Peninsula, Borneo and the Philippines as a great southward extension of Asia. Sahul Land included New Guinea, Bismarck Archipelago, Australia, Tasmania and other islands as a broad low land extending northward into the Timor and Pacific oceans. The two migration routes followed the high lands along the northern and southern borders of the Banda Deep.

After Griffith-Taylor.

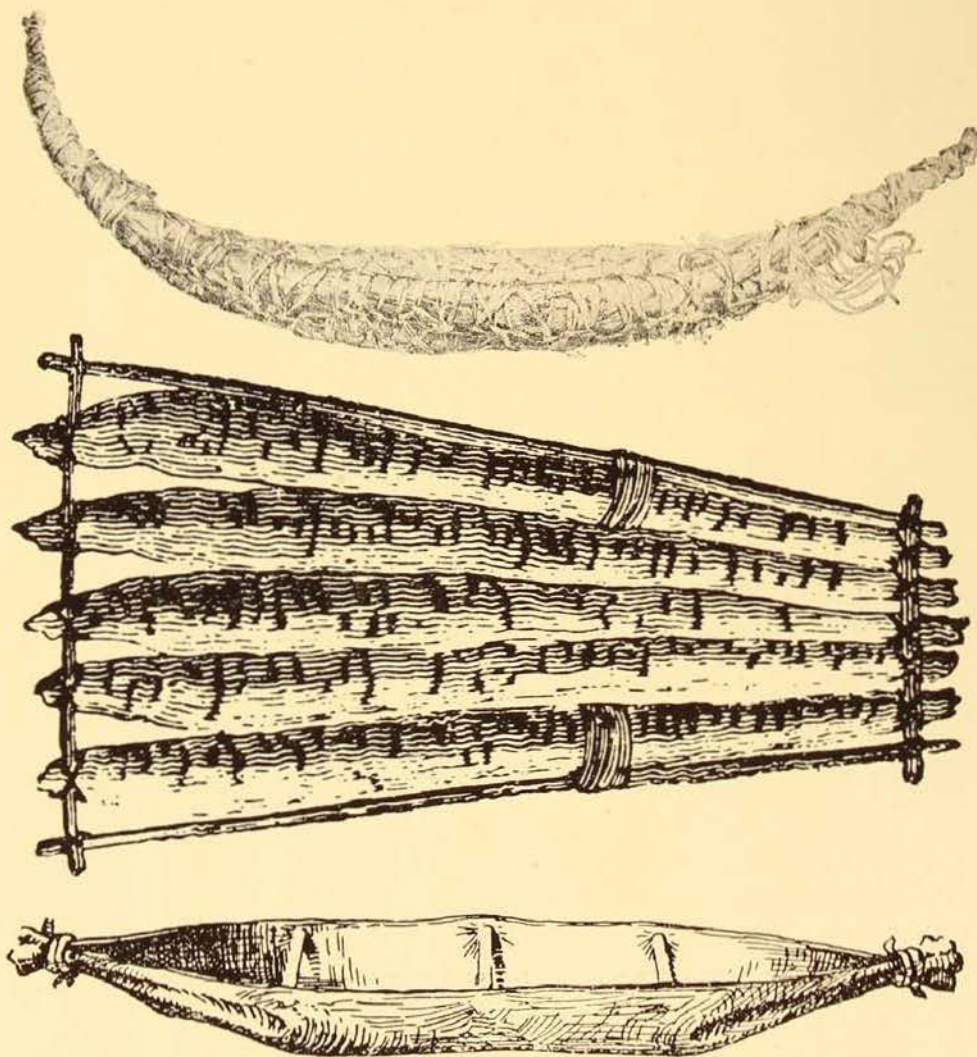
parts of New Guinea, and concluded that the inhabitants of the latter island are predominantly negroid. It is generally considered that the Veddahs of Ceylon and the Pre-Dravidians of India belong, basically, to the Australoid race, and the latter strain occurs in the so-called Sakai of northern Malaya, and elsewhere in Indonesia. It is thus apparent that the Australoid people, before they reached Australia, once occupied a vast region in south-east Asia, Indonesia and Melanesia, where later peoples have now almost submerged them in what has proved to be a corridor of human migration.

Another study by Fenner of more than one thousand Australian skulls established the interesting result, as previous

studies had suggested, that the Australians are not a pure race, but comprise three types, as shown in his map.

HOW DID MAN MIGRATE TO AUSTRALIA?

In this long physical history of the Tasmanians and Australians the question may be asked when and how they entered the Australian continent. It is known, for instance, that the later Melanesians, Polynesians and Indonesians all reached their present abode in sea-going canoes, but we are not certain whether the first-comers into Australia travelled by land or by sea. There was an unbroken land bridge between Australia and Asia in Pliocene times, more than one million years ago, much too remote in time to have served man in his migrations, or



Three of the earliest types of watercraft used in the Oceanic area comprise the Tasmanian canoe (top) made of three long bundles of bark - strips bound tightly together, the north - west Australian raft (middle) consisting of one or two triangular platforms of slender mangrove poles tied together, and the south-east Australian bark canoe (bottom) made out of a single sheet of bark.

After Ling Roth, and D. S. Davidson.

even to have been traversed by the placental mammals such as the water-buffalo, elephant, tiger and others which never crossed the deep channel known as Wallace's Line between Banda and Sahul lands. These mammals certainly entered and inhabited Banda Land when it was still an extension of Asia.

During the glacial phases of the Pleistocene period, when the ice-sheets increased their southward limits in Asia, the high ranges in Banda and Sahul lands were also ice-covered. It was during these periods that the encroaching cold in the north caused a pressure of population which forced groups of man to migrate further southwards for space in which to live unmolested, a process that has continued to the present time. Then, as the snows melted in the ensuing inter-glacial warm periods, the water thus released covered the low portions of Banda and Sahul lands and left only the high lands and mountains exposed as the Indonesian islands of today. Actually, the fluctuations of the sea-level together with subsidences and elevations of land masses during Pleistocene times compelled man and the animals to move

about constantly on the changing landscape. Now, the crucial point of man's antiquity in Australia is whether the first migration took place during one of the early or in the last of the Glacial phases, and the latter is the generally accepted one. Cotton has shown, on the other hand, that a land route, both to the mainland of Australia and into Tasmania, might have been open during periods when the sea was a few hundred feet below its present level, conditions which existed prior to the last Glacial phase.

The first type of water transport employed by the Tasmanians and Australians was a raft made of a single log (the only kind known to the natives of south-western Australia), or a raft made of tree trunks and limbs tied together. Rafts of this kind were used in many parts of Australia and Tasmania and are in widespread use throughout Indonesia and Melanesia. On the other hand, the later Australians, who brought the dingo, might have travelled in a single-sheet bark canoe of the eastern Australian type, which, by the way, is still made in Borneo.

As this issue goes to press we are saddened by news of the death of Mr. G. C. Clutton, in Charge of the Department of Preparation. He had been in indifferent health for some time, but it was hoped that rest and the quietness of his mountain home would bring a restoration. Mr. Clutton joined the staff of this Museum in 1904, and in 1913 was promoted from assistant to the position of articulator, formator and photographer, subsequently advancing to his last post. He was a most capable and expert officer; no task seemed too difficult or intricate for him—few, if any, things tried his patience. In the process of exchange between this Museum and kindred institutions abroad, work of his found its way and met with cordial

approval, one foremost institution expressing wonderment at the craftsmanship responsible for the preparation and casting of the famous Talgai skull. His skill was not infrequently availed of by other institutions and his casts of soft anatomical sections were eagerly sought abroad, a leading American clinic rating them as amongst the finest. He gave special attention to the preparation of films used in the Museum's educational service, his colour work being particularly excellent.

Personally, he never spared himself; he was a generous and helpful colleague. A kindly, considerate and forthright man, extremely tolerant yet staunch to his views and convictions, one whose friendship was something to hold.

Coral-Built Land

By FRANK McNEILL

HOW very often does the mention of "island" conjure up in our minds some thought of coral—some half-forgotten story from the romantic background of youth. Most of us cherish a desire to visit a coral isle, but only for a few does the wish become a reality. We mostly become acquainted only with the more familiar fragments of land that dot the waters along the coast—lands of solid rock and soil formation. Those of coral formation are vastly different in structure; they have little semblance of the geologist's usual "stock in trade".

Perhaps the best known coral isles of the Australian region are the cays of the Great Barrier Reef, off the north-eastern coast of Queensland. These are fascinating islets which had their origin on the tops of reefs—the reefs or coral that have grown through the ages towards the surface of the sea. These reefs are primarily the work of the lowly flower-like polyps which possess an ability to

extract calcium carbonate from seawater and deposit it in protecting layers about the soft flesh of their bodies.

Of the many coral cays scattered over the eighty thousand-odd square miles of the Great Barrier Reef, the Capricorn and Bunker groups are the most striking and best known. These lie in a somewhat isolated position in respect to the main barrier of coral reefs. They could be said to form the southern outposts of that vast coral field, and they stand well off the coastline between the towns of Bundaberg and Gladstone. Most are long established, verdant patches on a sea of cobalt blue. Others, not so verdant, here and elsewhere to the north, are either broad platforms of coral and other reef debris cemented to form a solid mass, or mere heaps of coral sands and shingle raised just above the waters of the highest tides. The land level of none is ever more than about twelve feet above the surrounding sea. Viewed from shipboard, a distant cay is little

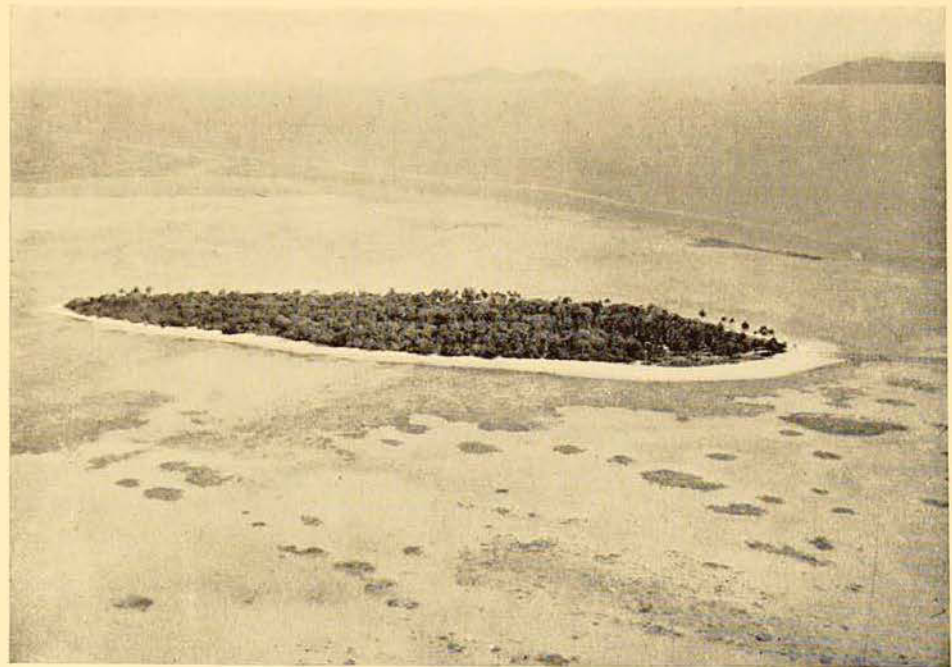


Green Island, a coral cay of the Great Barrier Reef, east of Cairns. The island, 32 acres in area, is dwarfed by the extensive reef by which it is surrounded. Taken from a height of 3,000 feet.

Photo.—H. Chargois,
F.R.P.S.

Another view of Green Island, from a height of 1,000 feet. In the background, extreme right, may be seen Fitzroy Island, beyond is the mainland.

Photo.—H. Charquois,
F.R.P.S.



more than a pencilled line on the horizon. Areas vary from as small as three and four acres to two hundred acres or more. The largest measures about three-quarters of a mile in length, and is half a mile wide.

The actual development of a cay is still a tantalizing problem to scientists; details, as yet, are far from complete. One established fact is that, initially, each has sprung from a large independent coral reef growing at only a shallow depth. Reef-building corals cannot flourish below the point where the light is sufficiently strong to maintain seaweed growth—round about the 30-fathom (180 feet) mark. Certain microscopic seaweeds (symbiotic algae) actually live in the flesh of the great majority of reef-building corals; they are necessary to the well being of the living growths and impart their colour to the polyps.

That today cays of the Great Barrier Reef rest many hundreds of feet above their original foundations has been established by recent bores on two widely separated cays. One of these penetrated to six hundred feet, the other to eight hundred feet, without reaching any semblance of the base rock of Palaeozoic age supposedly underlying the region.

These findings must surely support the theory that the cays came into being either through a gradual subsidence of the sea floor or a slow change in the water level. The first consideration fits the argument advanced by the great Charles Darwin, which could be claimed to have been strengthened by the evidence of boring operations. This profound student of coral reefs had a special explanation for the origin of barrier reefs. The theory, of course, covered the Great Barrier Reef, including all the islet cays surmounting it above sea level. It is direct and simple, claiming primarily a gradual subsidence of the shallow edge of the continent (continental shelf), with which the upward growth of the reefs kept pace. The Darwinian claim still has numerous adherents, but subsequent detailed investigation of many coral reefs in different parts of the world shows that the situation is more complex. Today it is considered by many specialists that every coral reef is an individual formation, the product of varied factors, and is understandable only from its own special history. Some modern students believe that the earlier simplified claims need to be expanded to embrace the evidence that water levels

have varied through other processes than mere submergence. In this regard we have what is termed by geologists the Glacial Control Theory. At the beginning of the Pleistocene Age, about one million years ago, great ice sheets formed and advanced over the continents of Europe and America. As a consequence there was a large scale withdrawal of water from the oceans. The ice sheets retracted a number of times, and on each occasion the water resulting from the melting of the ice returned to the oceans and slowly raised the level. The general effect in each cycle was for the shallowing waters to allow wave erosion of submarine platforms, which were subsequently covered again to about the depth actually supporting coral reefs in certain areas. Whatever may be the true explanation, the bores above-mentioned have proved that cays (coral islets) of at least the Great Barrier Reef area have been built upwards from an old sea floor that is now many hundreds of feet below the surface.

It was not, of course, the living coral alone which rose, bank upon bank, from the lower levels. Rather was it a gradual accumulation and slow consolidation of living material and the dead waste of the reefs reduced to shingle, gravel, and sand. In speaking of coral reefs it must not be forgotten that there are other forms of life which are a big factor in the consolidating process. One author has said that "the bricks of a reef are laid by the corals, but the cement which binds the bricks into a homogeneous rampart comes from a very different source".

Among the lower plants are the coral-line algae or *Lithothamnion*. These are dense, lime-secreting, encrusting growths, light mauve to pinkish in colour. They seem to occur more abundantly on the weather surface of the reefs, a position where their cementing action is of the greatest advantage. Yet another factor in the consolidating process is the host of tiny animals called foraminiferans. These are among the most simply

organized and smallest members of the animal kingdom, and belong to the Protozoa. Foraminiferans are the largest members of the Protozoa and they build around themselves protective structures of calcium carbonate, many and varied in pattern. These simple animals are especially abundant about coral reefs and their whole or fragmented skeletons comprise a large percentage of the sands flanking coral cays. Thus their remains, with coral fragments of all kinds and often the broken shells of molluscs, provide the packing for the cracks and spaces between the massive types of coral growth and any irregular coral boulders. In this way they play their part in the final consolidation of the reefs. The sea water possibly plays the final role in a general cementing action. The general consolidating action is what guards against any wholesale form of disintegration by temporary changes in the temperature of the surrounding sea. From well below the surface growing reefs are thus able to build ever upwards until their great bulk of calcium carbonate reaches and breaks the surface at the highest point. Around this place the currents continue to bank up more and more reef debris, aided in their work by wind-driven waves. Next come chance seeds, either stranded by the waves or perchance borne by the sea birds which alight to rest and to breed on the newly-formed land. The first vegetation soon becomes established, gradually to develop and increase in abundance with the fertilizer provided by the droppings of the birds and the humus from the dying and mouldering plants.

A visit to one of the verdant coral cays is a most impressive experience. Often parts of a weather shore are heaped with tumbled boulders of limestone, soft, smooth of outline and pure white inside. There are areas of beach where the sand grains have become consolidated into shallow shelving layers. An inseparable feature is the great encircling reef, most of which becomes exposed when the tide



Masthead Island, a coral cay of the Capricorn Group. A falling tide has exposed the reef edge or reef crest.

Photo.—F. A. McNeill.

waters recede. This is commonly thousands of acres larger than its surmounting islet. While from one quarter an islet may be only a few hundred yards in from the edge of its reef, a wader could travel for as much as five miles at low tide to a distant reach in the opposite direction. Invariably the seaward margin is slightly higher than the rest of the reef top; it is known as the "crest". Over this edge the waters cascade with a falling tide, and only fifty feet or so away depths of eight and ten fathoms may be plumbed. The richest coral beds occur in deep pools along the crest and in adjacent lagoon-like shallow expanses of the reef top.

Cay beaches are always narrow and comparatively steep. Their white bleached sands glare under a noonday sun. On those of greatest age there is a typical vegetation. The tops of the strands are flanked by stately drooping-leaved casuarinas (oaks). At the back of these are *Tournefortia* trees, low, spreading and twisted of limb; their thick bunched leaves are grouped around

the ends of the stems. Either close to or intermingled with the *Tournefortia* trees groves of *Pandanus* palms are found, with their bases surrounded by the crowded stilt-like buttress roots which spring from high up on the trunks. The inland part of the islet mainly supports a forest of *Pisonia* trees, many rising to sixty feet in height and measuring as much as fifteen and twenty feet around the bole. These trees bear delicate yellow-green leaves six to seven inches long and four inches across. In places the layers are so thick that the strong light is unable to penetrate to the forest floor. *Pisonia* trees carry bunches of sticky seeds and their distribution is effected through their adhering to the feathers of sea birds departing after the summer breeding season. In the *Pisonia* forest occasional giant native figs are found. These have grown from seeds dropped by birds in the forks of living *Pisonia* trees, which have ultimately been strangled and killed by the creeping roots of the growth they nurtured.

The Shepherd Fish and Its Flock

By GILBERT WHITLEY

THE fishes technically known as the Series Stromateiformes constitute a little-known group of strange species, many of which are widely distributed in the oceans of the Globe. The Shepherd Fish, Pastor, or Portuguese Man-o'-War fish (*Nomeus*) is one of these, and there are others, classified near it, quaint fishes with quaint names, such as the Square Tail (*Tetragonurus*), Fiatola Butterfishes (*Stromateus**), the False Pompano (*Pampus*), the Snotgall Trevalla (*Seriotelella*) and the small Eyebrow Fishes (*Psenes*) and Harvest Fishes; the Rudder Fish (*Centrolophus*) accompanies the great Ocean Sunfish (*Mola*) and flotsam such as timber, while the Raft Fishes (*Schedophilus* and *Hoplocoryphus*) disport under rafts or floating barnacles or vegetation; finally the pelagic Ragfishes (*Leichthys*) have bodies "soft and limp like a wet rag". Truly the Shepherd Fish and its flock of relatives are an interesting assortment of pelagic roamers. The majority of them rarely come inshore and are not numerous in Museum collections; indeed some are the great rarities of ichthyology. Thus any fishes washed ashore with flotsam should be taken to the nearest Museum for identification. The fishes of this group are not easy to determine and may perhaps best be recognized by students from the accompanying illustrations. They show unusual modifications in the numbers of spines and rays in the dorsal fins (being in some respects intermediate between the two great groups of soft-finned and spiny-finned fishes); the form of the slabsided body and the extent of the gill openings are noteworthy features,

and they have teeth in side-pockets down in the gullet for crushing the jelly-fish and salps upon which they are believed to subsist.

When they occur in sufficient quantities the larger ones are valued for food.

FISHES OR FAIRIES?

Writing of a Barrel Fish or Rudder Fish, *Lirus perciformis*, from the Aran Islands, Holt and Byrne related the unusual experience of a school of these fishes which followed a barnacle-covered log ashore in September, 1901, and a Mr. Colman Costello reported concerning this:

At the time, owing to the tide being low, it was like a horse-shoe, so that if the islanders took twenty fathoms of net and put it across the entrance they would save thousands upon thousands of fish; but, instead of that, when they saw the fish from a high ledge on one side, having the barnacles like a calf would have the teat of a cow in its mouth, they all got afraid, and said they were "Sheeogues" [i.e., "little fairies"], and they ran away, except one old man.

At the time when the log struck the shore about 400 of the fish jumped on dry land, and were hopping about on the shore, so that some of them got into the water again, while others died and were carried away by the next tide, except two that the old man took home with him.

When the old man came home, and his wife and sons saw the fish, they would not allow him to take them into the house, as they never saw the like before; they were no fish, but Sheeogues resembling fish. . . .

A man . . . a few days after . . . saw one of these fish swimming about very near the surface. He pulled ashore and did not go out again for three days.

It is to be hoped that none of my readers will suffer from such superstitious horror if they find any queer-looking fish in the vicinity of barnacle-encrusted

* A Greek word meaning a patchwork bedcover, adopted for the fish on account of the "Joseph's coat" colouring of some of the species.

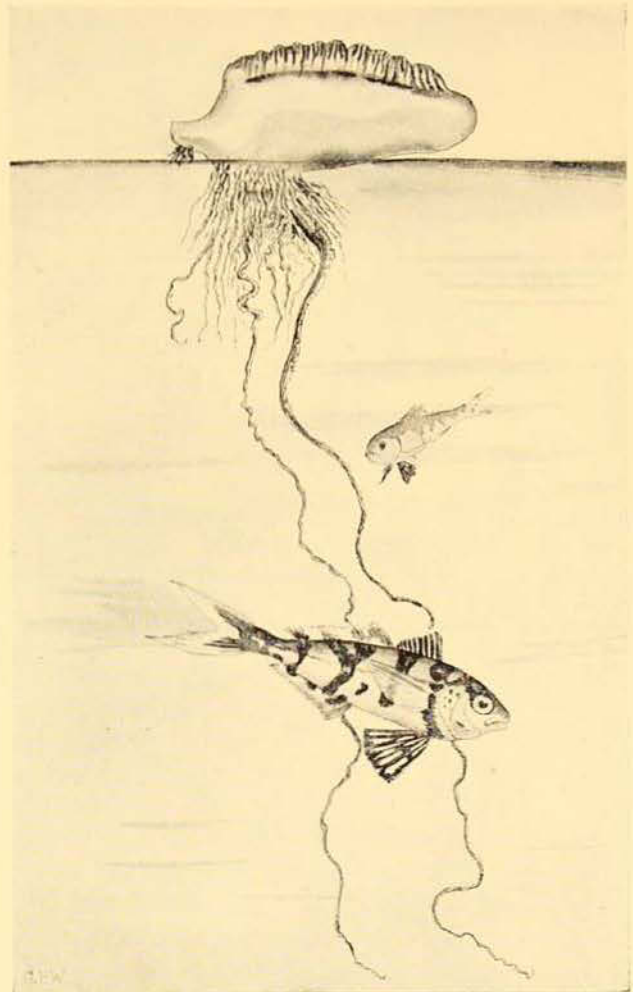
logs, floating boxes, and the like. Sometimes such fish turn out to be rarities, like the above; at other times, they may be young Drummer (*Segutilum*) or Tripletail (*Lobotes*).

THE SHEPHERD OR BLUEBOTTLE FISH

Usually a fish coming in contact with the virulent stinging threads of a Bluebottle or Portuguese Man-o'-War (*Physalia*) would be killed and eaten but certain little fishes known as Shepherd Fish or Portuguese Man-o'-War Fish (*Nomeus*) seem immune from this fate and swim under what is now the protection of their jellyfish-like friends. Possibly the fish's thick skin is impervious to the stings, which can even incapacitate a human bather, and the fish may live on fragments of food rejected by the Bluebottle which they do not leave. The association between fish and bluebottle is not parasitism, symbiosis, or commensalism but has been termed inquilinism (a seeking of lodgings without paying rent). If the bluebottle be taken from the water the Shepherd Fishes are lost, therefore they are sometimes cast ashore on our beaches, when the winds strand the caravels of their hosts. Bluebottles have been known sometimes to kill *Nomeus* and the fish occasionally nibble the tentacles and polyps of the Portuguese Man-o'-War, so there is evidently a little treachery at times in this unusual arrangement between two animals. Indeed, Kato, a Japanese scientist, found remarkable cells in the intestines of *Nomeus* evidently for producing special enzymes which one imagines would be needed for digesting bluebottle zooids and stinging tentacles. He was inclined to discard the story of the friendly relationship mutual between *Nomeus* and *Physalia*. If he be right then another pretty legend joins a host of others in nature myth.

NOMEID FISHES

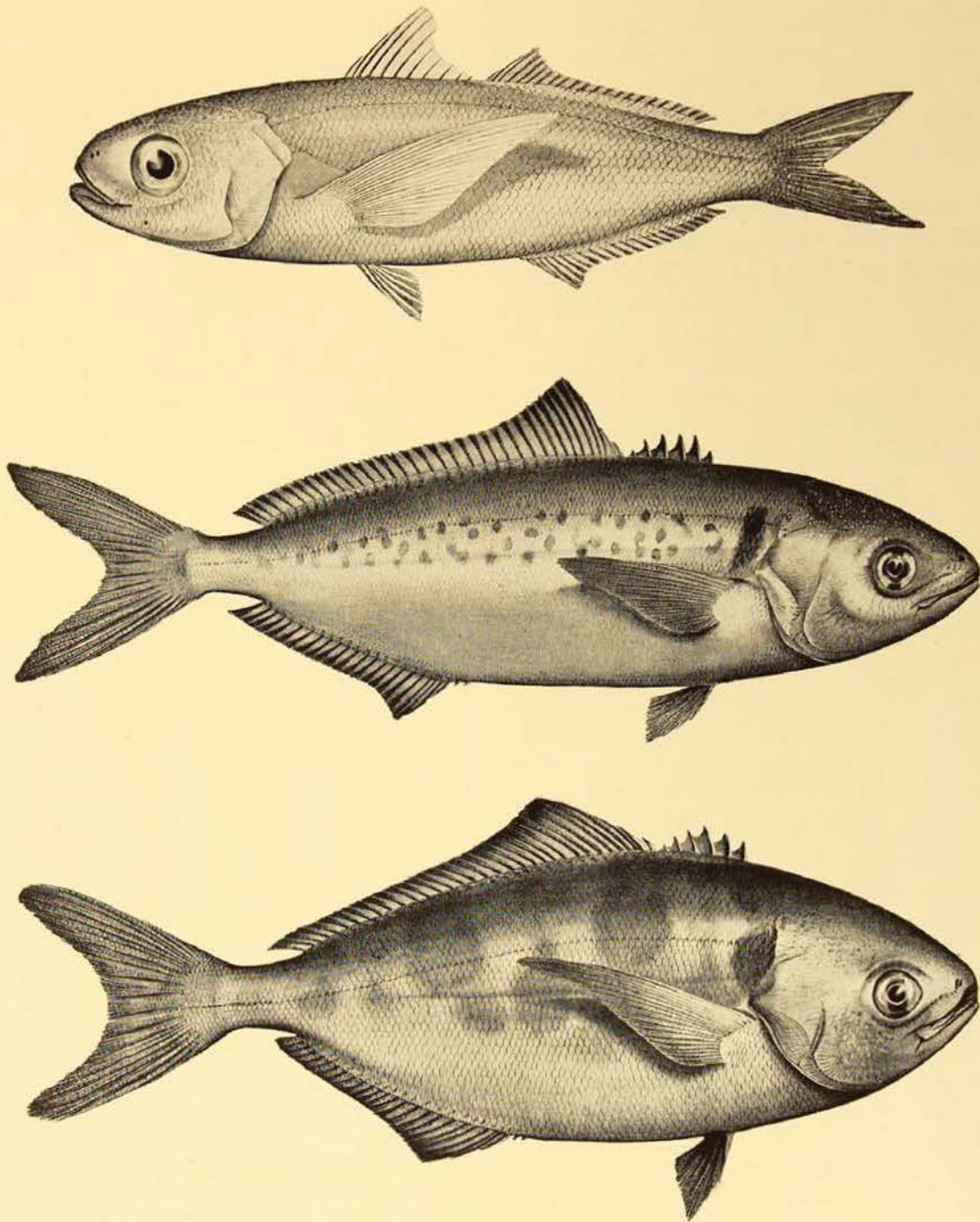
Allied to the Shepherd Fish is the Cubehead (*Cubiceps*), which is dark chocolate brown in colour and grows to



The Shepherd Fish or Portuguese Man-o'-War Fish (*Nomeus dyscritus*) which swims amongst Bluebottles (*Physalia*). New South Wales.

G. P. Whitley del.

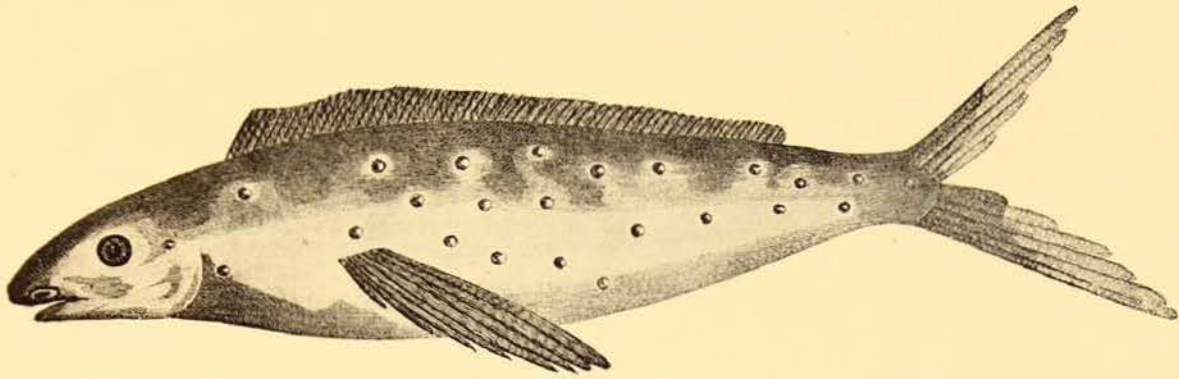
about eighteen inches in length. Only a couple of specimens of *C. baxteri* are known from Lord Howe Island and New South Wales. Like most of the fishes dealt with in this article, it may be commoner in the open ocean between Australia, New Zealand and Norfolk Island. Most of these fishes have a ring of pores around the eye, suggesting eyebrows to the imaginative mind; thus, the little Eyebrow Fishes (*Psenes*), with deep bodies and well-developed front dorsal fin, derive their name, especially as one (*P. cyanophrys*) has a blue, chevron-shaped "eyebrow"-mark on top of the head. These fishes only grow to about five inches and may be associated with particular types of jellyfishes; terns sometimes feed on them.



Some of the larger Australasian Nomeid Fishes. Top to bottom: Cubehead (*Cubiceps baxteri*), Mackerel Snotgall (*Seriotelella maculata*) and Warehouse (*Seriotelella brama*).
A. R. McCulloch del.

The only Australasian Nomeid fishes sufficiently large and abundant to be used commercially are the Trevallas (not to be confused with Trevallies of the family Carangidae) and very delicious fish they are. The Snotgall Trevalla, known to the Maori as Warehouse or Whario, *Seriotelella brama*, grows to thirty inches in length and fourteen pounds in weight, but the best

flavoured ones are those up to one pound in weight such as may be caught by hook or net in Hobart from February to April. It is a southern fish living in from one to forty fathoms of water. It has a brother species, *S. maculata*, a slenderer fish with a smaller eye, known as the Mackerel Snotgall, Silver Warehouse, or "Silver Fish" of New Zealand, where it exceeds two feet in



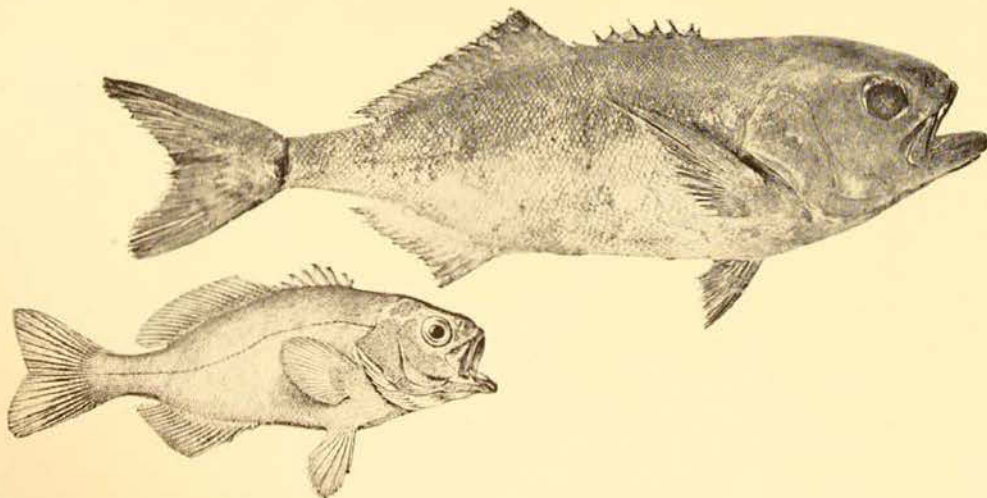
"A Fish of New South Wales", drawn by Dan Butler of the First Fleet: the earliest illustration of a Mackerel Snotgall, *Seriolaella maculata*.

From Governor Phillip's "Voyage", 1789.

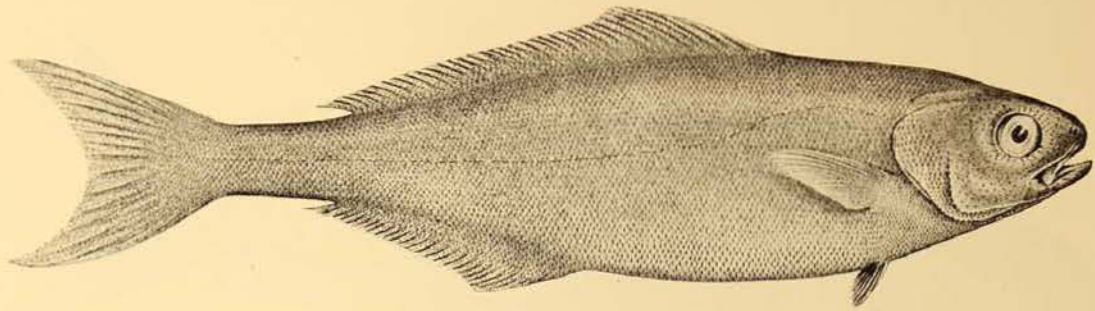
length. This species moves about in schools, sometimes entering bays and estuaries, sometimes descending to 150 fathoms, but their movements are evidently erratic. It appears in the Derwent estuary, Tasmania, in March and April in some years but may avoid that region for years on end. The Mackerel Snotgall was discovered by Cook's men in calm spots near river-mouths in New Zealand. It is rare in New South Wales, yet Dan Butler, "a clever little tar" with the First Fleet, drew "A Fish of New South Wales", evidently this species, which was published in Governor Phillip's *Voyage to Botany Bay*, 1789, and named *Stromateus maculatus* by Forster in 1794. This is not the "*Stromateus maculatus*" which

forms an important fishery in South America. Forster's name for the Australasian fish preoccupies that of the South American fish which has been renamed *Stromateus adrectitius*.

The Bream Trevalla, or "Bream" of New Zealand, *Hyperoglyphe porosa* is a giant, four and a half feet long and weighing up to eighty pounds, sometimes caught by trawling or on the set lines for groper and sharks in twenty to 150 fathoms. It seems to occur in great numbers sporadically, perhaps at intervals of many years. As the accompanying figures show, it changes a great deal with growth, adults having the body longer, the opercles not serrated, and pectoral fins more elongate instead of rounded.



Bream Trevalla (*Hyperoglyphe porosa*) showing variation with growth. Larger figure, an adult (after McCulloch); smaller, the young (after Richardson).



A Rudder Fish (*Centrolophus mauricus*) from Crookhaven Entrance, New South Wales.
J. R. Kinghorn del.

RUDDER AND RAFT FISHES

Differing from the Nomeids, just considered, by having the front, spinous dorsal fin, when developed, united with the soft-rayed dorsal, forming a single fin (instead of two separate dorsal fins), the family Centrolophidae next demands mention.

Little is known about the Rudder Fish (*Centrolophus*), a dark slaty-brown fish up to thirty-two inches long, except that it changes in shape as it grows, being deep-bodied when young and slender when adult. Several immature ones, six and a half inches long, were caught "swimming like Pilot Fish" with an Ocean Sunfish at Botany Bay in December, 1930. Only one was preserved, and unfortunately somebody accidentally trod on it so a very imperfect example of this rarity found its way to the Museum!

The Raft Fish (*Hoplocoryphus*) is a pretty little harlequin, blue and silvery

with dark grey bars (sometimes broken into stripes) or bluish-grey blotches with navy to black bars; the front of the head is occasionally dotted with white. It grows to four and a half inches in length and is at times washed up on beaches after storms.

A related rarity, the Mauve Ruffe (*Tubbia*) is pale mauve above and silvery below the body with silver spots on the head. Only one specimen is known, from Tasmania.

From Lord Howe Island comes another unique type, the Harvest Fish, yet to be scientifically named. This has very ample dorsal and anal fins, is yellowish in colour, and only four inches long.

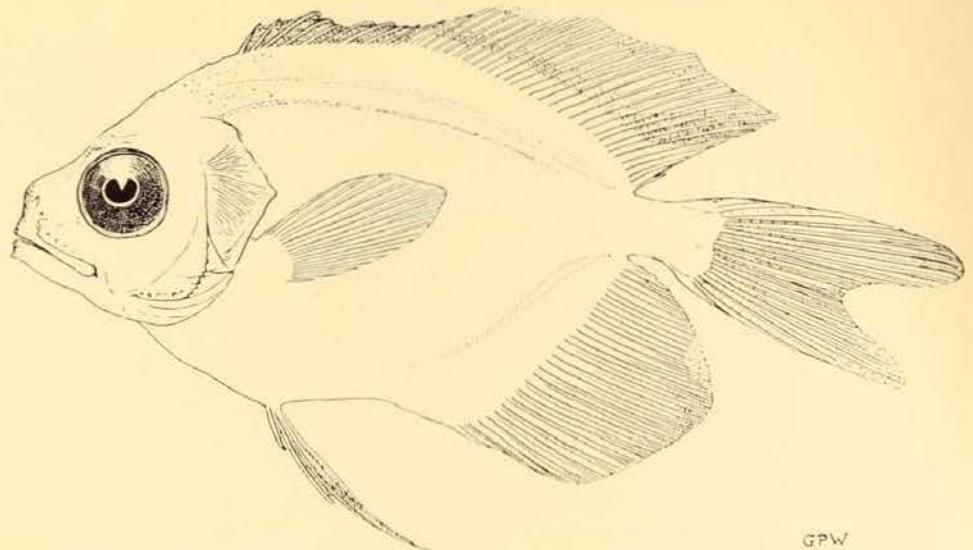
SQUARE TAIL OR RAVEN FISH

This extraordinary fish (*Tetragnurus*) is like no other so is placed in a family of its own, Tetragnuridae. The sides of the lower jaw, bearing the

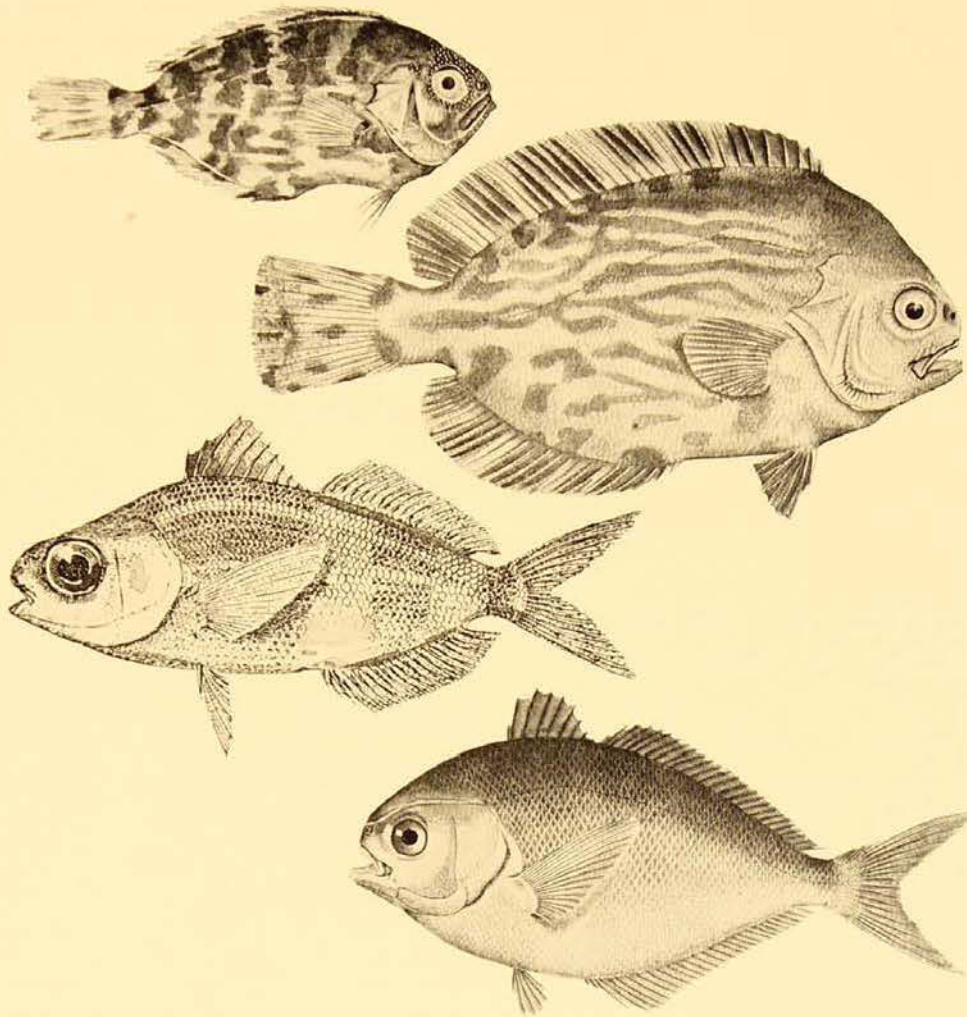
An unnamed species of Harvest Fish from Lord Howe Island. Natural size.

Block by courtesy of the Royal Zoological Society of N. S. Wales.

—G. P. Whitley del.



GPW



Top to bottom: Two examples of the Raft Fish (*Hoplocoryphus physaliarum*) showing pattern variation, and Eyebrow Fishes (*Psenes whiteleggii* and *Psenes cyanophrys*).
After McCulloch.

teeth, are elevated like the built-up sides of a boat or somewhat like the baleen in a whalebone whale. The head and the limp, dark chocolate-brown body are densely covered by peculiar scales which form four notable ridges just before the tail fin, giving the four-angled butt of the tail from which the generic name derives. Found, like most of the fishes dealt with in this article, in the Tasman Sea and related to allies in other oceans, the Square Tail grows to $12\frac{1}{2}$ inches in length.

In an old book in my library (Aldrovandi's *De Piscibus*, Libri v, 1638, p. 610) is an illustration of a Square Tail, but it is called the "very black raven of the Nile" (*Coruus Niloticus nigerrimus*)

because of its resemblance to that dark bird. The Mediterranean species was first described as a "black mullet" by Rondelet in 1554 and was called *T. cucieri* by Risso in 1810; he said it was a weak swimmer and that eating the flesh produced acute pains and sickness as he found by experimentally eating it on several occasions. One can only admire his intestinal fortitude! He thought the poison was due to the jellyfish, *Stephanomia*, upon which the fish fed.

Lowe, in his "Fishes of Madeira", describes the Square Tail or Sea Raven as "solitarii, erratici", and probably a surface fish. Lowe contrasts the poisonous effects upon man of the jellyfish-

devouring Square Tail with the hedgehog which feeds with impunity upon cantharid beetles of which a single insect is sufficient to kill a good-sized dog, and with the Brazilian hogs feeding on the poisonous roots of the wild Cassiva.

Young Square Tails have been found in the stomachs of dolphins in the Atlantic, but even these have thrown no light on the affinities of this anomalous genus.

C. Emery (1882) reported: "Three young specimens were caught in the spring of 1880 in the Gulf of Naples. These were found within the respiratory cavity of large salps, a circumstance which, as far as I am aware, has not previously been observed. These fish thus take their place among the fairly numerous animals that have as their temporary or permanent host such pelagic tunicates."

Reviews

THE STORY OF SARLI, THE BARRIER REEF TURTLE. Written by Leslie Rees, illustrated by Walter Cunningham. (John Sands Proprietary Limited, Sydney, 1947.) Pp. 43. 5s. 6d.

SARLI is an authentic story of the life of a Green Turtle, and, though written for children, should be thoroughly enjoyed by adults. Sarli commences her adventurous life three feet down under the sand, as a newly hatched sister of more than forty young turtles. The story commences with her scramble to the surface and exciting race down to the sea only to meet other adventures which follow her until she is an aged adult weighing approximately six hundred pounds.

Leslie Rees, who has done considerable research on turtles, gained much of his expert knowledge among them on the Great Barrier Reef, and his story, though romantic and imaginative, is therefore founded on scientific details.

The book is charmingly written and beautifully illustrated, qualities typical of other productions from these collaborators. Tribute should also be made to the printers, both letterpress and offset, for their part has been admirably done.

J.R.K.

THE STONE IMPLEMENTS OF AUSTRALIA (Australian Museum Memoir IX). By Frederick D. McCarthy, Dip. Anthr. (Syd.), assisted by Elsie Bramell, M.A., Dip. Ed., and H. V. Noone. (Trustees of the Australian Museum, Sydney, 1947.) 94 pp., 386 figures. 9s.

This is a review of all known types of stone implements in Australia. At present there is no precise knowledge of the full range of these and their variations, likewise some confusion regarding nomenclature, and this systematic study is intended to clarify these aspects. Although it is not a monograph embodying all known data, it is a summary catalogue in which are given the sources where such information is to be found.

It is divided into five sections. In the introduction such matters as previous classifications, nomenclature, eoliths, material and technique, suggested lines of research in the future, and the need for systematic collecting throughout the continent are discussed. The second section is the classification, in which the implements are divided into the major groups of trimmed coroid, knapped, edge-ground, percussion and abrading, ritual, hunting and domestic implements, weapons, playthings, ornaments and perforated stones. In the third section is given a general description of each group and specialized or local type, with an illustration, and a full list of references and previous names so that identification of implements is simplified. The fourth section is a glossary of definitions used in the work, the fifth section is the extensive bibliography, and this is followed by the index.

Till the appearance of this publication the student of Australian prehistory has been at a disadvantage. A reference work for both professional and amateur, and designed for use in the field and laboratory, it cannot fail to be of great help.

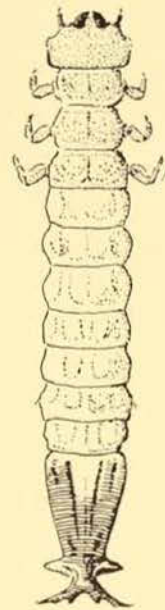
Australian Insects. XXXI

Coleoptera 8—The Cucujidae

By KEITH C. McKEOWN

THE Cucujidae, among the smaller families of beetles represented in Australia, presents the entomologist with numerous problems. The family appears to be rather in the nature of one of "convenience" than of close relationship. The Cucujids differ within wide limits, not only in the tarsal formula—the number of joints in the tarsi or feet—the relative shape of the joints forming the antennae, but also in their general form. The group is divided into six sub-families, each so sharply defined that they might, perhaps, be regarded as actual families. For this reason it is difficult to give a general description that will adequately cover the insects of the family as a whole. A glance at the sub-families will give some indication of these difficulties. In the subfamily Passandrinae the antennae are very markedly moniliform—like a string of beads—and the joints of the tarsi are 5-5-5 in both sexes, i.e., 5-5-5 means five joints on the feet of the first, second, and third pairs of legs. The Australian *Hectarthrum heros* Fabr. belongs to this section. The Cucujinae have a tarsal formula of 5-5-5 in the females, but in the males it is 5-5-4, and the antennae are thread-like—filiform—or somewhat bead like. Among these is *Platysus integricollis* Reitter. The Brontinae resemble the Cucujinae in having thread-like antennae, but here the first joint is very much elongated, and the tarsi are 5-5-5 in both male and female. Among these insects is *Uleiota militaris* Er. The antennae of the Hemipeplinae resemble those of the Brontinae, but the feet of the sexes are again 5-5-5 and 5-5-4:

the wing-covers—elytra—are extremely short and do not cover more than a small portion of the abdomen. *Inopeplus dimidiatus* Waterh. falls in this group. The Silvaninae are the smallest members of the family, with the antennae tending to become somewhat swollen towards the tips, and with the tarsi 5-5-5—but with 5-5-4 in the males of some species. Here



Larva of *Hectarthrum heros* showing the remarkable forked appendage at the extremity of the body: its purpose is obscure.

N. B. Adams del.

are placed the genera *Nepharis*, *Nepharinus* and *Eutermicola*, as well as the introduced species *Oryzaeophilus surinamensis* Linn. In the Parandrinae the antennae are short and bead-like, and the tarsi in both sexes are 5-5-5. The number and arrangement of the subfamilies differs according to the opinion of different workers, but the arrangement given above is that usually adopted in Australia. So much for complexities.

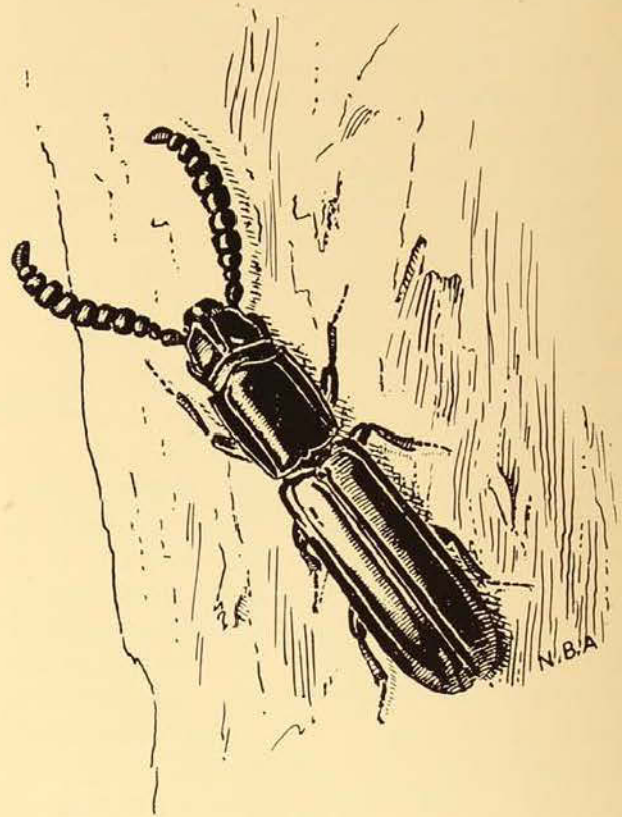
Both the active, flattened larvae and the adult beetles are usually to be found

in rotting bark, under bark, or in borer-riddled timber. Some of them may be actually feeding upon the bark, but many are carnivorous, preying upon the larvae of other bark-feeding insects. Some, as *O. surinamensis*, are pests in grain, dried fruits, and other stored food products. Some small species in the genera *Nepharis*, *Nepharinus*, and *Eutermicola* are found living, apparently upon a friendly footing, in the nests of ants and termites, but details of this association are quite unknown. The larvae may be exceedingly flattened, but others may be almost cylindrical in form. The large larva of *Hectarthrum heros* Fabr. is an amazing creature with the terminal segment of the abdomen developed into a strange pronged process. The purpose of such an appendage is difficult to imagine; indeed, one would think it would be an encumbrance to an insect living in narrow tunnels in bark. The appearance of this strange larva is well shown in the illustration. The life-histories of our Australian Cucujidae are little known or entirely unknown.

In the absence of details of the lives of our own species, the curious story of the life of a Cucujid, found in British Guiana by W. M. Wheeler, may be of interest. Dr. Wheeler wrote of these beetles:

"They occur only in the hollow leaf-petioles of a very interesting tree, *Tachigalia paniculata*, and only in young specimens 1½ to 7 feet high while they are growing in the shade under the higher trees of the jungle. The older trees, which may attain a height of 40 feet or more, have all their petioles inhabited by viciously stinging or biting ants. Each beetle colony is started by a male and female which bore through the wall of the petiole, clean out any pith or remains of previous occupants it may contain and commence feeding on a peculiar tissue rich in proteins, which is developed in parallel, longitudinal strands in the wall of the petiole. As they keep gnawing out this tissue they

gradually make grooves and pile their feces on the ungnawed intervening areas, so that the interior of the petiole assumes a peculiar appearance. While the beetles are thus engaged numbers of small mealy-bugs of the genus *Pseudococcus* (*Ps. bromeliae*), covered with snow-white wax, wander into the

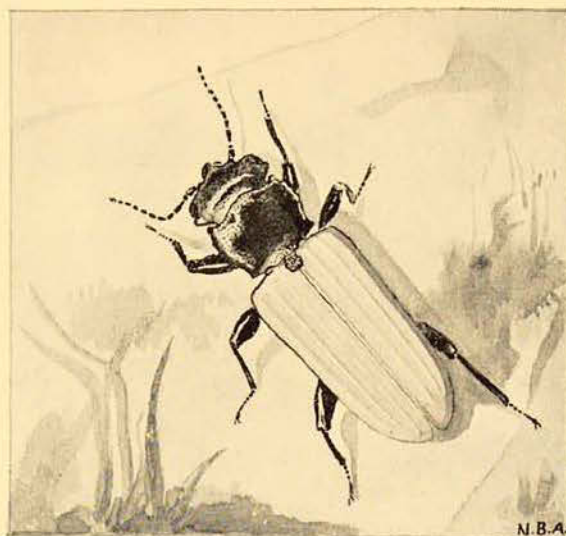


The largest of the Australian Cucujid beetles—*Hectarthrum heros*.

N. B. Adams del.

petiole through the opening made by the beetles, settle in the grooves, sink their delicate sucking mouth-parts into the nutritive tissue and imbibe its juices. The beetles soon begin to lay their small, elliptical, white eggs along the edges of the grooves, and the hatching larvae, which are beautifully translucent, run about in the cavity and feed on the same tissue as the parents. But incredible as it may seem both the adult beetles and the larvae in all stages have learned to stroke the mealy-bugs with their antennae, just as our common ants

stroke similar mealy-bugs and plant-lice, and feed on the droplets of honey-dew, or saccharine excrement which they give off when their backs are properly titillated. So greedy are the Silvanids for this nectar that I have seen a beetle or a larva stroke a mealy-bug for an hour or longer and receive and swallow a drink every few minutes. When two or more larvae or a group of beetles and larvae happen to be engaged in stroking the same mealy-bug, they stand round it, like so many pigs around a trough, and the larger or stronger individual keeps butting the others away with its head. The butted individuals, however, keep returning and resuming their stroking till the knocks become too severe or the stronger individual leaves and begins to stroke another mealy-bug. Thus the beetles and their progeny have discovered a rich food supply, consisting in part of the proteid-containing tissues of the *Tachigalia* and in part of the sugar and water discharged by the mealy-bugs, which in turn imbibe the sap of the tree. The beetles lay their eggs at intervals so that larvae in all stages are found in the same colony. When mature, each larva constructs a cocoon of minute particles bitten out of the plant tissues, creeps into it, closes the opening from the inside and pupates. When the young beetles hatch they remain with their parents and soon begin to lay eggs, so that eventually the colony consists of several dozen beetles, larvae, pupae, and mealy-bugs all living peacefully together, except for the little family bickerings of the beetles and larvae over the milking of their patient, snow-white cattle. When the petiole becomes too crowded, pairs of young beetles leave it, enter other petioles of the same or other *Tachigalia* trees and start new colonies. As the tree grows and emerges from the undergrowth into the sunlight, the ants which then take complete posses-



***Platisus colonarius*, one of the extremely flattened, bark-dwelling Cucujid beetles.**
N. B. Adams del.

sion of it oust the beetles from the petiolar cavities but adopt their mealy-bugs, just as the invading German army appropriated the French cattle."

But to return to the Australian Cucujids. . . . The largest of our species is *Hectarthrum heros* Fabr., a glossy black, elongate insect with the elytra strongly grooved along the suture and sides. It is extremely variable in size, and may range from barely a quarter of an inch in length to almost an inch. The illustration well shows its appearance. It is widely distributed throughout Australia. *Platisus colonarius* Olliff, from Queensland is extremely flattened, with the head and thorax black and the elytra a light brown. It measures about three-quarters of an inch in length (see illustration). The smaller *Platisus integricollis* Reitter is so flattened that it is not much thicker than a piece of stout paper, a form well suited to its habit of living under bark. It is wholly dark brown in colour. The small, narrow *Uleiota australis* Er., with its spined thorax and brown colouration, is perhaps the commonest of our Cucujids. Mention of the smaller forms is impossible here, for there are many of them: about one hundred and twenty species of Cucujids have been described from Australia.

Rocks in the Making

The Geochronology of Very Recent Times

BY R. O. CHALMERS.

ON occasions there have been described and recorded specimens of sedimentary rocks which because of the peculiar circumstances surrounding their origin give some idea of how long they have taken to form. Some time previous to 1934 an old cannon encrusted with ferruginous conglomerate was dredged off the coast of Florida, U.S.A. A similar rock, encrusting a stove-lid was found on the shores of an island in Lake Erie in 1933. From knowledge of certain historical events the earliest dates at which the cannon and the stove lid could have been dropped in the water are 1513 and 1788 respectively.¹



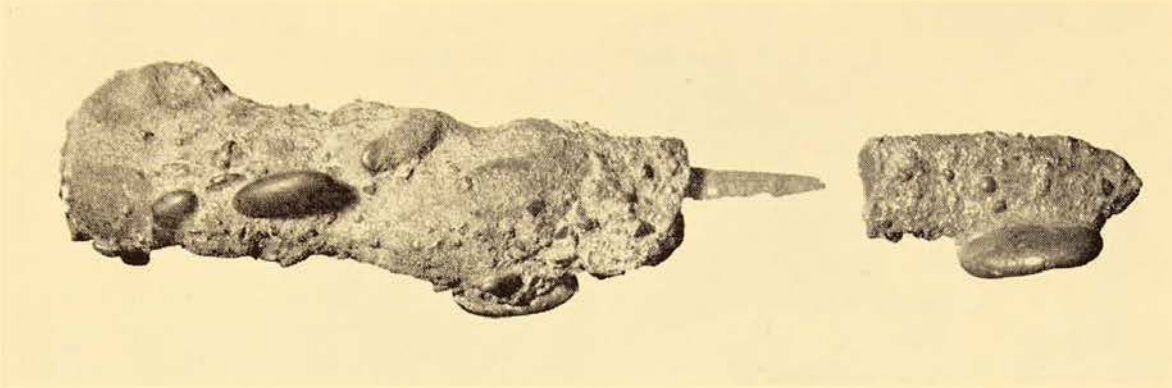
This encrusted tobacco tin was found on the shore at Sawtell, near Coff's Harbour, New South Wales.

A local example, which must have originated in much more recent times was found near Coff's Harbour on the north coast of New South Wales and was presented to the Museum some 12 years ago. Again the rock is a ferruginous conglomerate together with some calcareous material due to the presence of shell fragments. In this instance the object encrusted was a tobacco-tin.²

In February, 1946, another specimen of fairly recent origin and like the tobacco tin, certainly much younger than either of the two American examples, was generously presented to the Museum by Mr. T. V. Paddon, of Bermagui South. The specimen was found at high water mark in the entrance to the Bermagui River, South Coast, New South Wales. Once again the rock is a ferruginous conglomerate, only this time the object encrusted is a knife blade. Due to its having been fractured, the top third of this elongated specimen is loose and can be slid off like a scabbard, thus revealing the corroded and rusty blade. Obviously in all these cases, since the objects encrusted consist of iron, the material which has cemented the sand grains and pebbles to form a hard rock is limonite (hydrated iron oxide) derived from the rusting of the object itself. In the Bermagui specimen, which is of special interest because a cross section can be seen, the centre part next to the knife blade consists predominantly of limonite. Then proceeding to the outside, sand grains make their appearance, and firmly cemented on the outside are siliceous

¹ Kindle, E. M.: Observations on Chance Experiments in Consolidation of Sediments. *Am. J. Sci.*, xxx, 1935, 537-540.

² Hodge-Smith, T.: The Adventures of a Tobacco Tin. *Aust. Mus. Mag.*, v, 10, 1935, 345-346.



Ferruginous conglomerate from Bermagui, New South Wales. Portion of the specimen has been moved to the right to show the top of the corroded knife blade which supplied the iron oxide to cement the sand, pebbles and shell fragments into a solid rock.

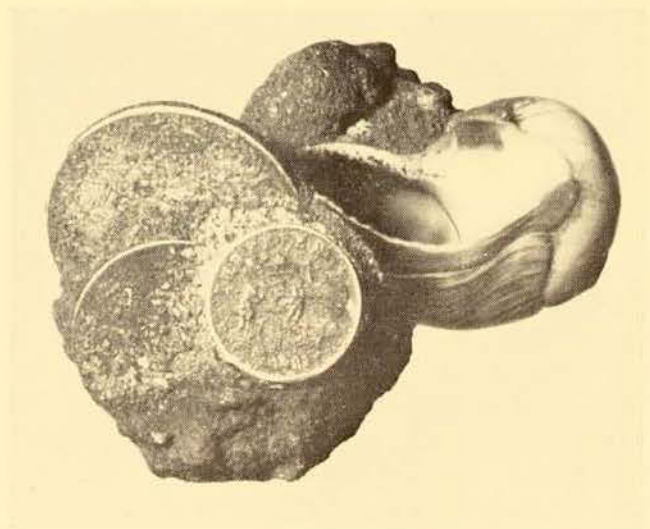
pebbles ranging from one-eighth to an inch and a half in length and quite a number of shell fragments. There is an appreciable amount of calcium carbonate, derived no doubt from the shells associated with the limonite on the outside. The colour of the specimen ranges from dark brown to black, thus indicating the high limonite content.

It would have seemed unreasonable to expect to find a specimen that would give any more definite indication of the minimum period required for sediments to become completely consolidated, but as is sometimes the case, the unexpected happened. In May, 1946, a unique specimen was brought to the Museum for identification by Miss B. Tunbridge, who had found it on Brighton beach, Botany Bay, in 1941, where it had been washed up by heavy seas. Although she would not part with the specimen she kindly supplied what information she could and permitted a photograph to be taken.

The specimen consists of a univalve shell, several shell fragments, a piece of lead shot and a two-shilling, a one-shilling and a three-penny piece all cemented firmly in a matrix of hard ferruginous sandstone. The threepence is conveniently placed so that the date, 1921, can be seen unmistakably, and since the specimen was found in 1941 it cannot have taken more than twenty years to form, perhaps even less. This method of dating the past may not be so spectacular as counting the seasonally deposited layers in shales that were deposited in the past

along the front of a retreating glacier, but it is just as reliable, if not more so, and is much less hard work.

It is interesting to speculate on how the three coins and the lead shot remained together long enough to allow cementation to proceed. People of macabre outlook have already suggested that the coins were in the trouser pocket of some individual who was lost overboard. The lead shot too grimly suggests the manner of his going. However, there is no evidence that the body was in the trousers when they went overboard, and indeed there is no evidence of the existence of trousers at all. The more likely explanation is that a purse went overboard. The metal parts would be corroded by the sea water and provide abundance of iron



Ferruginous conglomerate, containing coins, from Brighton Beach, near Sydney.

oxide to cement the coins and lead shot. The presence of a piece of lead shot is not surprising when one considers the abundance of odd articles usually found in the average purse. The shell could have become attached later and would have supplied calcium carbonate, a further cementing agent.

It is stated in text-books that consolidation of sediments is brought about by cementation aided by the pressure due to the weight of overlying sediments, or by cementation due to the action of ground water circulating in unconsolidated sediments on the land surface. The ground water carries calcium carbonate, limonite or any other cementing agent in solution and deposits it between the individual grains and fragments, thus binding them firmly together to form a rock.

Neither of these agencies has operated in the cases just described. There the cementing and solidification has taken place when the object was submerged for

at least part of the time. Nor does it seem necessary for a foreign object always to be present as a source of iron. In the collection there is a specimen of recent conglomerate from near Bateman's Bay stated to have formed recently in a purely natural manner in shallow water, between tide marks. Slabs of sandstone containing shells are to be found between tide marks on Narrabeen beach, near Sydney, and it is considered that this sandstone was formed on the spot.³

In view of all this evidence it can no longer be assumed that a great length of time is necessarily required to form conglomerate and sandstone from unconsolidated gravel and sand. Indeed some experiment could no doubt be designed to throw light on some of these aspects of the solidification of sedimentary rocks hitherto seldom noted and little explained.

³ Hodge-Smith, T. and Iredale, T.: Evidence of a Negative Movement of the Strand Line of 400 feet in New South Wales. *Journ. Roy. Soc. N.S.W.*, lviii, 1924, 157-168.

A REPORT was recently forwarded to the Australian Museum of the occurrence of large fossil shells in a magnesite quarry at Thuddungra, near Young, New South Wales. At our request one of the fossils was forwarded for examination. In appearance it showed the true outline of a shell, possessed the right valve convexity and traces of a faint ornamentation were visible. The presence of organic remains associated with magnesite, which is a product due to the weathering of serpentine, is impossible. Fossils do not occur in igneous rocks. A visit was made to the locality with Mr. J. Whiting of the Geological Survey of New South Wales when it was found that the rocks in the area were of an igneous intrusive origin. The supposed fossil shells were actually concretions of varying sizes with a slight wrinkling of the surface which gave the appearance of valve ribbing. The specimen presented to the Australian Museum

was one which resembled a shell to a marked degree and is really an excellent example of a "pseudo-fossil". These are not uncommon and are composed of inorganic material which closely resemble fossil species.

Mr. J. H. Wright, taxidermist, retired from service in the preparatorial department of this Museum in November last. Mr. Wright had been on the staff of this Museum since 1908. A talented taxidermist and skilful collector, he was versed in various handicrafts, as evidenced by many exhibits. His resourcefulness and manual dexterity enabled the Museum to display the fine tomako, or head-hunters' canoe, from the Solomon Islands. The size of this was so large that it had been considered impossible for it to enter the building.

Left or Right Turn

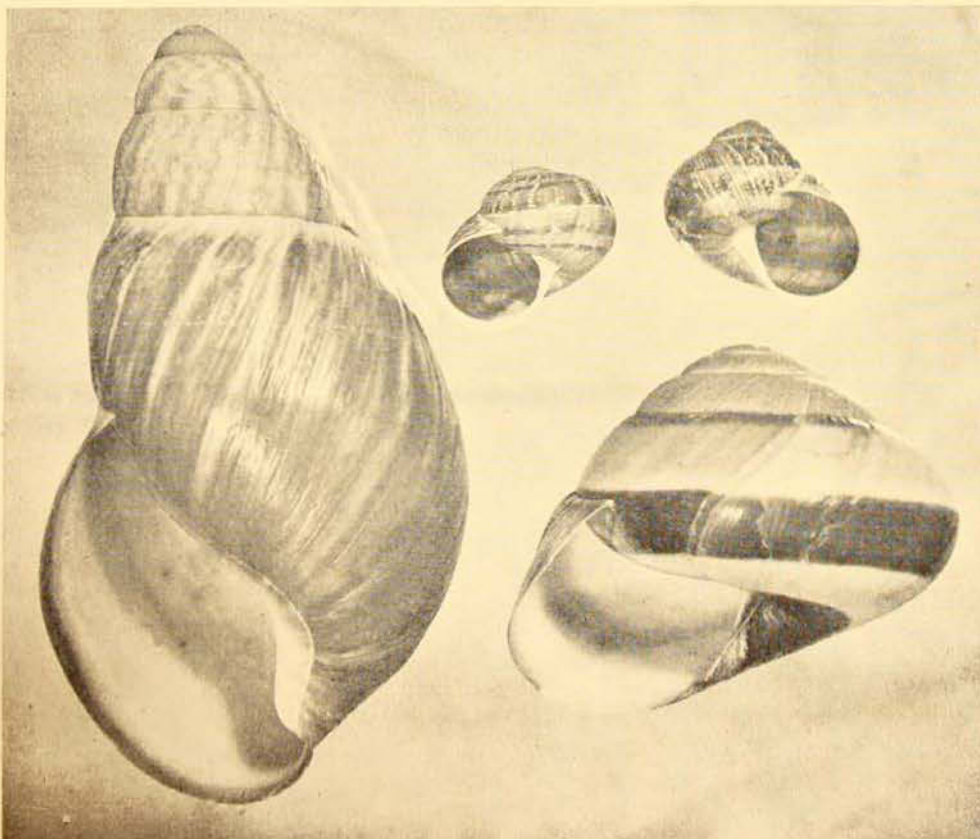
By JOYCE ALLAN

THE spiral shells of most gasteropod molluscs are coiled from left to right, and have the entrance or mouth of the shell on the right-hand side, that is, if the shell is placed with the mouth uppermost and the apex pointed away from the observer, the mouth lies to the right of the axis of the shell. Some, however, are coiled in the reverse direction, and the mouth is then on the left-hand side of the axis. The former are known as dextral and the latter as sinistral shells, or, as they are more popularly called, right- and left-handed shells. Occasionally some dextral individuals are found of normally sinistral species.

Reversed coiling is liable to occur in all spiral shells. Although it is often

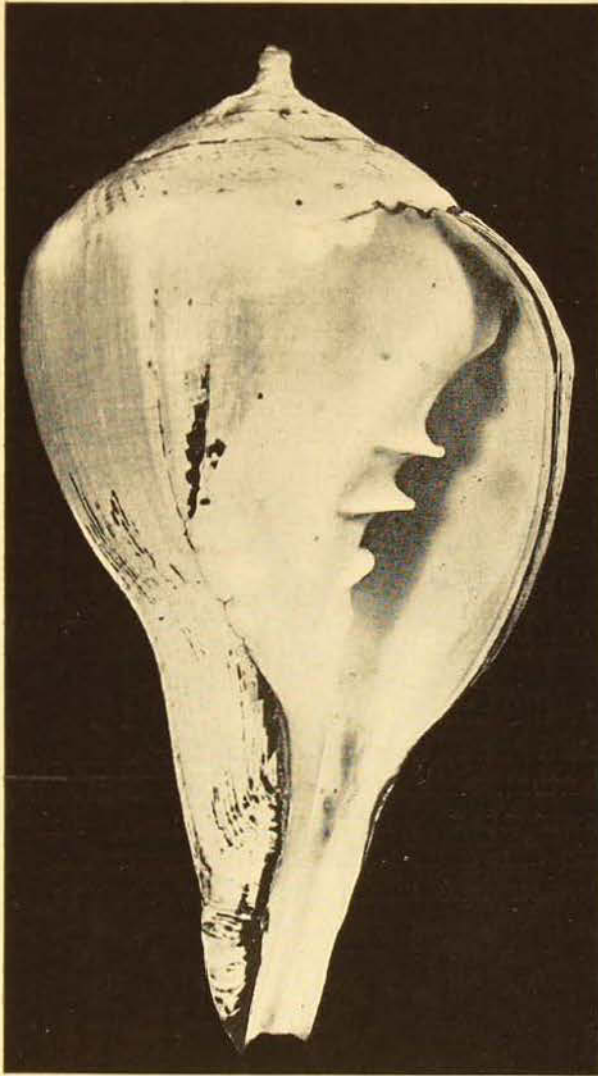
met in some very common gasteropods, such as the garden snail and various whelks, a left-handed or sinistral specimen of the large Trumpet shell of the Indo-Pacific, for instance, would arouse considerable interest.

Some species of shells, in particular certain land forms, such as the large, brilliantly coloured African tree snails, are often either sinistral or dextral; others, like the small pond snails of the family Bullinidae, are always sinistral. On the other hand, very similar types of pond snail, the Lymnaeidae, are normally dextral. Also there are certain molluscs, amongst the fresh-water snails, Ampullariidae, for instance, with dextral organization but sinistral shells, that is, the



On the left is the large African Tree or Agate Snail which coils to the left, making the aperture sinistral. Next to it is a large chocolate banded snail which also coils sinistraly, and above is an abnormal sinistral specimen of the common garden snail, with a normal one beside it for comparison.

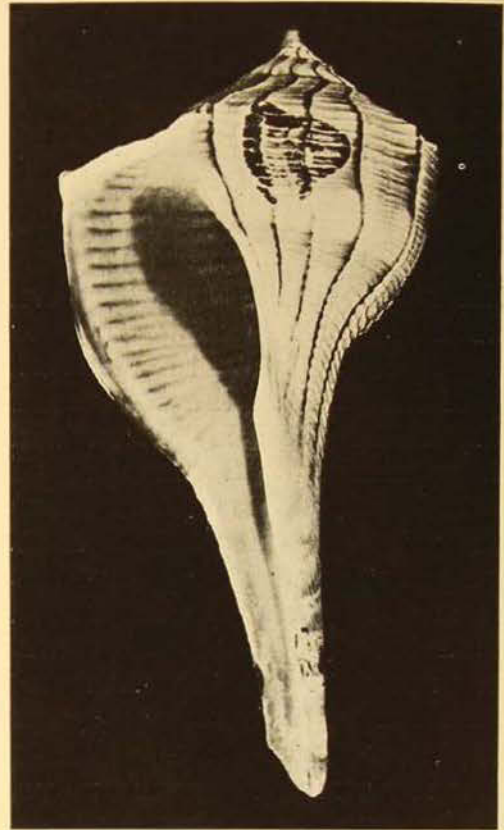
Photo.—
Howard Hughes.



The Chank Shell of India has the aperture on the right side normally. Reversed or left-handed specimens are very rare, they are greatly revered by Hindus, and priests use them in sacred rituals.

Photo.—Howard Hughes.

animal coils one way and the shell coils in the opposite direction. Again, there are cases, as in the genus *Turbonilla*, slender, marine snails, where the young shell (which forms the apex) is sinistral, and dextral growth suddenly appears and the completed shell is dextral. When a reversed individual appears amongst normal forms—whether a sinistral specimen amongst normally dextral shells, or the less frequent dextral individual amongst normally sinistral species—the occurrence is more or less novel, according to the rarity of its appearance in relation to the species affected, and,



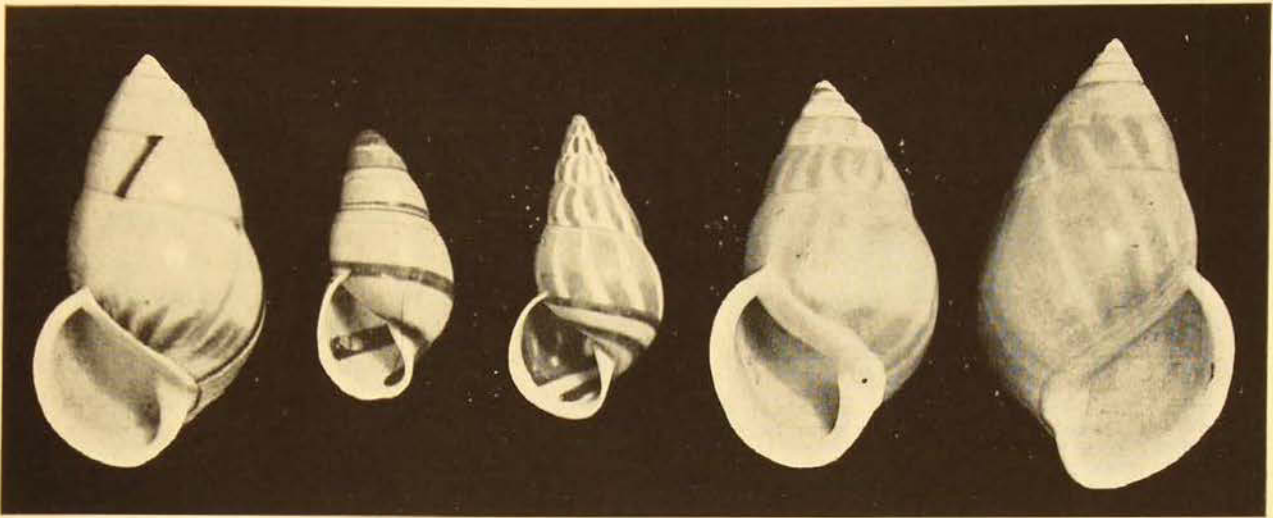
The Lightning Whelk of Florida always has the aperture on the left side of the central axis. It is frequently, and incorrectly, mistaken for a left-handed or sinistral form of the Chank Shell.

Photo.—Howard Hughes.

although of no general value, is always a matter of interest to conchologists.

A sinistral or left-handed specimen of the Chank shell (*Turbinella pyrum*) of Ceylon, is considered a great rarity in India and Ceylon, where it is particularly revered by the Hindus and used by priests in sacred rituals. Fabulous sums are said to have been paid to the finders of these rare sinistral forms. They should not be confused, however, with the Lightning Whelk (*Fulgur perversus*), which is a handsome, Florida shell, normally sinistral, and as a result, has caused considerable disappointment to many owners, who were under the impression they had a rare left-handed Chank shell.

The normal coiling of the mollusc inhabiting a shell corresponds with the coiling of the shell. The heart lies on the left side, and the external apertures of the various organs on the right side,



"Running both ways" land shells (*Amphidromus*) showing both left and right coiling. The prettily marked second and third shells always coil to the left. The remaining specimens are examples of a species which coils either left or right with equal frequency. "Running both ways" shells are famed for their brilliant green and yellow colouring. They come from the regions of Malaya and Borneo.

Photo.—Howard Hughes.

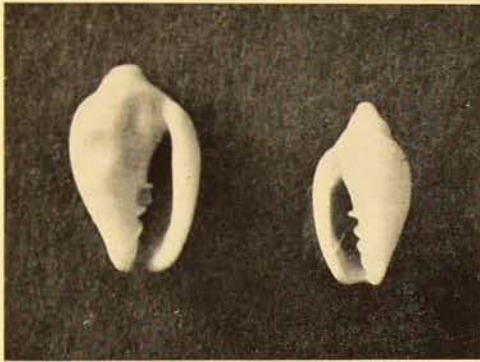
in dextral gasteropods, and *vice versa* in sinistral ones. Where molluscs coiling one way occupy shells of a different coiling, particularly noticeable in the genus *Planorbis*, this is known as *inversion* or *hyperstrophy*. It is caused by the part usually forming the base of the shell becoming the upper part of the spire, the process reversing the direction of the shell, although the reversal does not affect the disposition of the organs of the animal. In other words, in a simple reversion in the direction of the coiling of a shell, organs of the molluscs become actually transposed in position, but in hyperstrophy they do not.

Sinistral or dextral reversion comes about, it is believed, during the early stage of a mollusc's larval growth, when it undergoes a normal torsion in which the visceral sac containing various organs rotates in a counter-clockwise direction through an angle of 180° on the rest of the body. Only the narrow portion, or neck, between the coiled viscera and the rest of the animal, twists, transferring, as it rotates, the various organic apertures from the rear to the anterior part of the shell, and the incipient spire, previously rolled towards the front, now faces the rear. Original sinistrality or dextrality of the coiling is determined by the

method in which this torsion is effected: if twisted to the right, the shell coiling is dextral, if to the left, it is sinistral. The rotation, or twist of the young mollusc, said to occupy only a few minutes in some of the species in which it has been observed, is entirely distinct from the coiling of the visceral hump itself, which precedes it.

What causes the visceral mass to rotate in a reversed direction, however, is unknown. As some localities have been well known for regular recurrence of reversed coiling of shells, the suggestion has been put forward at times that locality has some influence on individuals. Electrical conditions, direction of embryonic rotation, crowding of embryos in the oviduct in the early stages of existence, are other conjectures advanced for the presence of a "black sheep" amongst otherwise normal individuals. The correct reason, or reasons, remain to be proved.

Experiments in hatching eggs of dextral and sinistral species have been carried out under difficult conditions, and the inheritance of sinistrality in certain molluscs has been studied. What little work has been done in this direction has shown that sinistrality behaves as a Mendelian recessive character.



Margin Shell (*Marginella muscaria*) from Balmoral Beach, Sydney. The specimen on the right has the whorls coiling to the left instead of to the right, and the mouth is on the left hand side. A normal specimen with the mouth on the right hand side is shown next to it.

Conchological literature abounds with records of occasional left-handed abnormal individuals of right-handed species. Recently Miss H. Wilshire collected at

Cronulla, near Sydney, three perfect sinistral specimens of the small white Margin shell (*Marginella muscaria*), amongst more than a thousand right-handed normal individuals of the same species. In a previous issue of this Magazine (Vol. VI, No. 3, p. 105-8), Mr. H. Mort illustrated a sinistral specimen of this species also, from Balmoral, Sydney. Although reversed examples of Margin shells (family Marginellidae) comprise 50% of the known cases of sinistrality amongst gasteropods, the above are the only occasions I have known them to be found locally.

As explained earlier, reversed coiling is liable to occur in all spiral shells, but it is less common in marine than in land shells. The chance of finding a reversed shell, though perhaps remote, is always an incentive for a keen collector.

AMONG the interesting acquisitions received by the Department of Anthropology in recent months is a fully equipped Eskimo kyak from Greenland, presented by Dr. R. J. Tickle, an Australian resident in Toronto, Canada. The kyak, which is fourteen feet long, is a splendid example of this tricky but graceful kind of watercraft, and is the only specimen in Australia.

Mr. J. A. Costelloe, District Officer at Chimbu, Central New Guinea, presented thirty-three prehistoric stone implements which were unearthed by natives in their gardens in the Wahgi valley. They comprise polished blades which might have served as hoes, a bird like a pigeon and a bird's head, club-heads of various kinds, pestles, a splendid series of mortars, and several curious implements of indeterminate nature. Among the mortars is one with a bird's head carved in relief at one

end, a shallow bowl-like type previously unrecorded, and some small well-shaped examples on a high base. This series has added a number of new types to our collection of these interesting relics of the past from New Guinea.

From Mr. H. V. V. Noone were received more than four hundred flake implements, including a fine series of burins for comparison with Australian types, from the Dordogne valley in France, and from Mr. H. J. Wright almost two thousand stone implements, forming the bulk of his collection from surface sites in New South Wales.

Mr. F. D. McCarthy, Anthropologist, visited Cowan, Patonga, Kuring-gai Chase, and the Upper Hawkesbury River, to record groups of rock engravings as part of his survey of pictographic art in the Sydney-Hawkesbury district.

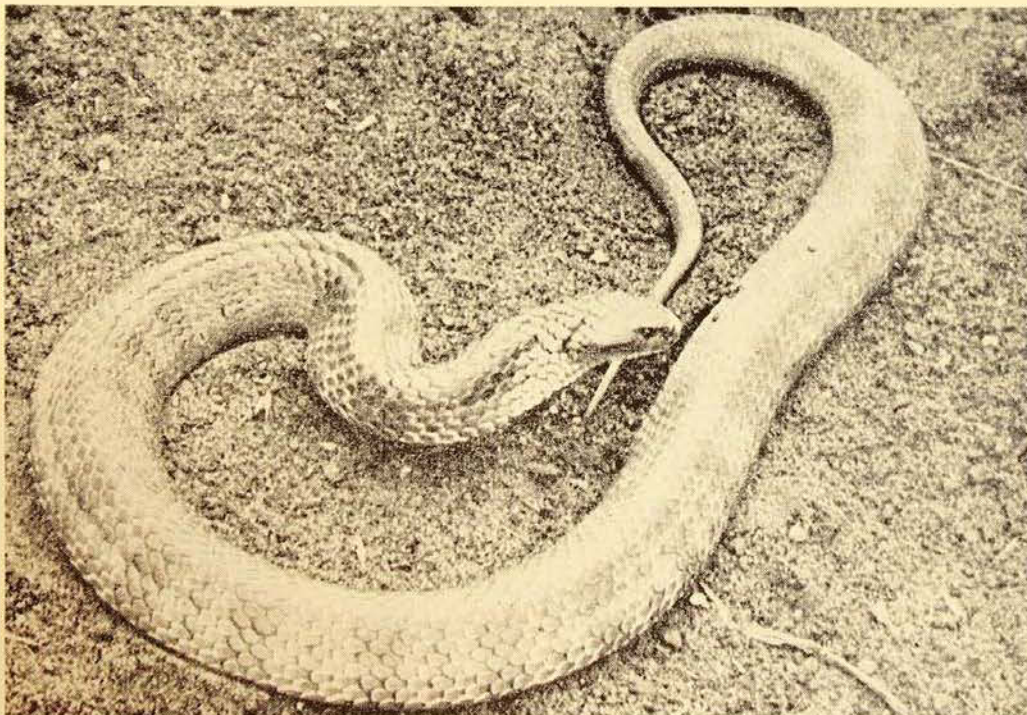
Questions I've Been Asked

BY J. R. KINGHORN

QUESTIONS by mail, phone, or from visitors to the Museum are always welcome, because they not only indicate a desire for enlightenment but often lead to instructive discussions. Some at first may appear trivial, perhaps silly; but that may be merely the outlook of the specialist concerned, for even the most trivial question may not be so silly as some asked by me of specialists in other walks of life. I try to remember that there are millions of people in Australia who are not naturalists, but who occasionally wish to know something of the natural objects seen, heard of, or picked up. My experience, mainly through broadcasting to the schools, or lecturing to classes visiting the Museum, is that by far the most interesting and fascinating questions come from children, young naturalists who really wish to know the

reason for this or that, and who are not asking, as many adults do, just to settle some argument or bet. As examples of questions from juvenile naturalists, I quote the following, selected at random from more than four hundred letters received during the last twelve months. "How were the black soil plains formed?" "What is a weed, and of what use is a weed?" "Why do some and not all frogs change colour?" "Why can't humans see at night as can some animals?" "Why does a horse smell the ground before lying down?" It will be seen that these have been framed after a good deal of wonderment, often following personal observation, or hearing adult discussions on the subjects.

Children, as well as adults, may jump to conclusions, but if there is any doubt, they are not afraid to ask questions.



Snakes cannot climb smooth vertical surfaces devoid of projections. The snake in the illustration is the deadly Tiger Snake—the venom of which is more potent than that of any other land snake.

Photo.—
Dr. C. H. Kellaway.

Recently a visiting farmer told me that he had seen a curtain which was hanging on the wall moving in a peculiar manner. Lifting the corner, he saw a tiger snake clinging to the wall three feet from the floor. Such a feat would be impossible as the wall was perfectly smooth. I asked some children why it would be impossible and immediately they answered that, as the wall was perpendicular and without any protruding nails or other projections, a snake could not get a "foot hold". They were right, but the farmer was offended when I suggested this to him.

A frequent question concerns ambergris. When our mammalogist was on service in New Guinea during the war it fell to my lot to identify several supposed examples of that substance. Fortunately my gospel was an article by the mammalogist which had appeared in this *Magazine*. The specimens brought to the Museum followed the finding by some lucky person of a piece of ambergris

valued at approximately £1,000, and for some weeks I was practically bombarded with all kinds of beach refuse at that stage of decay where the odour will penetrate several layers of paper wrapping; apparently the popular belief is that an unpleasant odour is an essential part of ambergris.

Quite late one night a journalist phoned me long after I was warmly tucked up in bed. He was completing a special article and had been "questioned" when he said that the cod, that is the North Atlantic cod, laid over two million eggs—was that so? I told him it was so, and that a mere million or so eggs to a cod did not matter much anyhow. I went back to bed to wonder how long it would take for the sea to become a solid mass of cod providing there were no losses, and all matured and lived to a ripe old age.

Many a wager is won or lost concerning lobsters—or are they lobsters?—for the question asked is, "Are there any lobsters

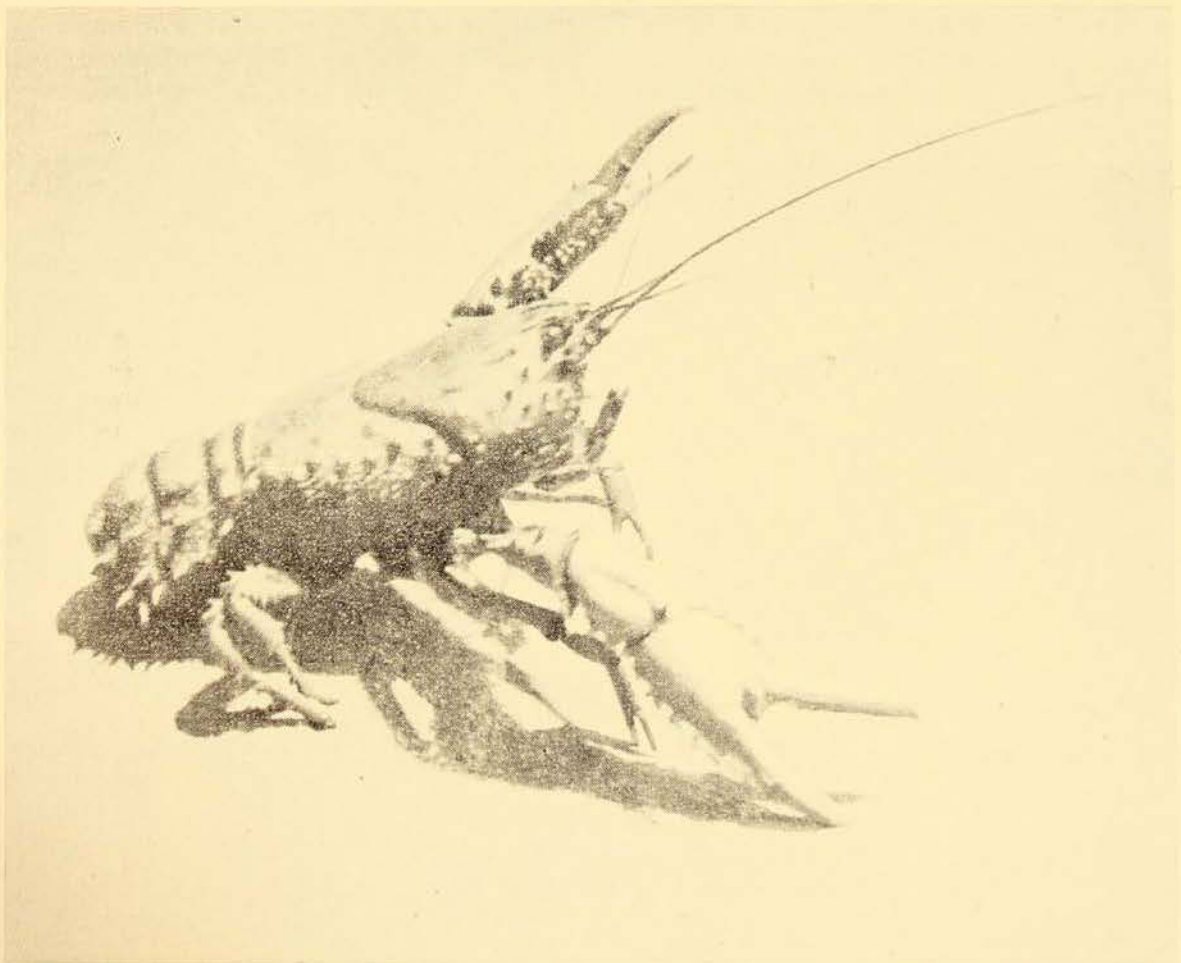
The Southern Marine Crayfish (*Jasus lalandii*). It is to this species that the term "lobster" is commonly applied. The front pair of limbs carry no nippers.



in Australia?" or "Are the so-called Australian lobsters cray-fish?" As far as I know, the true lobster is the European sea-crayfish of that name, and it is a species bearing two large and powerful claws, or nippers if you like that name better. The name lobster is popularly applied in Australia to the nipperless edible species, whilst the name crayfish is generally reserved for our fresh-water kinds which, like the true lobsters, have two large claws. Our marine forms are sometimes called spiny lobsters, though they are listed in the fisheries list as Common Crayfish—what a mix up! but what's in a name, and does it matter very much when you can still ask for lobster and get what you want—crayfish!

A question concerning stings is—"Can a Death Adder sting with its tail?" The answer of course is no, the sharp point on

the tip of the tail of the Death Adder is merely a modified scale, in no way connected with venom or venom apparatus. One loser of a wager told me in no uncertain terms that whilst he did not object to paying his bet with a friend, he felt aggrieved at having to accept the opinion of an arm-chair naturalist, as he had seen his dog "stabbed" by an adder's tail, and the dog died. What my informer had not seen was the adder biting the dog. Twice within a decade I have been asked for an explanation of the old-time saying "You don't know a hawk from a handsaw". That sounds rather extraordinary, A hawk! A saw! But wait—handsaw was the word, and the saying dates back to the palmy days of falconry when the term handsaw was a common corruption of the word heronsaw, meaning heron, the chief quarry of the falconers.



The name crayfish is generally reserved for our fresh-water species. The Fresh-water Crayfish, or Yabbie (*Euastacus serratus*), carries prominent pincers on its first walking legs, similar to those of the Sea Lobster of Europe.

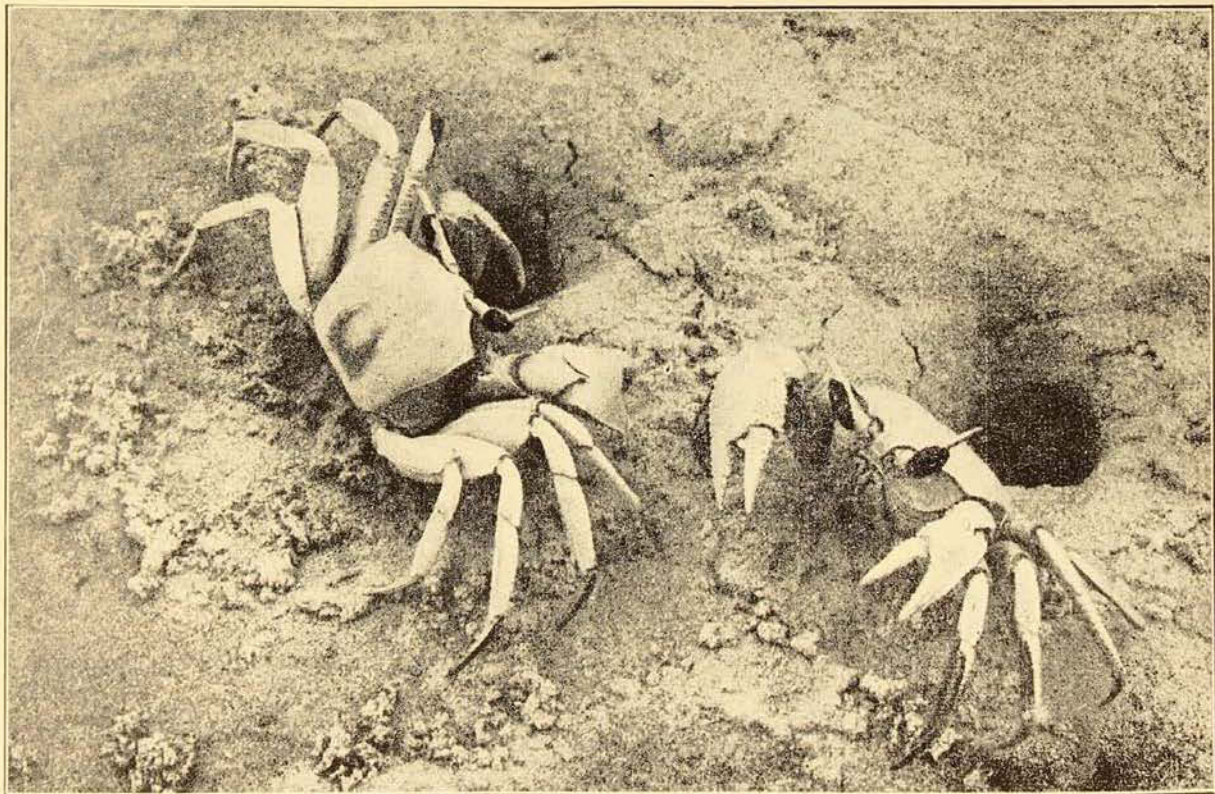
Photo.—L. White.

More correctly the saying should be "You don't know a hawk from a heron" and, believe me, there are people who don't. Another question put to me a few weeks ago by a young naturalist who hopes to be a poultry farmer dealt with the origin of the domestic fowl—no particular kind, just fowl. Strange to say it is a question nobody can dogmatize on, though investigations lead us to believe that one of the Asiatic jungle fowls was the great grandparent of all present-day types of domestic fowls. We believe that the jungle fowl was first domesticated in Burma some hundreds of years ago, but there is some evidence of this special breeding having been carried on in China—and there the matter rests.

A snap question put to me over the phone a few months ago was, "How many kinds of skeletons are there in the animal world?" It ran through my mind that there was the human skeleton, the spicules of sponges, the shell of a crayfish—no, that won't do; perhaps my enquirer

means there are as many kinds as there are animals; no, it can't be that because the jelly fishes have no skeletons; then it came like a flash—there are only two kinds—the endoskeleton which is the inside support of the body of vertebrates, and the exoskeleton, such as the outer covering of beetles, crabs, and similar creatures. It is extraordinary how many persons think that both goanna oil and mutton bird oil will penetrate glass. Yet we are asked time and again what kind of container can one keep goanna oil in, as it oozes out of a bottle. Of course it does not, but you can't convince some people.

Has a centipede one hundred legs? No, the great majority have less than thirty pairs; one might as well ask—has the millepede a thousand legs? It matters little so long as one does not ask which leg moves first. Which reminds me of the old rhyme: "A centipede was happy quite, until a toad in fun said pray, which leg moves after which? This raised her doubts to such a pitch, she fell exhausted



Crustaceans, beetles, and similar creatures have a hard outside covering which, besides being a protection, is also the skeleton; it is known as the exoskeleton. The skeleton of vertebrates, the inside support, is termed the endoskeleton. This illustration is of the White Sand Crab which speeds across the ocean beach like foam before the wind and pauses near his burrow to watch your movements.

in a ditch, not knowing how to run". As I write, two high school girls are in my room studying the skeleton of a very large Solomon Island frog as part of their biology course. During a general conversation relating to the characteristics of frogs and toads, one asked me for the scientific name of the "Lemon Sucker Frog". I had never heard of it. "What is it like?" I asked. "Oh, it's a tiny frog with round suckers on the tips of its fingers and toes and it is found clinging to lemons on trees." The answer was that the so-called lemon-sucker frog was one of the tree frogs of the genus *Hyla*, and the supposed suckers were merely climbing disks common to tree frogs, enabling them to climb smooth surfaces, even a window pane.

More than ninety per cent. of questions from schools are from children under thirteen years of age—and one small girl asked, "Why can't humans see at night as some animals can?" Simply because we have not that special arrangement or development of sensory cells, with their rods and cones, which enable nocturnal creatures to see at night. Added to this anatomical feature are the greatly expanding pupils of nocturnal animals such as may be observed with cats, certain lizards, and so on. Naturally this enlarged pupil allows more light to enter the eye, thereby reflecting the images of objects within the field of vision. Some persons can see better at night than others, and that is because of the development of rods or cones as the case may be. Often in such persons the pupil is more expansible and is affected by daylight or darkness more than is usual. If a nocturnal creature had some physical defect affecting both the expansion of the pupil, and the rod and cone cells, it would be as blind at night as we are. Of course no animal can see in total darkness, such as may be found deep down in a mine, but no night on the surface of the earth is totally dark. A ten years old boy asked, "How is it that the electric eel can store up enough voltage to produce a 399-

volt shock?" I don't know why he stated the 399 volts, but that matters not at all. The question has been asked many times, but no really satisfactory answer can be given. Although scientists are carrying out experiments they still confess almost complete ignorance as to how the electricity is produced by the eel, except to say that the battery is a living dynamo, in which special muscles produce the electricity by movement and friction. When visiting the Philadelphia Zoo in the year 1938, I was introduced to the electric eel in a large glass tank. The eel was about five feet in length. A medium power light globe was fixed to the top of a steel rod, and earthed by flex wire to the netting surrounding the tank. When the eel was touched by the rod, the globe flashed, but after a few demonstrations the current ran out, and the eel was left alone for the day so that it could recharge its batteries.

Several specimens of the so called "petrified caterpillar" have been sent to me during the last two years, these mostly having a peculiar kind of root growing from the head end. The entomologist informed me briefly that the creatures are not "petrified caterpillars". Actually a caterpillar becomes infected with a fungus, known as Vegetable Caterpillar Fungus. This grows within the caterpillar, eventually killing it, the complete creature becoming "fungus" which is rather woody in appearance. Later this fungus sends out its fruiting body, which is often mistaken for a root, the caterpillar then looking, and thought to be, petrified, whereas it is merely a fungus the shape of the caterpillar.

Yes! it is questions, questions, questions. Why has a rabbit a white tail? What is a fossil? Why do animals mate in the springtime? In my opening lines I said all questions are welcome, but I forgot the one and only nuisance—he or she who phones and says, "Can you tell me another name for an eagle, in four letters?" I succumb, as I also do cross word puzzles.

Museums in the Work of UNESCO

NOVEMBER was celebrated as UNESCO month in Australia, part of the time coinciding with the second General Assembly of UNESCO at Mexico City. One of the objects was to bring before as wide a public as possible the activities of UNESCO and its ultimate aim.

UNESCO (United Nations Educational Scientific and Cultural Organization) is a part of the world organization whose main object is to ensure that the peace of the world is securely maintained. Its task is to work through education to attack some of the primary causes of war, by persuading men to use their abilities for peace. In order to achieve this aim it operates in the fields of education, science, and all those artistic activities (such as music, literature, drama, and the pictorial arts) contributing to the culture of nations.

The part that museums can play in the general scheme of the organization is well set out in the following quotation from a report which was presented to the first meeting of UNESCO in Paris in 1946:

"Besides their primary rôle as collectors and preservers of what man does creatively, and of data he has gathered about his world, they have developed active secondary functions as educational and service agencies, capable of making a large contribution to civilization, for they demonstrate, teach and exemplify by direct visual and tangible means. Their opportunity in the modern world is to make the utmost use of their own means

and to draw to their use all the devices of the time. Theirs is another order of communication than words, and in their own field they cannot be challenged.

In one institution or another, in one place or another, almost everything has been tried that can give an indication of what museums can do in the way of service to mankind—on every level from the specialised scholar to the child. Growth in museums service now is largely a matter of communication among museum professionals, exchanging experiences, technical information, checking responses and results, stimulating one another by the clash of opinion and the stirring of suggestion. In this growth the Museums section can aid by serving as an international centre to collect and to distribute information, a mechanism for exchange of ideas and for aiding exchange of personnel. It will depend much on the counsel, co-operation and interest of the appropriate national and international groups, associations and societies concerned with its own professional field and with the varied fields it serves. In co-operation with the appropriate specialists, it will initiate when there is need, as there is urgent need in the case of checking the condition of scientific collections and the loss of museum equipment. It will exist to serve museums and museum professionals everywhere in their services to the arts and the sciences, and to general instruction and recreation, and to men and women of every kind, who care to use their resources of things and experts."

A.B.W.

RECENT visitors to the Australian Museum included Dr. G. H. H. Tate of the American Museum of Natural History, New York City, who is studying the distribution of the Australian mammalian

fauna, and Professor T. Levering, accompanied by Mrs. Levering, of Gothenburg, Sweden. Professor Levering is interested in algology and hopes to see a considerable part of our coastline.