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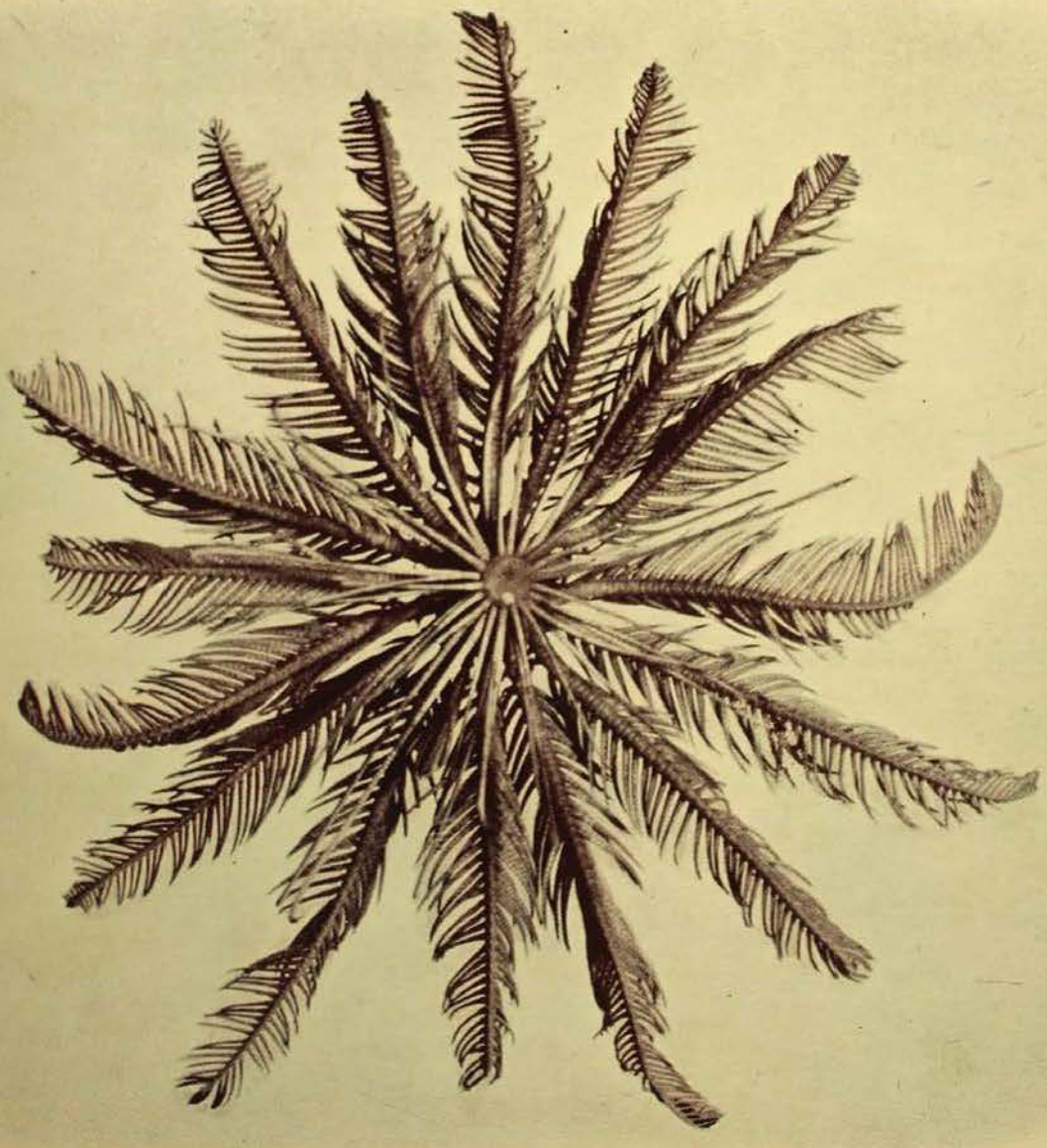

Feather Star.

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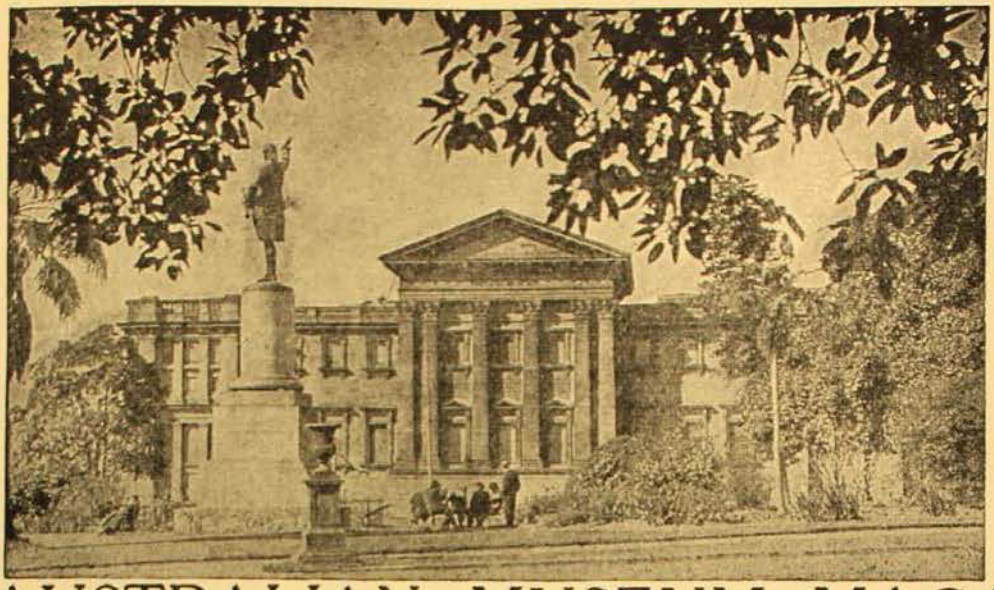

THE AUSTRALIAN MUSEUM MAGAZINE

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

• OUR FRONT COVER. The Feather Star, *Ptilometra mülleri*, has been photographed from the underside, so that the numerous, fine, whip-like cirri appear on the surface nearer to the camera. In the illustration the cirri lie above the feathery arms but, when the animal is in its natural habitat on the sea floor, they lie on the lower side of the body and serve to keep the animal raised above the fine, choking silt.

Feather Stars are related to the stalked Sea Lilies, belonging to the group Crinoidea. They show this relationship very clearly in the earlier part of their development, since they pass through a stalked stage and are attached to the sea-floor like the Sea Lilies. Later, they break away from this anchorage and swim about by waving motions of the feather-like arms.

This particular specimen was dredged from the bottom in Pittwater, an inlet of Broken Bay, north of Sydney, but Feather Stars are also found among boulders near the low water mark.

VOLUME VIII, NUMBER 12. JUNE–DECEMBER, 1945.

This striking Malangan incorporates a bird with a snake in its mouth as the central motive set in an open-work field, while the figure of the deceased person is carved at one end. It is three feet six inches long.

(See "The Art of Malangan in New Ireland".)

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Vol. VIII, No. 12. June-December, 1945.

The Art of Malangan in New Ireland

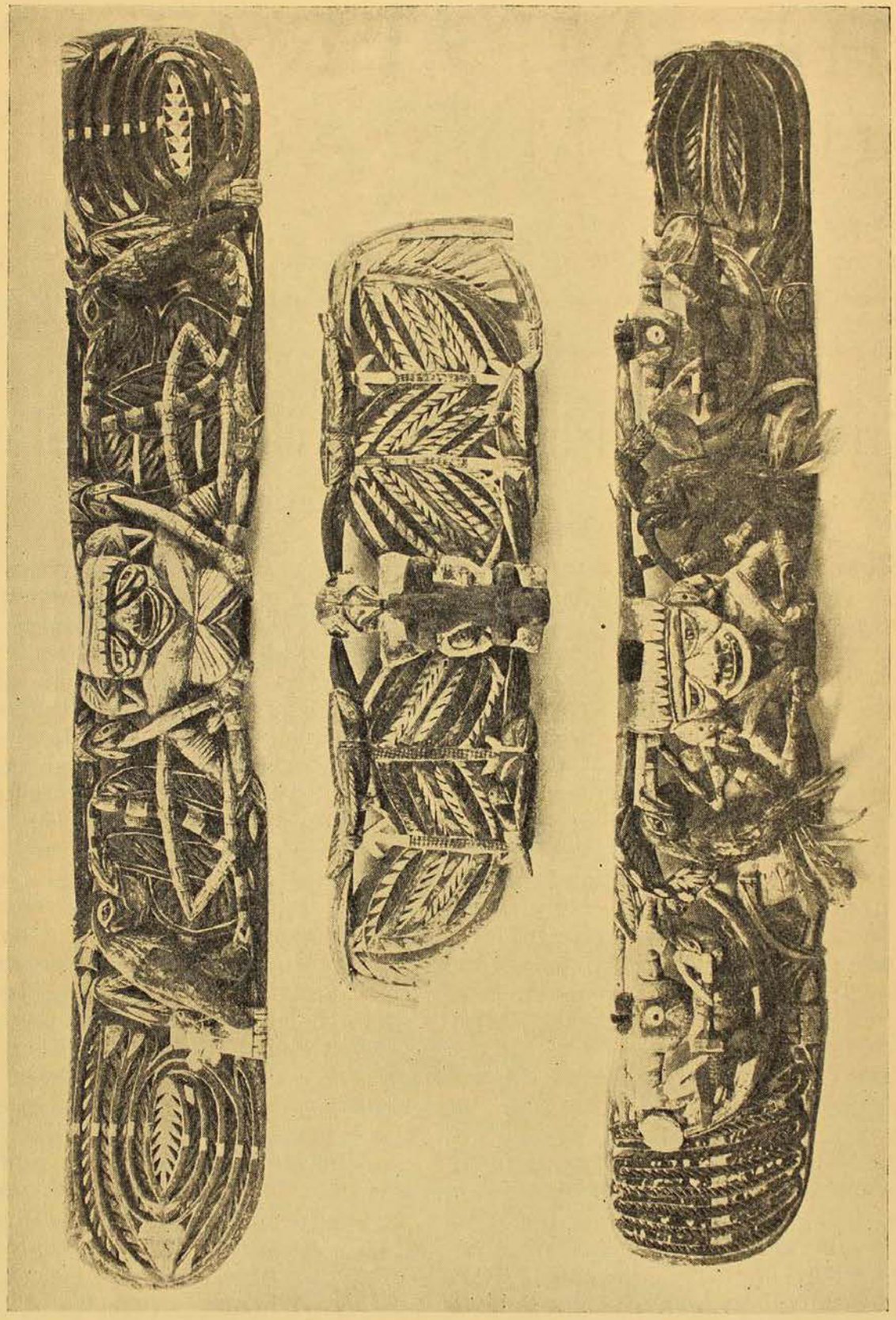
By FREDERICK D. McCARTHY

THE art of Melanesia is renowned for its remarkable range of design and technique and for its striking use of colour. Among the art forms of the Melanesian region of island communities, none is more interesting from these points of view and also for its grotesque mode of expression, than that of Malangan. It is restricted to the Gardner Islands and the adjacent coast of New Ireland in the Bismarck Archipelago. Legend says that Tabar Island, in the above group, is the place of origin of the cult. The Museum possesses a magnificent collection of about 140 Malangan and associated carvings, the great majority of which were acquired from Captain Farrell between 1883 and 1892.

To gain any understanding of the art, it will be necessary to peer into the religious and social life of the people, because Malangan is not only a series of wood carvings; it is a cycle of rites in which their display is associated with feasts, dances and exchanges of gifts, sanctioned by myths and legends. It is, fundamentally, a post-mourning ceremony in which the relatives of the deceased and the community as a whole express their sympathy and reverence. Malangan, in addition to playing an important part in the initiation ceremonies when the youths are shown the carvings and are told their meaning, is a powerful psychological and physical stimulus to both secular and sacred activities. By connecting art with the economic and social life, Malangan gives rise to the production of carvings and food and to the circulation of wealth. As a solemn cult of the dead, strangely enough, it provides much pleasure for the people upon whom, throughout the rites, are impressed the attributes of generosity and reciprocity.

It is apparent, from these remarks, that the cult of Malangan is the dominating feature, the very core of the life of the communities practising it, because it establishes a link between the past, the present and the future; in other words, it preserves the traditional life of the community. Faith in Malangan gives a person security in the belief that his death will be properly mourned and assures him that his spirit will not only go to the world of the dead, but will maintain its connection with his people through Malangan rites.

The art is also expressive of the social organization of Malangan communities. There are two main groups, or moieties, each of which has up to three bird totems. On Tabar Island the totems are the land eagle, sea-eagle and sea-gull for one

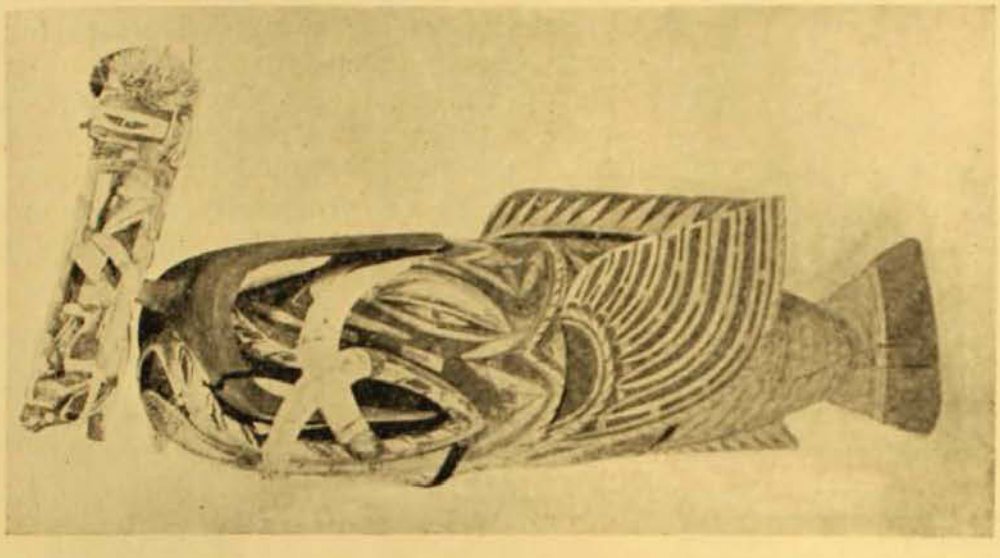


Symmetry is a feature of these three Malangan designs. In the left and right examples the bird is holding a snake's head in its mouth as though it intended to kill the reptile. There are three human figures in the left-hand carving, the upper and lower ones lack heads and are holding canoe paddles. Two are six feet and one is four feet long.

moiety and the fish-hawk, parrot and black scrub-hen for the other one. Preference is given to the eagle and fish-hawk, respectively, and members of a moiety speak affectionately of their totems as "my bird". The chief function of the moieties is to regulate marriage in so far as a man must marry a woman of the other moiety. In addition, each moiety consists of a number of clans which possess sacred totem-centres or *masili*—these are portions of a reef, beach or bush land, a prominent tree or rock, or an animal such as a shark. The *masili* are dwelling and resting places for the spirits of the dead, who are beneficial to the members of a clan and protect them from other evil spirits which wander about at night in lonely places. In Lesu, on the coast of New Ireland, at each *masili* on land there dwells a mythical pig, or a snake, and in the sea a shark, eternal animals friendly to clan members. The shark, for example, protects them from other sharks should they fall into the water. This relationship between the clansman and his totem is of a very intimate personal nature and more importance is attached to the clan totem than to the moiety totem. Curiously enough, all of these totems are of little economic value, a point which might well be contrasted with the important food fishes which form art motives and the hosts of the spirits of the dead in the southern Solomon Islands.*

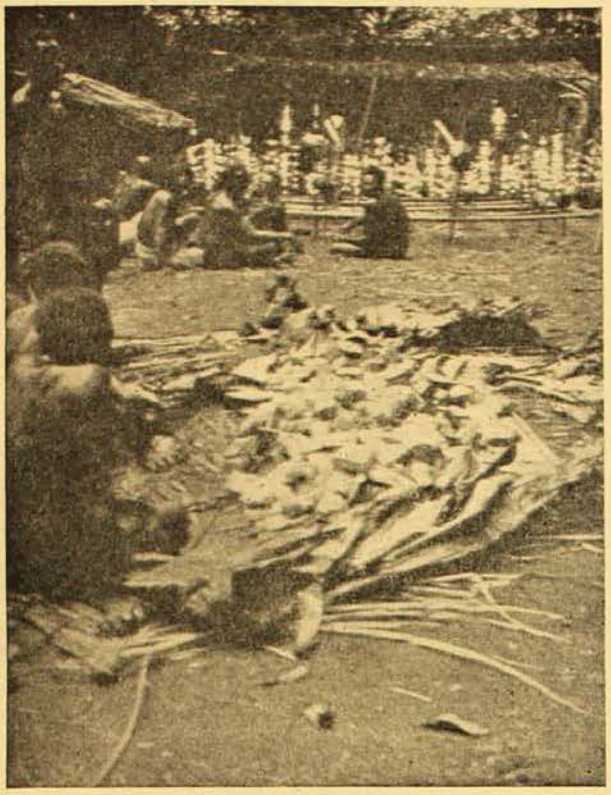
Such is, briefly, the background of the art. It is interesting to see, however, the way in which Malangan functions in a community. When a person dies, the burial rites are carried out immediately, and the body is either buried in, or cremated at, the *masili* of the clan concerned. Some time afterwards—perhaps a year or more will pass before sufficient wealth is available for the purpose—the deceased's family and relatives prepare for the Malangan rites. The extent of these depends upon the age and status of the individual and, in the case of an old man or woman dying, a number of villages will be involved. Several male relatives act as sponsors. Their most important task is to collect enough *tsera*, or shell-money, to buy a Malangan design and its associated dances and rites, to pay the selected carver and special dancers and to provide food for the numerous feasts which mark every stage of progress. The sponsors borrow the money from the family and relatives of the deceased.

Each Malangan design is named and the complete ownership of it is purchased and may be re-sold. Originally, each



A magnificent Malangan of the flying-fish type. It has boar's tusks on the side of the face, and a human figure with animal totems perched on the nose. The decorative treatment of the wings displays an effective use of simple motives. The figure is seven feet long.

* AUSTRALIAN MUSEUM MAGAZINE, VIII, 1944, pp. 156-157.



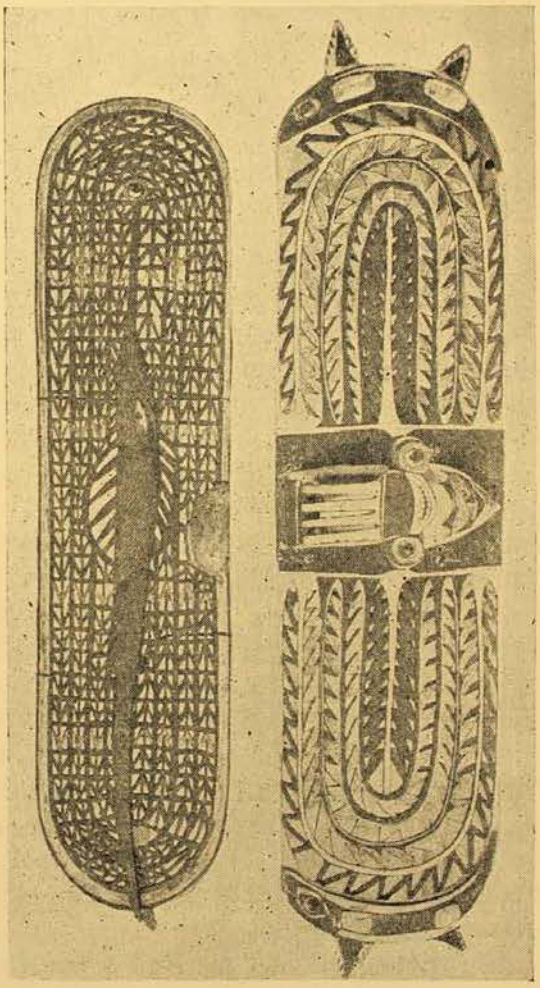
Sago-cakes placed on palm-leaves ready for distribution at a Malangan feast. Portion of the shrine is shown in the background. (Courtesy of the Australian National Research Council.)

design originated in a dream by a woman, there being few so created by the men. A suitable tree is selected in the forest and the men of the village are engaged to fell it and bring in the log which is placed in a small hut built in a secluded spot. An expert carver is then commissioned and, if the design is not familiar to him, one of the sponsors directs his skilled hands in the production of the Malangan. The carver works with stone and shell adzes and chisels. A large carving involves many months of work, during which a number of feasts are given to the craftsmen and the villagers.

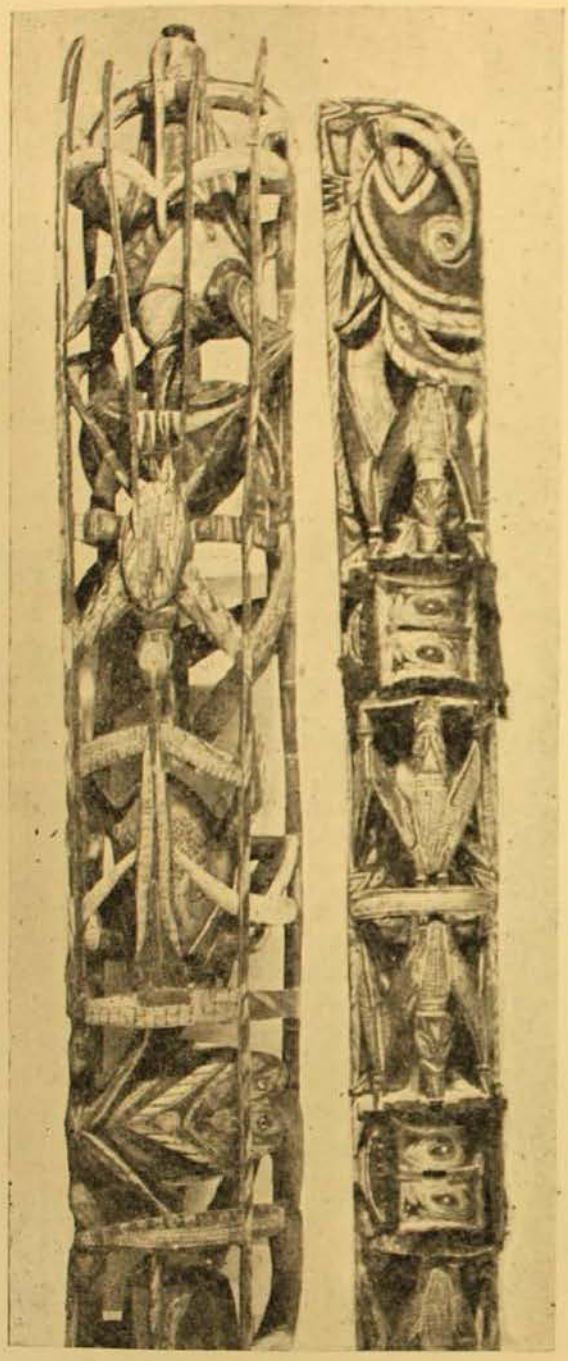
The completed but unpainted carving—there may be more than one for important individuals—is taken to a Malangan shrine. This is a portion, enclosed with high fences of bamboo and palm fronds, of the *masili* of the clan. The ground within is beautifully decorated with plants and flowers and stones in traditional patterns, on the lines of a neat garden with white sand pathways.

The Malangan are set up for display over the grave, or cremation site, of the deceased, usually at one end of the shrine. Here they remain for some time and the concluding rites are not carried out until the figures are painted. A series of elaborate dances, feasts and sacred rites, too long and detailed to describe here, conclude the ceremony. The Malangans may then be destroyed, or sold to a European collector. The striking masks used in these ceremonies will be described in a subsequent article.

In times of prosperity, a community Malangan may be held and, on these



Two small fretwork panels, probably used as decorative pieces at the shrine. In the left-hand one the fish is set in a field of V's in parallel lines, and in the right-hand one, a simple but well balanced design, rows of wavy and toothed lines fill the area between the gracefully curved fish at each end and the human face in the middle.



Portions of two open-work logs, eight to nine feet long, the most elaborate kind of Malangan. The left specimen has a boar's head at each end and between them a series of alternating birds and human faces. The other example is unusual in not incorporating human and snake motives. It has two boars' heads at each end, a crab in the middle, and a series of birds down the front.

occasions, a large number of carvings is prepared by the members of one or more villages.

The carvings vary considerably in design. They are cut out of one log and, though their appearance suggests jointing, they are always in one piece. The two principal kinds are fretwork panels bearing figures carved in high relief and open-work logs and posts embodying a number of motives. As in all Melanesian art, the human head, with or without the body, forms the central motive which is ingeniously combined with the bird totems of the moieties and the snake, pig, shark and bird totems of the clans. Occasionally, other animal motives of no ritual significance are incorporated, an interesting one being the domestic rooster.

Symmetry is the basic plan of a Malangan carving. Thus, on some of the fretwork panels in our collection, a central human figure is flanked by totemic animals nicely balanced on each side. In other examples, a central group of a bird and snake is set off with fretwork panels at each end. In every carving it is obvious that the carver has given careful attention to achieving a good composition in which repetition plays an important part. In the open-work logs, up to thirteen feet long, a boar's head at one end is balanced by a human head, on which is poised a bird, at the other end, and in between is a series of sharks, snakes and birds, or of human figures, with snakes in sinuous postures along the sides.

In detail, the hands and feet of the bird grip long serrated rods which often extend from end to end of the Malangan and also extend from the ears and nose and form tails of the human and animal figures. The snakes usually run from the ear or mouth of the human heads to a bird or shark, or they may be wound in and out of the ribs of the carving. The birds, too, often hold in their beak, or appear to be pecking, the snakes or sharks of the clans. Furthermore, the bird is frequently shown holding a shark by the tail, while its head either forms the tongue of a human head, or is held by another bird. Thus, in these complicated carvings, various devices are utilized to illustrate the link between the dead person, for whom the Malangan is made, and his clan and moiety totems. At the same time, the idea of a conflict between bird

Three standing Malangan about six feet high. The one on the left is a plain human figure. The massive central carving consists of a bird astride a fish within the open jaws of a shark, below which is a human head with a flying bird on the very large and protruding tongue. The one on the right is a human figure with a series of birds and fish down the front and snakes on the sides.

and snake or shark appears to be indicated.

All of these old carvings are painted in red, white and black, though yellow, which has taken the place of the black in modern work, is present on a few of them. A few show touches of blue. The colours are applied in bold masses, on which are painted in fine work a wide range of secondary decorative motives; among these, parallel, toothed and zig-zag lines, cross-hatching and panels of squares, diamonds and circles are notable in nicely contrasting colours. They are combined in small figures of innumerable shapes, including the lozenge, triangle, rectangle and circle. Some, however, resemble insects, others invertebrates and plants, but this similarity may not have been intended by the artists.

It is obvious that the artist has little freedom in Malangan art. His creative talent is hemmed in by almost absolute cultural restrictions, the evasion of which would mean no more commissions by sponsors in the future. The result is that

his sincerity is unquestionable; he accepts the traditional designs because they satisfied past generations of his people and his faith in them is beyond doubt. He and his people have practised and lived with Malangan and its art for generations; it has a deep and all-powerful influence upon his life and he has no desire to change it. This attitude is well illustrated by the following incident. When Miss Powdermaker, an anthropologist who investigated the Malangan culture, explained to the old men of Lesu that she was taking some Malangans back to her country where they would be exhibited in a museum, the old men very seriously urged her to tell her people that the Malangans were not just carved and painted pieces of wood; she must make her people understand all the work and wealth that had gone into the making of them, the large taro crops, the many pigs, all the *tsera*, the cooking for the feast and other essentials of the rites. These, said the old men of Lesu, are the important things to remember about Malangans.

John Gilbert: Centenary of His Death

THURSDAY, June 28, 1945, was the centenary of the death of John Gilbert. On that day representatives of scientific institutions, natural history societies and admirers of Gilbert's work attended St. James' Church, Sydney, to honour the memory of one who had contributed greatly to science, particularly to Australian ornithology.

The rector of St. James' Church, the Reverend E. J. Davidson, presided. A brief account of Gilbert's work was given by Mr. K. A. Hindwood, President of the Royal Australasian Ornithologists' Union; this was followed by an address by Mr. C. Price Conigrave, of the Royal Australian Historical Society. Mr. Conigrave in other years, as a Western Australian zoologist, camped in many of the localities in Western Australia and the Northern Territory that Gilbert had explored for birds. Wreaths of native flowers, of kinds that Gilbert must have often seen and admired during his wanderings in the lonely parts of the Australian bush, were then placed on the mural tablet in the church by Mrs. A. E. Watson.

The name of John Gilbert was practically unknown to most Australians until a few years ago. In 1938 Mr. A. H. Chisholm discovered, in English villages, a considerable number of letters which the naturalist-explorer wrote in Australia and, more important, the diary he kept on the Leichhardt expedition to Port Essington. These historical documents were in the possession of descendants of John Gould. Gilbert's diary, written in almost microscopic handwriting up to what must have been the hour of his death, now reposes in the Mitchell Library, Sydney. It forms the basis of A. H. Chisholm's fine book *Strange New World* in which we obtain in true perspective, after the passing of a century, the worth of Gilbert and his place in Australian history.

Gilbert came to Australia with the famous John Gould, the "father" of Australian ornithology, in 1838. During intervals of seven years he collected specimens of birds, mammals, reptiles, landshells and plants for Gould. He did not confine his activities only to the collecting of natural history material, but made detailed notes on the habits of the birds and mammals observed; many of these observations were used by Gould during the preparation of his magnificent folios dealing with Australian birds and mammals. In the words of A. H. Chisholm, Gilbert "tramped or rode thousands of miles throughout the strange new world of Australia. He saw the bush of various colonies and of many islands, at various seasons, in all its beauty and all its harshness. He discovered single-handed more new birds of this country than any-

The Gilbert Centenary. Mrs. A. E. Watson placing tributes of native flowers on the mural tablet in St. James' Church, Sydney, on June 28, 1945.

(Photo.—Courtesy of *The Sydney Morning Herald.*)

one before or since his time . . . He had the novel experience of seeing every one of our capital cities in its infancy. He knew many of the most distinguished men of the period. He was offered an important position in Van Diemen's Land and he held notable status in the Leichhardt expedition of 1844-5. His name has been given to various features of Queensland and to many examples of Australian fauna and flora" (*Strange New World,* introduction, p. v).

Gilbert joined the Leichhardt overland expedition to Port Essington in August, 1844; for some nine months he endured the hardships and dangers of that terrible journey. On the evening of June 28, 1845, when the party was camped in country near the Gulf of Carpentaria, hostile blacks attacked the explorers. "Gilbert sprang up at the first wild shout. He knew that sound only too well; the war-cry of bloodthirsty blacks. But in all his years of travelling in Australia—in all the time he had studied and sympathized with the aborigines—he had never known them to attack at night. Something had enraged these men.

"There was no time for reflection. Gilbert grabbed his gun and scrambled out of the tent. In that moment a spear flew through the half-light. By the greatest mischance, it struck Gilbert in the chest. He staggered and groaned; but, with a supreme effort, he kept his feet . . . Grasping the hilt of the spear with both hands, Gilbert pulled it from his breast and sank to the ground" (*Strange New World,* p. 267).

The following day, about 4 o'clock in the afternoon, Gilbert was buried beneath a large tree on which his companions, Phillips and Murphy, carved his name and age. A lonely spot, one of the loneliest in Australia, but a fitting last resting-place for a great naturalist and a pioneer in Australian field ornithology—a man to whom, because of his enthusiasm, ability and fearlessness, science owes so much, and to whom it is proud to honour the debt one hundred years after his death.

The date given on the mural tablet in St. James' Church (June 29, 1845) is the date of Gilbert's burial; he was killed on the evening of the previous day.

Design Among the Echinoderms

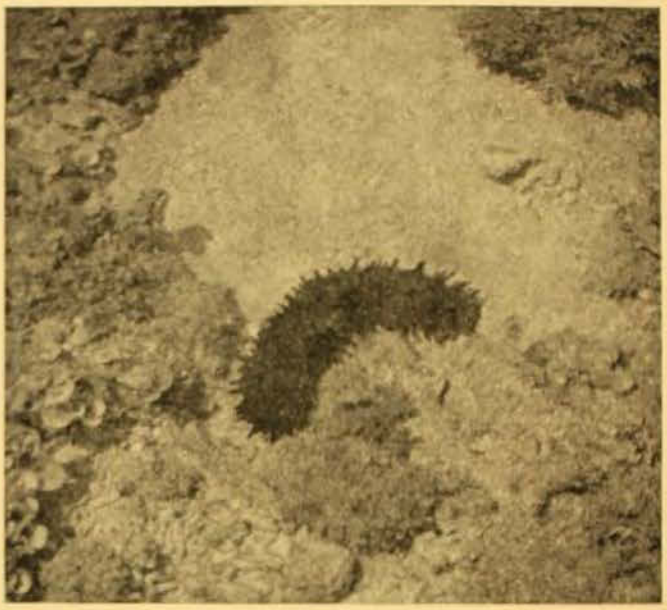
By ELIZABETH C. POPE, M.Sc.

THE name Echinoderm is perhaps not familiar to most people and calls to mind no visions of the animals to which it is applied. But translation of the word from the Greek into "Spiny-skinned Animals" makes us think of sea-urchins, or starfishes and all their relatives.

At first glance it might seem rather hard to find resemblances between some of the widely divergent members of this group. Who, for instance, would see at once the likenesses between the sausage-like Prickly Fish or Bêche-de-mer illustrated here and one of the conventional type of five-rayed sea-stars? And neither of these types shows much resemblance to the spine-covered, rounded sea-urchins or the feathery sea-lilies and feather-stars. All these types, nevertheless, have sufficient features in common for scientists to group them together in this one big group of the Animal Kingdom—the Echinodermata.

Australia is one of the finest collecting grounds in the world for spiny-skinned animals and literally hundreds of different kinds may be found between tide-marks along the coasts of the mainland. The Great Barrier Reef is the home of many more.

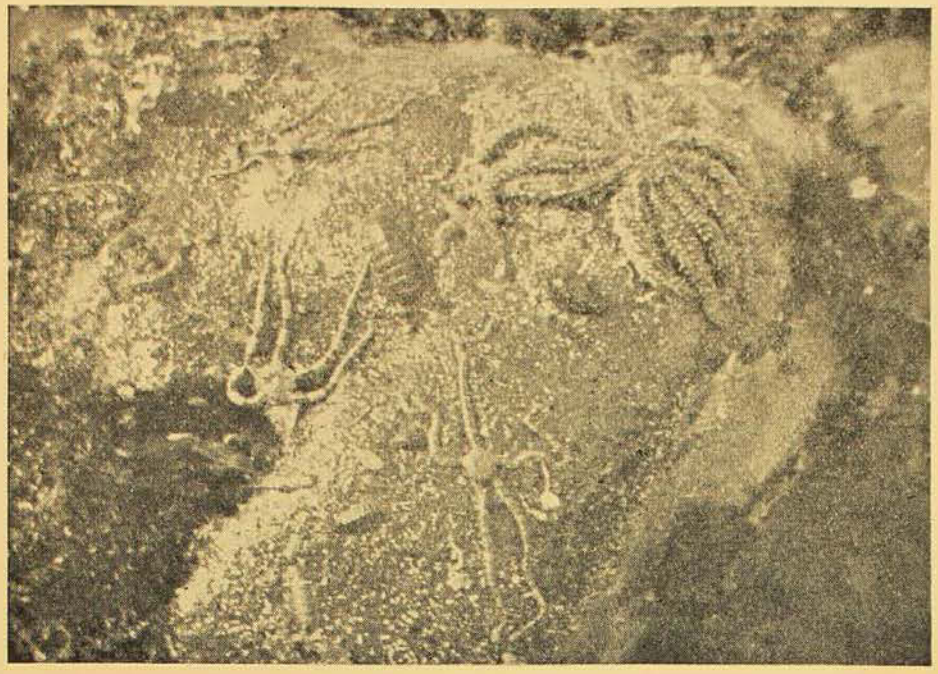
All the members of the group agree in having peculiar calcareous plates projecting through, or buried in, the skin. In addition, the internal organs of the body are arranged in a radial manner, often on a five-rayed plan. Quite often the five-rayed scheme of arrangement extends to structures seen on the outside of the body—in the number of arms, or the rows of tube-feet used by many forms for locomotion. However, the five-rayed plan is not invariably adopted by the starfishes or sea-stars. Often there are considerably more arms and rows of tube-feet than



Prickly Fish, or Bêche-de-Mer.
Photo.—W. Boardman.

this, as, for instance, in the Thorny Starfish, *Coscinasterias calamaria*, shown clinging to the rock in the top right-hand corner of the accompanying photograph. In sharp contrast to the Thorny Starfish are the two types of brittle stars which are hastily vacating the rock surface to avoid capture. The markedly striped one with the smooth arms is *Ophiarachnella ramsayi*; the other one, towards the centre of the foreground of the photograph, has spiny arms, is extremely common on the coast near Sydney and is known as *Ophionereis schayeri*. These types are not always easy to find, since they lurk on the lower sides of boulders and are only revealed when the stone is overturned, as in the picture.

All echinoderms are marine, and most are extremely intolerant of muddy conditions, so that only a few kinds can penetrate to the upper reaches of estuaries and the greater number of species are



Thorny Starfish and Brittle Stars on lower surface of rock at low tide.
Photo.—E. C. Pope.

taken where the water is fully saline and well aerated.

Luckily for the spiny-skinned animals, few types are of commercial value, so they live largely unmolested by man. Some Bêche-de-mer, however, are hunted and dried for export to China as trepang and some types of sea-urchin are regarded as a delicacy by Greeks and Italians, who crack open the hard, shelly test to get at the tasty gonads inside. In some countries certain species of starfishes rank as pests, because they cause trouble to the oyster-grower through their habit of pulling open the oyster shells and consuming the occupant. The oyster-growers therefore wage war on these predators and collect all the specimens they can off the oyster beds and carefully save any that are dredged up. When dried and broken up they make an excellent manure because of the lime and other manurial salts in them.

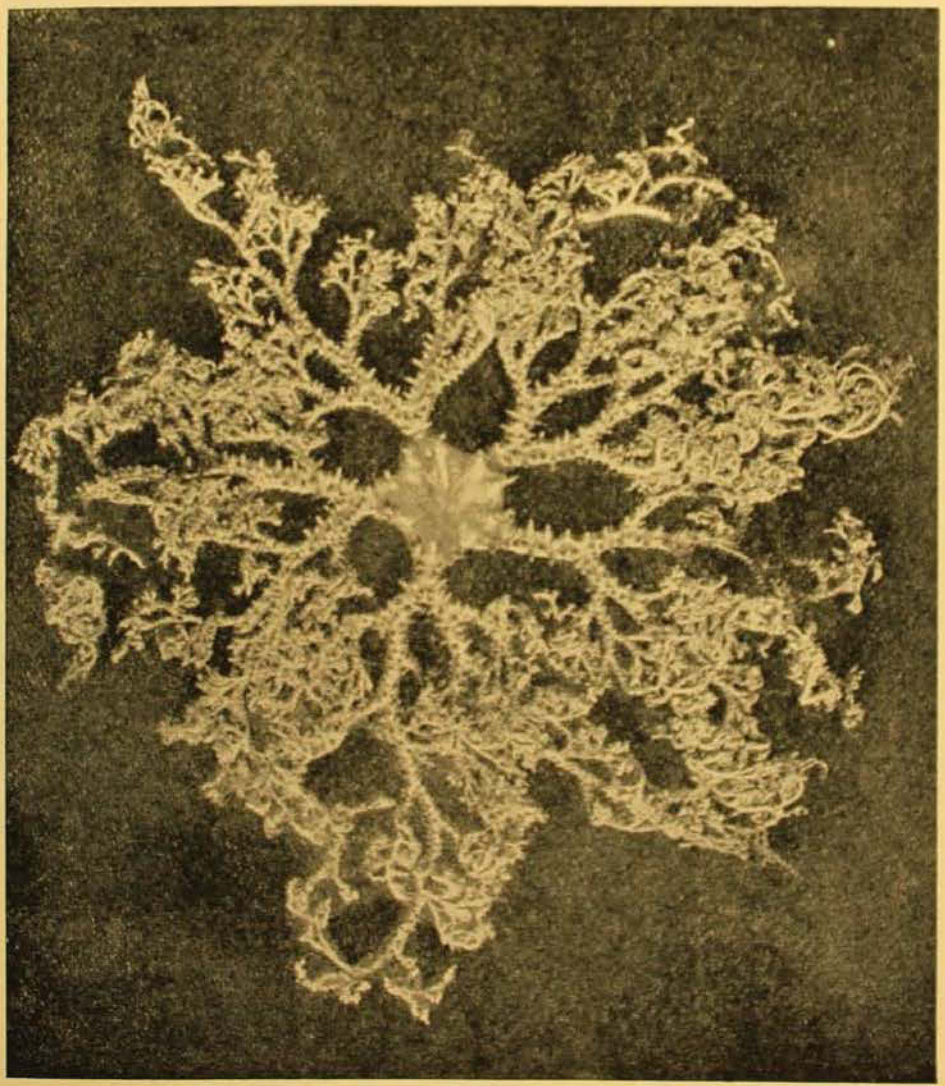
Before much was known of the habits of starfishes, fishermen used to chop up the captured marauders and throw the pieces back into the water, assuming that they had thus destroyed the pests by breaking them up. In reality they were assisting them to multiply their numbers,

Sea Lily.

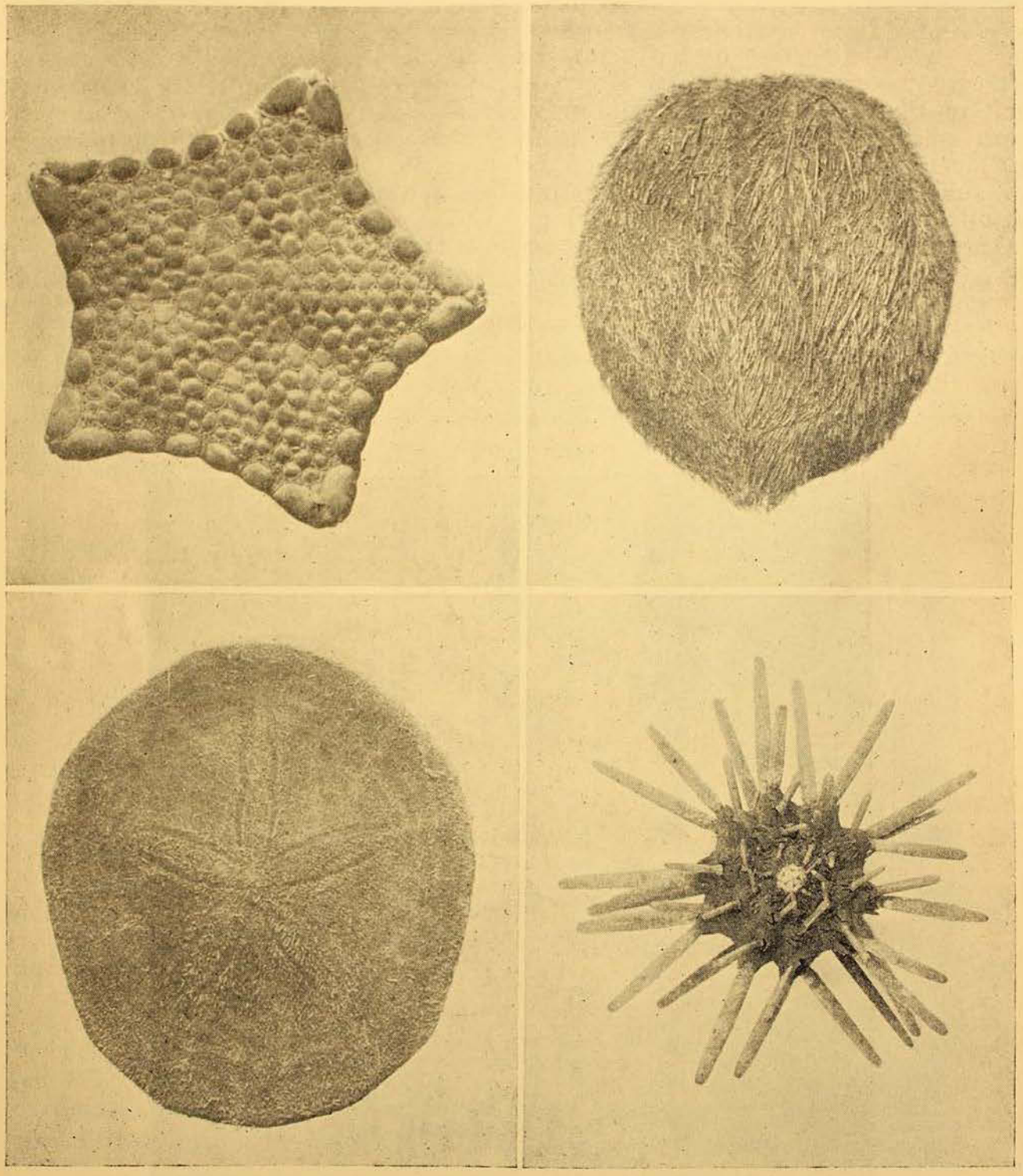
for most of the broken pieces were capable of regenerating and replacing the missing parts and growing into new individuals. In Australia one never hears complaints from oyster-growers about them. Here the chief oyster pests are little red worms and boring molluscs. Despite their relative unimportance to man, spiny-skinned animals play quite an important role in the economy of the sea, since many types are scavengers and eat up much of the debris of the sea floor.

On the cover of this magazine is seen one of the most dainty Australian echinoderms, the feather star, *Ptilometra mülleri*. Most often specimens are dredged up from the sea floor, but sometimes the lucky fossicker will find one among the loose boulders or rocks when there is an exceptionally low tide to lay bare the outer regions of the shore. Very careful handling is necessary to prevent the specimen's arms from "coming off in the hand".

A close relative of the feather-star type of echinoderm, despite its long "stalk", is the sea-lily here illustrated. This species is a common Australian one, *Oligometra thetidis*. The shore collector is not likely to find one because sea-lilies are denizens of the sea floor and are found in deeper waters, where the long stalk serves to raise its owner above the ooze and mud of the ocean bottom. The resemblance between the arms of the feather-star and the sea-lily may be appreciated by comparing the two illustrations. Like its relative, the sea-lily is also very brittle.



Gorgon's Head Brittle Star.

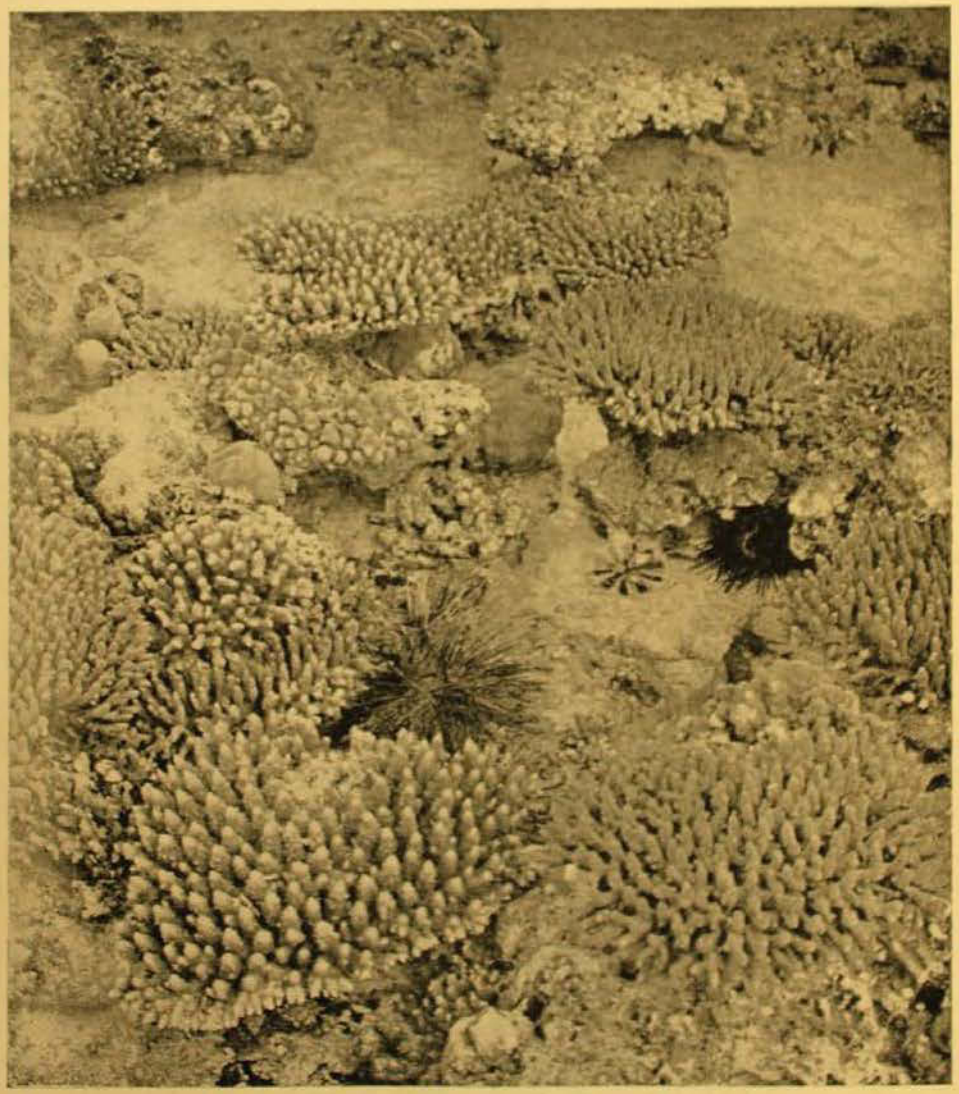


Above.—Left: Biscuit Starfish. Right: Heart Urchin.
Below.—Left: Sand Dollar Urchin. Right: Slate Pencil Urchin.

In the Barrier Reef coral pool illustrated here, four of the more conventional type of sea-urchin may be seen sheltering under ledges of coral. In the centre of the foreground two needle-spined urchins are huddled close together and the fineness and length of the jagged spines can be seen. Towards the right, at the back of this pool, two further kinds may be seen, while careful searching will disclose three of the arms of the famous Blue Linckia sea-star near the lower right-hand margin of the urchins' pool. The other two arms are tucked out of sight.

Both the pictures of echinoderms in their natural habitat fail to show the species to full advantage, but this is because their camouflage is of a rather high order of efficiency and they tend to melt into their surroundings.

Four rather unusual types of spiny-skinned animals are shown on the preceding page. The Biscuit Starfish, *Tosia australis*, on the top left-hand corner of the picture, is a particularly compact type of sea-star and the five arms are greatly reduced in length, till they appear merely as five small points jutting out from the main body-part of the animal. The closely packed plates of this dried specimen remind one of the cobble-stone streets of former days. The top right-hand photograph shows the Heart Urchin, *Breynia australasiae*, which is so common in the sand on the floor of the lagoon at Lord Howe Island, or in the mud and sand of



Sea Urchins in a coral rock-pool.

Photo.—Frank Hurley.

the bottom round the northern coastline of the mainland of Australia. The five-rayed plan of the internal organs betrays itself externally by the star-like pattern on the upper surface. Along the star-shaped grooves spines are not attached to the calcareous body shell or test; instead, rows of pores are seen, through which, when the animal is alive, the tube-feet project. Flattened, spatulate spines enable the Heart Urchin to bury itself rapidly in the sand should it become uncovered.

Somewhat more flattened than the Heart Urchin is the Sand Dollar Urchin, *Peronella lesueuri,* shown in the bottom left-hand picture. Again the five-rayed plan reveals itself in a petaloid pattern on the upper side of the animal. The spines, however, are so reduced in the Sand Dollar that they impart a fine "furry coat" to the animal, rather than an armour of spines.

The mouth opening is on the surface of the animal away from the camera in the three foregoing species, but in the Slate Pencil Urchin, *Phyllacanthus parvispinus* (bottom right-hand corner), the mouth may be seen in the centre of the body and also the five white teeth projecting through it. The teeth tip the five hard jaws which go to make up the structure known as Aristotle's lantern. This jaw structure is well developed in the Slate Pencil Urchin and may be viewed by cracking open the rounded test, when it will be found occupying a large portion of the internal cavity. By means of these jaws and sharp teeth the urchin cuts off and eats pieces of the algae which grow on the rocks where it makes its home, round about and below the low tide mark. The urchin's popular name is bestowed on it because of the appearance of the spines and also because they can be used to write on slate.

Among the more exotically shaped echinoderms is the Gorgon's Head Brittle Star, *Euryale aspera.* From the small central body-disk five arms project; each divides immediately into two, and later subdivides and goes on dividing in this way to form numerous, small, tendril-like branches. Each arm thus has the appearance of a many-branched tree. The tendril-like end-parts of the arms can be twined round the branches of alcyonarians or other similar marine growths and there the Brittle Star perches like a bird on a tree, extracting its food and oxygen from passing currents of water.

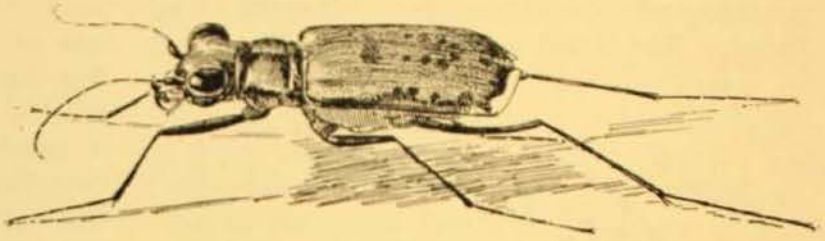
Different as these representatives of the Spiny-skinned animals are, they represent only a few of the delicate body shapes found among the members of this group. An exhibit has been set out in the Museum Galleries showing still more of the variations on this five-rayed body plan indulged in by the sea-stars and urchins and their relatives, and the reader, if interested, may see them for himself.

WITH regret we have to record the death of Mr. F. S. Mance, A.I.C.A., President of the Board of Trustees of this Museum, on 24th August. Mr. Mance had been an elective trustee since 1926, and in 1940 was appointed Crown Trustee. Since 1931 he had been President. His tenure was marked by a deep interest in this institution and an appreciation of its activities in all directions. He had familiarized himself with the Museum and had made it a point to know each member of the staff. He was a foundation member of the Art Galleries and Museums Association of Australia and New Zealand, and had assiduously fostered friendly relationships between this and kindred institutions in the Commonwealth and New Zealand. He had been a distinguished member of the Public Service of New South Wales, and had served a lifetime in the Department of Mines, in which he had risen to the post of Under-Secretary. He was closely identified with movements of a benevolent and philanthropic nature.

Australian Insects. XXV.

By KEITH C. McKEOWN, F.R.Z.S.

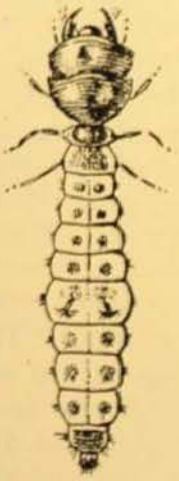
Coleoptera 2— The Tiger Beetles.*



The widely distributed Tiger Beetle (Cicindela semicincta) which inhabits the banks of streams and dams.

WITH that aptness which only genuine and spontaneously bestowed "popular" names possess, the insects of the family Cicindelidae have come to be known as "tiger beetles". No better name could have been chosen, for these beetles are the embodiment of voracity and cunning, ferocity and speed; they are truly the "tigers" of the open bushland spaces, where, like the lion of Scripture—sadly to mix the metaphor—they go about seeking whom they may devour among the inoffensive members of the insect world.

Formerly included in the family Carabidae, they were elevated—and rightly—to the status of a family name of their own, the Cicindelidae. The Tiger Beetles have typically large heads, held almost vertically to the line of the body, which are wider than the prothorax. The jaws are large, sickle-shaped and toothed, adapted for piercing and slashing. The eyes—essential equipment in an insect which depends wholly upon living prey—are large and prominent. The antennae are slender and are in constant movement while the hunt for prey is in progress. The legs, another beautiful adaptation to their mode of life, are long and slender. As might be assumed from their structure, these beetles are very active and swift runners and the majority are capable of sudden and rapid flight. They run about over open sandy spaces, in evident enjoyment of the bright sunlight on the hottest days, or upon the trunks of forest trees. Most of the species are strikingly coloured with bright and frequently metallic tints.

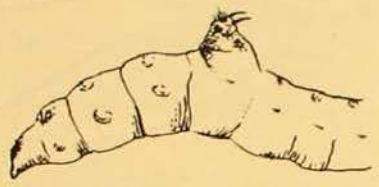


A typical Tiger Beetle larva showing the stoutly armoured forepart of the body, large head and projecting jaws.

Very little is known regarding the early lives and habits of our Australian species, beyond the fact that the larvae frequent the same localities as the adults and that they are ground-dwellers, living in burrows which extend for about a foot into the soil. The larva is an amazing creature with an enormous, stoutly armoured head and prothorax. The jaws are formidable and prominent, the abdomen soft and lacking in armament with, as its most remarkable feature, a pair of stout hooks arising from a swollen

* Illustrations by Nancy B. Adams.

pad or base situated on the back of the fifth segment. The broadened head and prothorax almost completely fill the entrance to the burrow and the strongly bent body allows the larva to keep in close contact with the walls of its retreat. The hooks, already mentioned, enable it to maintain such a firm grip that its unwilling withdrawal from its shaft is a matter of considerable difficulty and force. The food of the larva, like that



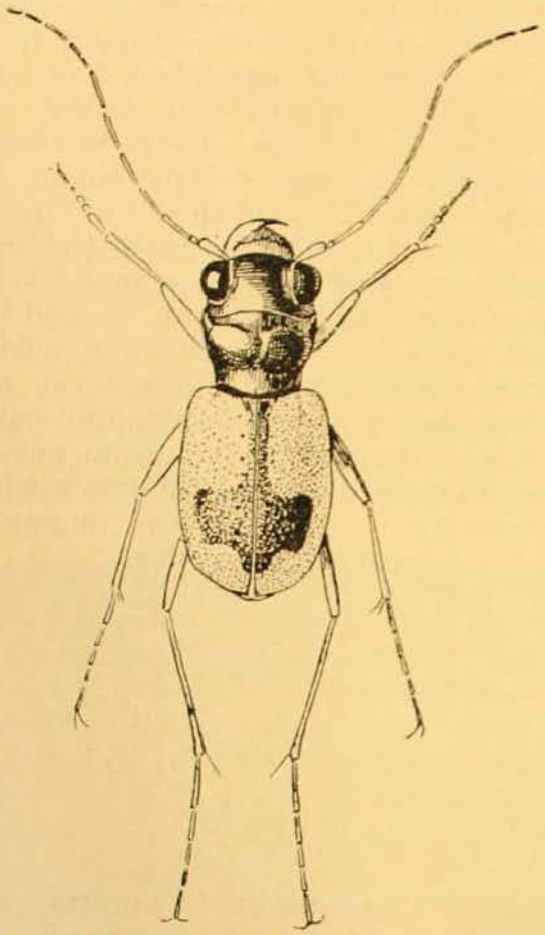
Abdomen of Tiger Beetle larva showing hooks on back.

of its parent, consists of such insects as may unwittingly wander near the mouth of the "tiger's den" and, when the prey is within reach, the hidden larva throws back its head with startling suddenness, seizes its victim in its long pointed jaws and as suddenly draws it within its retreat where it is devoured.

In view of the absence of details of the habits of our own species, it may aid local observers if I quote at some length a popular account of the life-history of the common European Tiger Beetle (*Cicindela campestris*), written by Edward Step in his book, "Marvels of Insect Life". He writes: "The female tiger-beetle is provided with a strong egg-laying drill, with which she bores a hole in suitable soil. Through the drill passes a single egg, which is left at the bottom of the hole. She repeats this process about fifty times. About a fortnight later the grub hatches out. It looks a misshapen little creature, the body being thrown into three curves. The head and adjoining fore body are broad and flat, forming a sort of shovel, and in addition to the six legs there are a couple of hooks on the upper side of the fifth segment of the hind-body. At first the little pit dug by his mother is sufficiently large to house him, and he is content with consolidating the walls and rounding the mouth. As he grows he enlarges the pit to suit the increase of his length and girth, and he keeps a circular area around the mouth clear of loose earth. In the operation of enlarging the shaft the shovel head comes in useful for carrying the surplus earth up to the surface, and the curves of the body and the hooks on the back make climbing easy, as well as enabling him with comfort to remain on watch at the top of the pit-shaft. In this position the flat head forms a stopper to the shaft, whilst the position of the eyes enables a good watch to be kept upon the surrounding area . . . No small animal walking carelessly over the ground could suspect any danger; so it is seized by the terrible jaws, and is then taken to the bottom of the pit to be demolished in private.

"The pit of this and most other species is vertical or at right angles to the surface, whether that surface is horizontal, perpendicular, or sloping . . . The shafts vary in depth according to species and the nature of the soil . . . When about to change its skin, the grub closes the mouth of its shaft and retires to the bottom until the moult has been effected. It then removes the stopper and makes the necessary widening to allow for its increase in size . . . In its third August it closes its burrow for the last time, and constructs an oblique oval chamber in the side of the shaft, wherein it changes to the pupal form. In the chrysalis the hooks of the back are still retained, and from the four segments in front of them leg-like processes are developed which serve to keep the chrysalis, as it lies back downward, from contact with the soil . . . This stage does not last long, for in the same autumn it has cast off its pupa-skin and emerged as a perfect tiger-beetle . . . But it does not at once venture into the outer world . . . Late in April or May it makes its appearance, and may then be seen flying vigorously over the heath in the sunshine." It must be remembered that the months referred to apply to the European seasons.

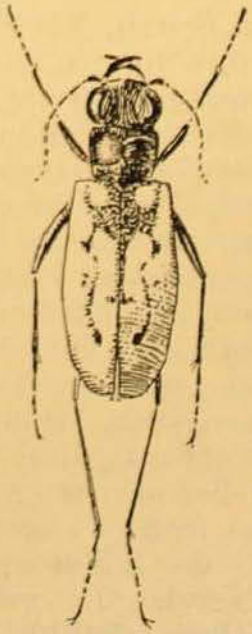
To turn to the Australian Tiger Beetles once again. Our land is not particularly



Megacephala crucigera, a fine yellow and black Tiger Beetle from Queensland and north Australia.

rich in species although some seventy have been described. The genus *Megacephala* contains our finest and most striking insects. *M. crucigera* Macleay (illustrated) has the dull yellow elytra, marked with a black cross, which in some lights shows a greenish lustre; the head and thorax are rich metallic green. It comes from Queensland and north Australia. *M. australis* Chaud., from Queensland, is a rich green with each elytron terminating in a rounded yellow blotch. *M. murchisoni* Fleut. is wholly vivid metallic green with yellow legs and antennae, while *M. greyana* Sloane is a rich blue; both are found in Western Australia. All the members of this genus have, as their name implies, enormous heads. *Distipsidera* includes a number of fairly large insects in which the black elytra are strikingly marked with yellow. The Queensland insect, *D. undulata* Westw. has a series of chevron-shaped yellow markings.

The cosmopolitan genus *Cicindela*—from which the family takes its name—includes the majority of our tiger beetles. *C. semicincta* Brullé is the commonest and most widely distributed Australian species, ranging practically throughout the continent. It is usually found on the banks of streams and waterholes and around excavated tanks or "dams" in the inland areas; here it runs actively about over the sand or mud, revelling in the hot sunshine. It is a rich velvety green or dark blue with a narrow white margin around the outer edge of the elytra. Its form is well shown in the illustration. One of the most striking members of this group is *C. ypsilon* Dejean, of a rich cream colour marked with coppery tints in a pattern considered to resemble the Greek letter y. This beetle races about over the sand of sea beaches in the North. Owing to its speed and alertness, it is very difficult to capture, but a handful of sand thrown at the speeding insect will usually flurry it and it may be secured before it has time to decide upon an avenue of escape. The colour of the beetle blends closely with that of the sand, the dark markings simulating irregularities in its surface, so that, when motionless, it is quite difficult to detect. Its place is largely taken by another



Cicindela ypsilon, the cream-coloured Tiger Beetle that inhabits sandy coastal reaches.

insect on New South Wales beaches; this is *C. albicans* Chaud., similar in colour to the preceding insect, but with many small coppery markings scattered over its elytra. The copper hue of the head and thorax is usually continued onto the base of the wing-covers in the form of a wide v-shaped patch. This is the insect referred to as *C. ypsilon* in an account of the Trial Bay district by A. Musgrave and G. P. Whitley in this Magazine (iv, 5, p. 150).

Mention must be made of the strange arboreal Tiger Beetle (*Tricondyla aptera* Oliv.), an insect, typical of the New Guinea fauna, which is sometimes found in North Queensland. Abandoning the life of its relatives, *Tricondyla* runs about over the tree trunks in the dense forests. A. R. Wallace has described how this beetle seems to prefer the trunk and branches to the foliage. He tells also of its habit of dodging swiftly round the tree trunk when approached and, as its intending captor walks round the tree, so does *Tricondyla* move in a spiral, keeping the tree trunk between it and its pursuer. The beetle is a strange looking creature, rather like a large black ant with bulging eyes and protruding jaws. It is black, tinged with iridescent purple, and, as its name tells, is completely wingless, trusting to its long legs to pursue its prey or escape its enemies.

At the August meeting of the Board of Trustees Mr. H. B. Mathews, B.A., was elected President in succession to the late Mr. F. S. Mance, whose death is mentioned elsewhere in this issue. Mr. Mathews' first association with the Australian Museum was in 1926.

Mr. T. Hodge-Smith, Mineralogist and Petrologist of this Museum, died suddenly on June 8, closing a service of twenty-four years. He had conducted many important researches, his papers being published principally in the publications of this Museum. It was due to his energies that the collections under his care were considerably expanded and enriched. Meteorites, especially, were his interest, and he spared no pains to trace reported falls. Chief amongst the exhibits installed in the mineralogical gallery during his régime were relief models of New South Wales, and the Sydney and Blue Mountains District, the limestone cave, and fluorescent minerals. He was an active member of various scientific societies, a foundation member of the Art Galleries and Museums Association of Australia and New Zealand, and had been President of the New South Wales Public Service Association.

Mr. H. J. Burrell, O.B.E., F.R.Z.S., C.M.Z.S., died on July 19. Mr. Harry Burrell was a Corresponding Member of this Museum which he had befriended for very many years. His name will ever be associated with his researches and observations upon the platypus which brought him world-wide recognition. He was author of *The Platypus* (Sydney, 1927) and co-author with A. S. Le Souëf and E. Le G. Troughton of *The Wild Animals of Australia* (London, 1926). Apart from these he had contributed to many journals. It was due to him that the only living platypus to be seen outside was successfully transported to the New York Zoological Gardens. His unique collection he presented to the Commonwealth; it is housed in the Commonwealth Institute of Anatomy at Canberra. His fine collection of photographic negatives he presented to the Australian Museum a few years ago.

Adventures on a Coral Isle

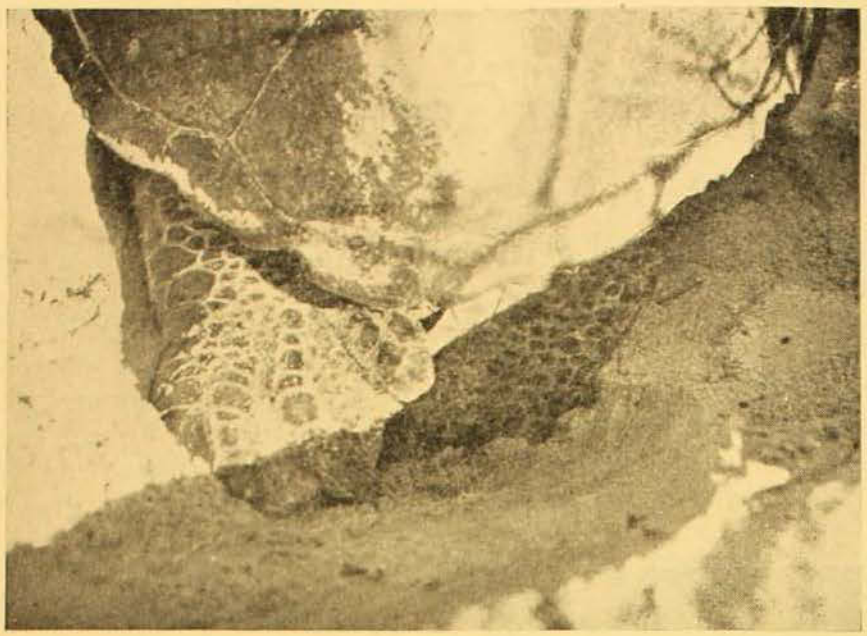
By FRANK A. McNEILL

THERE are many who have pined for a carefree holiday in the romantic tropics, but it has fallen to the lot of few to realize such a dream. It was this thought which first moved me to set down my own humble impressions and adventures in a series of articles commenced two issues back in this journal.

An egg-laying Green Turtle in a wallow-like excavation on a coral strand. The roots of beach shrubs at times cause trouble, but mostly these obstructions receive scant notice as the resolute female goes to work with strong sweeps of her large front flippers.
Flashlight Photo.—A. Embury.

Already I have endeavoured to transport my readers in fancy over a sunlit sea of azure and cobalt to a lonely island gem of the coral-built Capricorn Group, some thirty or so miles east from the little town of Gladstone on the Queensland coast. Some companions and I spent four wonderful weeks on this verdant fragment of land, shown on the maps as Nor'west Islet. The earlier articles have dealt more fully with its location and general features and also with much of the fauna of the surrounding coral reef that we crossed on foot at low tide on our way from the launch to the beach.

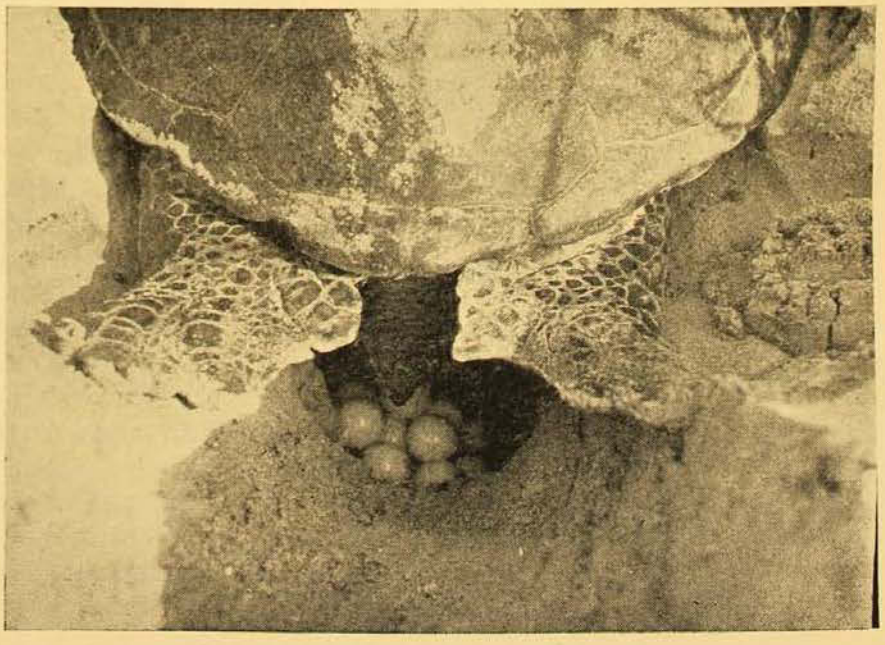
Late afternoon found us mounting a rather steep strand of white gravelly sand, eager to inspect the camp site. At the top, the thin drooping foliage of a line of Casuarinas (Oaks) hung curtain-like from low branches. Behind these sentinels of the beach were scattered Tournefortia trees, low and twisted of limb, their bunched thick leaves furry-silver on the undersides. Underfoot was a lush growth of creeping "Goat's-foot" Convolvulus, reaching to the shady outskirts of the stately Pisonia forest some thirty yards away. In a clearing between the beach and the big trees, sheltered by a large native fig, was the straggling low-roofed building we sought. It was the decaying remnants of a turtle-canning factory abandoned years before—a relic of one of those "mushroom" ventures which, somehow, have been able first to exploit and then to leave their blight on places which should receive protection as national assets. This sentiment was one to which we all subscribed around the camp-fire that first evening on Nor'west. Thankfully, though, the spot was recover-



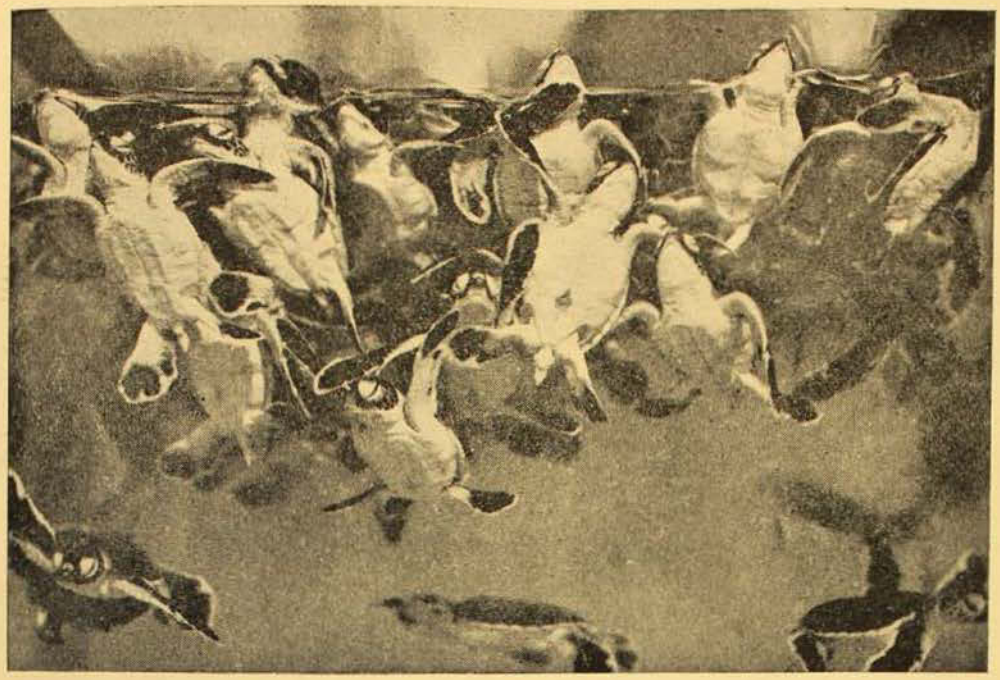
Having completed an initial large excavation in the sand, the egg-laying Green Turtle digs a secondary round hole (egg-shaft) in its floor with her short hind flippers.
Flashlight Photo.—A. Embury.

ing from the rude setback it had received. The fast-growing tropical vegetation was healing the scar. Turtles in the surrounding sea had multiplied and conditions generally had reverted almost to their former state. Our natural aversion, of course, did not make us baulk at using a fresh-water supply still retained in a large indifferently covered iron tank. This had been an important item in our planning and proved an asset in augmenting the meagre supply of drinking water carried from the mainland. An inspection of the tank showed us that at odd times it had claimed the lives of numbers of blundering sea birds, but our doctor member quickly adjusted this matter by adding the requisite amount of purifying chemical brought specially for the purpose.

I have purposely enlarged on the question of water to emphasize the general waterless nature of coral isles. On Nor'-west the only other uncertain sources of



Egg-shaft completed, the turtle straddles the cavity and commences to lay her eggs. Sometimes during this process the short flippers are curled protectingly around the hind-quarters. In order to secure this flashlight photo some of the sand had to be raked back from the rear of the hole.
Flashlight Photo.—A. Embury.



Company of young Green Turtles immediately after hatching; length three inches. The babies have very large front flippers with which they can right themselves immediately when turned on their backs. At birth their tenacity of life is astounding, and they are fully capable of fending for themselves in the sea.
Photo.—F. A. McNeill.

supply were the deep forks of the largest trees, where a minimum was retained for a limited time after rain. The shortage of water had its compensating aspect, for there was apparently insufficient to maintain a mosquito population which would detract from the charm of the warm nights. The daylight, too, was equally unspoilt by fly pests of any kind. These were pleasant first impressions and enlivened the one short day we took to set up house. We even installed a fuel stove, which later accommodated delectable dishes of soused fish and the prime cuts of steak from the moderate four Green Turtles slaughtered during our stay. Meantime our auxiliary launch was moored in a position conveniently close to the beach and the camp. Our skipper had brought her on the "full" of the tide over the coral reef from the anchorage off its edge. Now, with each fall of the tide, the little vessel rested upright on her keel supported by four stout poles lashed to the shrouds, port and starboard—"shored up", as the skipper termed it.

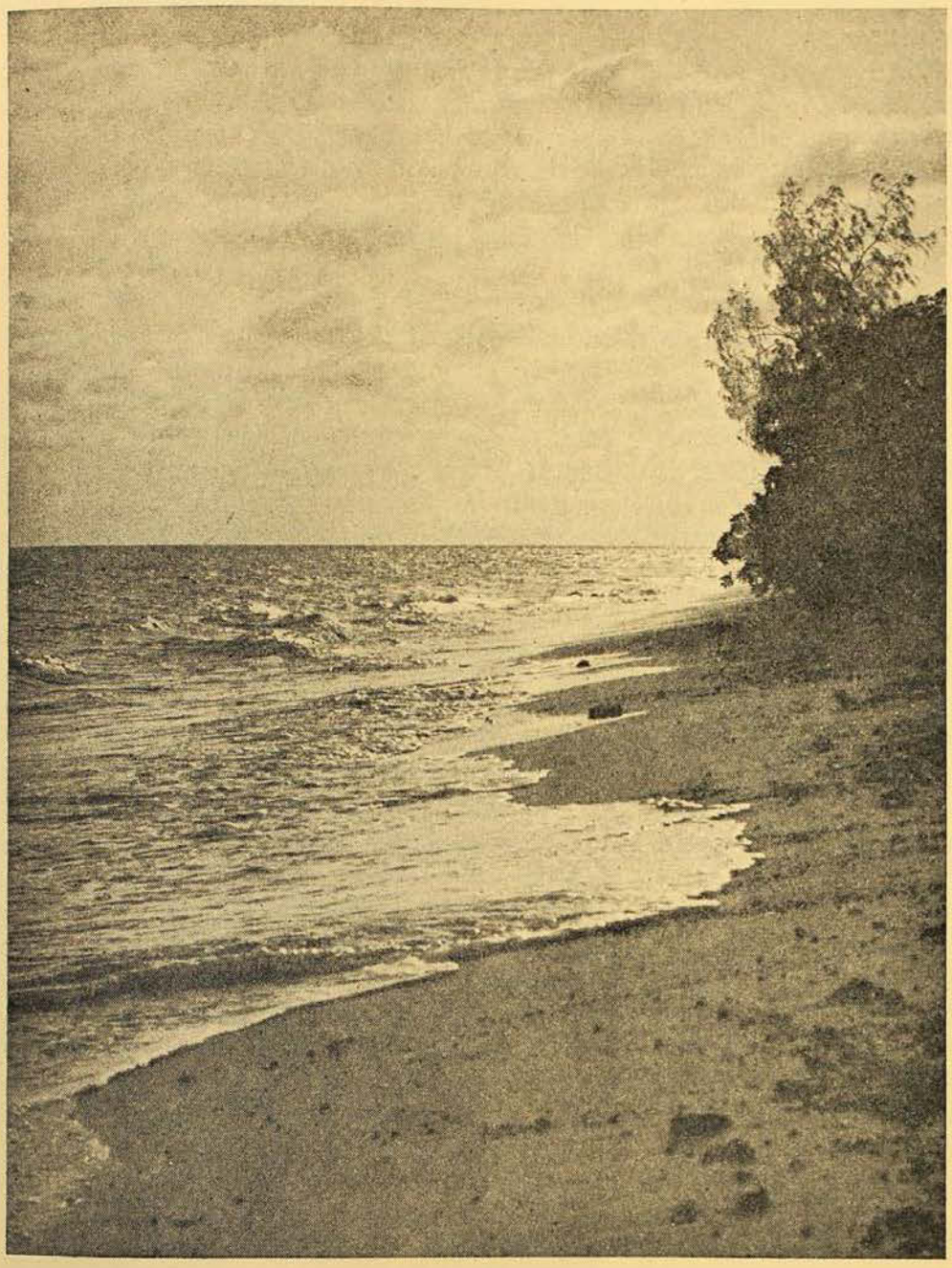
From then on we were free, and as delightfully free as humans could ever hope to be. There was no worry about the conventions of dress, for most of us went bare of body but for one small garment, occasionally added to by a second as a gesture to the cooler hours of the night. We indulged our bents as the fancy took us. Always it was easy to lie about and just talk where Time's only reminder was the rising and setting of the sun and the ebb and flow of the tide. We were tempted to laze in the limpid blue waters. Any over-expression of energy involved a mental struggle against a drowsy and delicious ease that might surely have come from that enchanted stem which fed the lotus eaters' dreams.

However, we had come for a real purpose to our 260-acre coral isle and were strong-willed enough to see the programme through. The nightly visits of numbers of egg-laying turtles first claimed our attention. We saw dozens of them on the suitable occasions when a high tide coincided with the fall of darkness—a darkness which came with the suddenness of the tropics. It was an enviable experience to stand on or silently pad over a beach which lay like a silver-white ribbon under the light of the full moon. The crowning thrill came when, from the lapping waters, emerged the massive, looming turtle forms, awkward and ponderous of motion. Over the moonlit coral sands they propelled their lumber-

The female Loggerhead Turtle is bulkier than the Green, drabber in colour, less docile and heavier in the head. Turned on its back in this fashion the adult is as incapable as the Green in righting itself again.
Photo.—F. A. McNeill.

ing bodies, lurching forward with strong sweeps of their big front flippers and leaving broad ridged tracks behind them. The upward climb was hard work for such ungainly creatures, with their two hundredweight or so of flesh, horn and bony frame. Ever and anon the climbers would stop in their tracks and heave loud sighs of exhaustion. The sound travelled clearly to us from full fifty feet away. It was necessary at first to view our quarry from a discreet distance. Too close an approach would have startled these timid creatures and caused them to beat a hasty retreat to the sea. To us initiates the whole scene seemed eerie and unreal—the brilliant moonlight, the quietly lapping waves and the low sounds made by the drag of those heavy ungainly forms moving slowly towards the gloom of the vegetation at the beach top. Nature seems in some perverse way to have neglected the turtles in her scheme of adaptive evolution, for it is hard to imagine another creature which is so totally unsuited for progression on land. This fact becomes more astounding still when it is realized that the females of the edible Green Turtle have to come ashore on egg-laying expeditions as many as seven times in the breeding season between November and February. The same probably also applies to the less abundant, thicker set and more drab-coloured Loggerhead Turtle of the same parts.

The dry sand above high water mark is the turtles' goal. Here the more or less level strand was found pitted with shallow excavations—mute evidence of the labours of innumerable egg-layers, coming and going nightly in almost endless procession. To watch and marvel at those labours was a fascinating pastime. They occupied fully two hours of relentless work and appeared to bring the turtles to the point of exhaustion. We were first attracted to the spectacle by a new swishing kind of sound coming to us on the still air. A quest by torch-light brought us to a spot where showers of sand were being energetically thrown into the air with each rhythmic backward sweep of the front flippers of a resolute female in a partially dug wallow-like hole. With methodical changes of position and intermittent rests, the turtle gradually deepened the excavation until her back was just below the level of the surrounding sand. Then with uncanny precision the short hind flippers were employed to scoop out a vertical egg-shaft at the



Coral strand. Evening and a full high tide are the conditions peculiarly suitable to the egg-laying turtles. The earlier the tide, the more the turtles that come ashore instinctively to face their tasks.
Photo.—A. Embury.

bottom of the hole. For a creature so rigid of body this feat was something truly remarkable. Those stubby limbs were used with the precision of human hands. Each in turn was thrust outstretched into the semi-damp sand. Then with a flexing of a short terminal joint the scooping operation was performed and the lifted sand flicked to the sides. The depth of the shaft equalled the extreme reach of the flippers which, during the digging, were deliberately pressed against the side walls to consolidate the sand grains as a precaution against collapse. Shaft completed, the industrious female straddled the opening and laid her eggs. These were round like golf balls, but rather larger, with soft parchment-like shells. At first they dropped slowly into the shaft, but the rate of laying soon increased to twenty or more a minute. The proceedings left us spellbound and we clustered closer around this intimate scene. Specimen eggs were reached for and examined. To our astonishment we found that they could actually be

bounced, so resilient was the shell. I remember that at this stage too we suddenly realized our presence had not in the least disturbed the turtle. It seems that once a female has commenced to dig, a natural urge takes complete control and all timidity is lost. The sum total of this particular turtle's effort was a clutch of one hundred and sixty. Egg totals mount with each expedition a female makes to the shore. At the beginning of the season they are as few as fifty, and at the end as many as two hundred eggs or slightly more are laid at a sitting. The smaller and longer-tailed male turtle never ventures ashore. He even leaves his mate to face her nocturnal labours alone. To return again to those eggs freshly laid in the shaft, I have still to record the final treatment they received. With meticulous care the turtle slowly covered them with sand shovelled in with her capable hind flippers, pressing down the grains as she worked. Then she shuffled clumsily about the big excavation, using her front flippers to some effect in pulling down more of the dry looser sand from the sides in order to hide the exact location of the eggs. Her labours finally completed, she wearily dragged her body up on to the level strand and journeyed slowly back to the sea. Thus closes one chapter in an interesting life drama of the tropics. The next is concerned with the young, which never know a mother's care. After nine to ten weeks these active two to three inch long babies escape from the eggs incubated in the sand. They struggle in their dozens to the surface and make their way unerringly seawards. To be born during the hours of daylight spells disaster, for the ever-watchful predatory gulls immediately swoop down and devour them. Only at night can they be certain of reaching the reef waters in safety, and they lose no time in getting there. It was a most unusual experience to come on little groups of them—ten to twenty at a time—waddling across the beach with a speed and activity that seemed to belong more to fully grown creatures than to newly born babes. Once in the sea, they seek places of hiding as best they can, but the hazards of that element are manifold, and you may be sure that few of the babies reach adult maturity. No wonder a kindly nature offsets these risks by providing the turtle with such bountiful clutches of eggs. The law of survival is an inexorable one, and will surely exact its price if an adequate balance is not preserved. This subject of the turtles has more than passing interest for me. I have always wanted to set down these first-hand impressions of mine on that coral islet of Nor'west. But the telling of the story has taken up most of my space. There are still many more adventures to record which, I hope, will form the matter of later instalments.

MR. W. J. PLOWDEN-WARDLAW recently presented to the Trustees of the Australian Museum a valuable synoptic collection of British Columbian bird-skins. There are few species unrepresented among the total of two hundred and seventy-eight and nearly eight hundred skins. They are in good condition with complete data and will be invaluable for reference purposes. Most of the specimens were personally collected by Mr. Plowden-Wardlaw during the years 1940 and 1941.

Some Butterflies of Australia and the Pacific

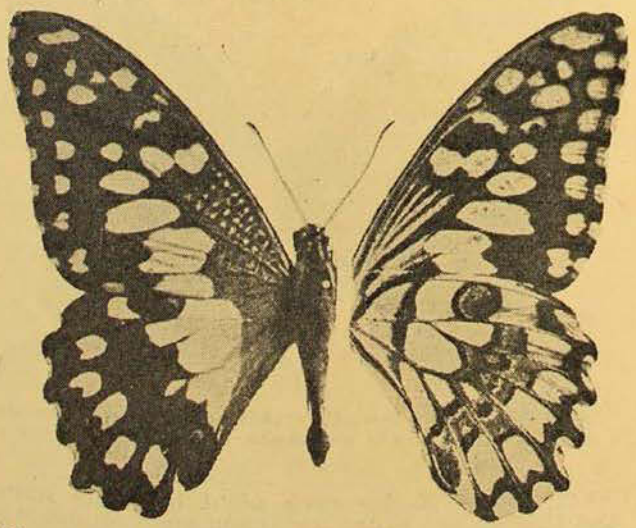
The Swallowtails—II.

By A. MUSGRAVE

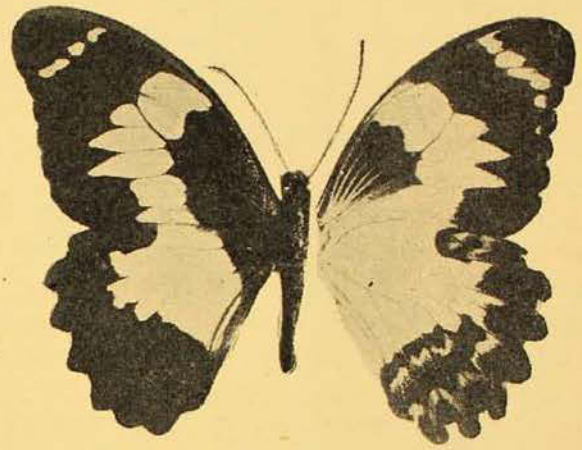
IN the previous article of this series we considered the first section of the Fluted Papilios, The Mimics of the Danaid Butterflies. In the present contribution we are concerned with certain forms of the second section.

2. *The Non-mimetic Forms and Mimics of the* Aristolochia *Papilios* (*Birdwing Butterflies*).—Six groups of Papilios are included here. In the Indo-Australian forms the body has no white dots, and no white spots are present at the base of the wings on the underside. In only a few species are the males mimetic, while the females of a number of species occur in several colour forms (polymorphic). We are here only concerned with five of these species-groups.

The *demoleus*-group, based on *P. demoleus* Linné, includes forms which range from Africa to India and the Indo-Australian region. A subspecies, which ranges over Australia, but which does not occur in Tasmania, is *sthenelus* Macleay,



The Chequered Swallowtail, Papilio demoleus sthenelus, has a wide range over Australia.

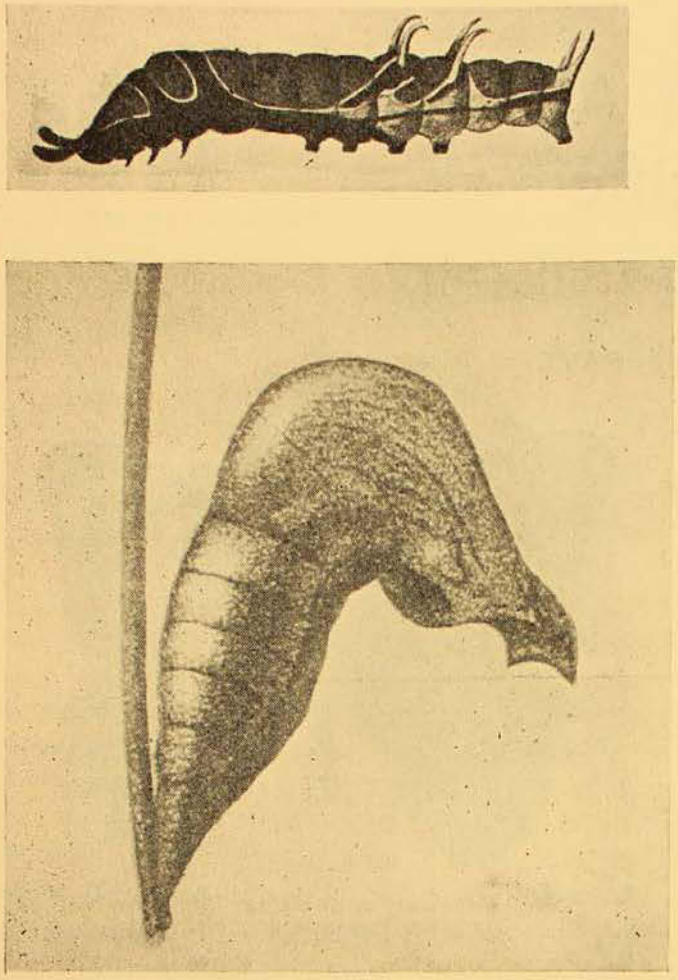


Papilio euchenor, a familiar Swallowtail of the Papuan region.

the Chequered Swallowtail. The adult male is brown-black on the upperside with many pale-yellow spots, some of which form a continuous band near the base of the hindwing. A round black spot partly circled with blue is present near the foreborder of the hindwing, while a red spot is present at the anal angle of the same wing. The underside is paler with yellow streaks at the base of the forewing, while the hindwing has the veins broadly blackened at their extremities and a series of ochreous spots bordered with blue and black about the middle of the wing. The female resembles the male in coloration. The life-history has been described by Dr. Waterhouse, who records the foodplants of the larvae as citrus and Salvia.

A subspecies *novoguineensis* Rothschild occurs on the south coast of British New Guinea (Papua) and closely resembles the Australian form.

Associated with the *demoleus*-group is *P. euchenor* Guérin-Méneville, which is



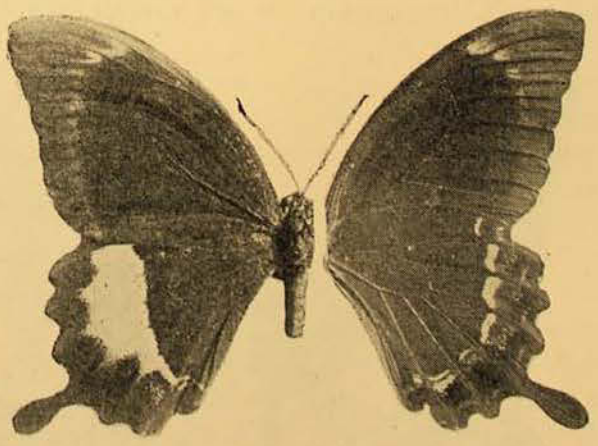
Papilio euchenor, larva and pupa.
(After Carl Ribbe.)

represented by a number of subspecies or varieties ranging from the Aru and Key Islands through New Guinea, New Britain, New Ireland, Duke of York Island to Woodlark Island.

The typical form, which is distributed all over New Guinea, has the body pale-yellow on the underside and dark brown on the upperside. In the *male* the dark-brown forewings bear a large pale-yellow spot at the apex of the cell near which is a discal band of five large pale-yellow spots and a subapical band of three small spots; on the hindwing a large yellow area extends from the costal border almost to the hind margin; the inner margin of this area is straight, but its outer edges are very irregular. Small yellow spots occur on the outer margin (termen) of each wing. The underside resembles the upperside, but there are more spots in the subapical area of the forewing, and in the hindwing the yellow central area extends to the base. Beyond this area are four ochreous yellow sub-marginal spots, one near the costal margin, the remainder posterior, and, situated between them and the yellow area, are some blue spots. In the female the spots are paler. The larva feeds on *Citrus,* and the life-history has been described and figured by Carl Ribbe,[1] who has also similarly dealt with other New Guinea butterflies.

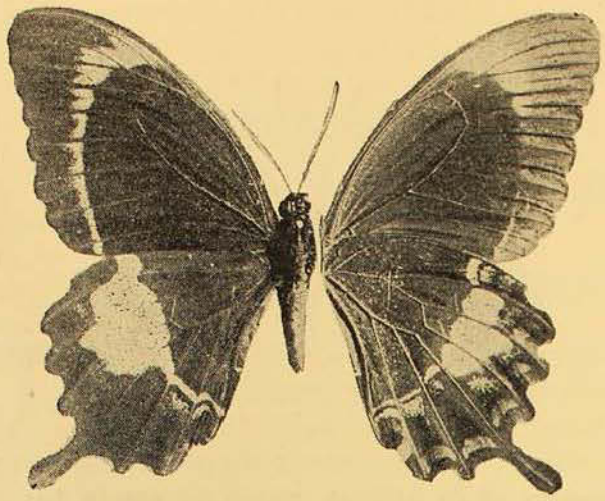
The *helenus*-group, as defined by Jordan, includes forms which are usually tailed and in which the sexes are similar. The body is black, but white spots are present on the head and thorax, while white markings may occur on the underside of the abdomen. In the female the abdomen may be yellow on the upperside and black on the underside. In the male the forewing is black, and a white transverse or oblique band is usually present; the hindwing is also black, with white or greyish-blue discal area or band. The species of this group do not mimic other forms, though the races of *P. canopus* resemble the Euploeids of the same districts.

Papilio fuscus Goeze, the Brown Swallowtail, and its many subspecies, ranges from the Andaman Islands through Borneo, Celebes, the Moluccas, Kei and Aru Islands, New Guinea and



The Brown Swallowtail, Papilio fuscus indicatus, a male example from New Guinea.

[1] C. Ribbe: Einige noch nicht bekannte Raupen und Puppen von Schmetterlingen aus dem deutschen Schutzgebiet in der Südsee. *Deutsch. Ent. Zeitschr., "Iris"*, Dresden, viii, 1895, Heft 1, 105-115, pls. i-iii.

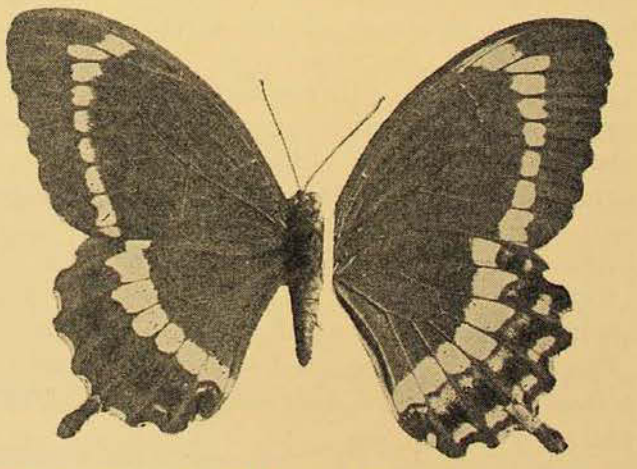


The Australian subspecies of the Brown Swallowtail, Papilio fuscus capaneus, extends from Cape York to Brisbane. The specimen figured is from the Lower Mulgrave River, Q.

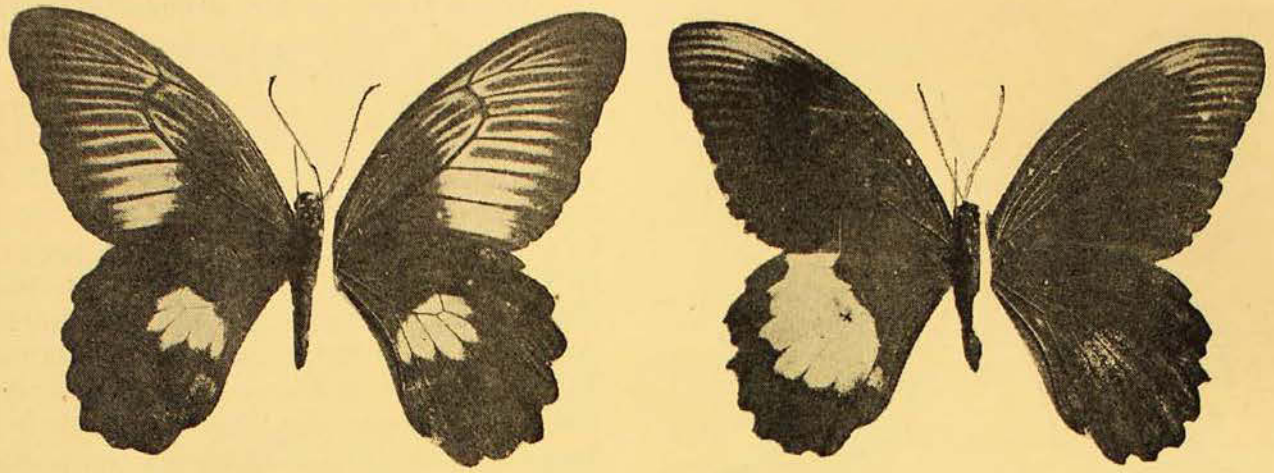
adjacent islands, the Bismarck Archipelago, Solomon Islands and Torres Strait to North Australia. *P. fuscus* subsp. *indicatus* Butler occurs in British New Guinea, the D'Entrecasteaux Group, Woodlark Island, Louisiade Archipelago, and the islands of Darnley, Murray, Banks and Thursday in Torres Strait. This race is darker than the more southern race, with the pale bands of the fore- and hindwing narrower and less distinct, the orange spots are smaller and not so well defined. *P. fuscus* subsp. *capaneus* Westwood ranges from Cape York to Brisbane, where, in the southern limit of its range, it is rare. The male is dark brown on the upperside with a pale band of spots on the forewing; a similar but broader band, near which are orange spots, occurs on the hindwing, which has a short tail. The markings on the underside resemble those of the upper surface, but orange spots are present in every space in the outer margin of the hindwing. The female resembles the male in the colour markings, though the band of spots on the forewing is larger. The life-history has been described by Dr. Waterhouse. The foodplant is *Citrus* and certain native plants.

Papilio canopus Westwood occurs in North Australia at Darwin, Daly River and Melville Island. This butterfly is regarded as a subspecies of *P. fuscus* by Dr. Waterhouse in his *What Butterfly is That?*, but Bryk, in the *Lepidopterorum Catalogus*, regards it as a distinct species and places *P. hypsicles* Hewitson, from the New Hebrides, as one of the many varieties of it. This last-named is also cited by Dr. Waterhouse as very similar to *canopus*. Other races of *canopus* occur in the islands in the Arafura Sea to the north of Australia, Sumba, Sumbawa, Alor, Timor, Wetter, Roma and Dammer. In *canopus* the fore- and hindwings in both sexes have a white or yellow band. In some of the tailless forms the band on the forewing is reduced to a few subapical spots as in *sumbanus* Rothschild, while the band on the hindwing may be also reduced. In the typical form *canopus* from Australia the spots in the band of the forewing are larger in front than at the centre and the spot in the subcostal fork is longer than the spots on either side of it. In *hypsicles*, on the other hand, they are of the same length. In the hindwing the abdominal margin is shorter than in *hypsicles*, so that the yellow spots of the discal band and the subcostal spots are closer to one another. The tail is spatulate in both species. The larvae and pupae of *canopus* and of *P. fuscus capaneus* are very similar to one another according to F. P. Dodd, who is quoted by Dr. Waterhouse.

Papilio polytes Linné is represented by various subspecies from China to the Moluccas. It is regarded as being a typi-



The Canopus Swallowtail, Papilio canopus, occurs in North Australia, the locality of the typical subspecies.



Papilio ambrax egipius is the Australian subspecies of P. ambrax which occurs in the Papuan region. The male (right) is from the Herbert River, N. Queensland, the female (left) from the Mulgrave River.

cal western representative of various eastern species, and so we read of these forms being "included in the *polytes*-group". In form and colour this butterfly resembles a small example of *P. aegeus* (which we consider later), and, like it, is tailless. The species is remarkable in having three distinct forms of females, one resembling the male in colour pattern, the other two mimicking two different types of butterflies.

Closely allied to *polytes* is *P. ambrax* Boisduval, which occurs in New Guinea, Waigeu, Mysol, Salwatty and Aru Island, while a subspecies or race, *egipius* Miskin, ranges from the Cairns district to Mackay, Queensland. The male, on the upperside, is black, with white streaks at the apex of the forewing, while the hindwing has a central white area with several red spots on the inner angle. The underside resembles the upperside, but in the hindwing there is no central white spot and red spots occur in all the outer marginal spaces. The female somewhat resembles the male, but the white streaks on the brownish forewing are more pronounced and, below the cell, broaden into whitish patches; in the brownish hindwing the white spot is smaller in size than in the male, and the red spots occur in every space. The underside resembles the upperside. The life-history has been described, the larva feeding on Citrus and probably on similar native plants.

Papilio phestus Guérin-Méneville is a near ally to the forms of *ambrax* and is represented by (1) the typical race, *phestus*, from New Ireland (Neu Mecklenburg) and New Hanover, (2) a race, *parkinsoni* Honrath, from New Britain (Neu-Pommern), with a diminutive form, *minor* Honrath, and (3) a race, *minusculus* Ribbe, from the northern islands only of the Solomons Group. The male of *P. phestus* resembles the male of *P. ambrax*, but in the hindwing the upperside bears a large red spot in the anal area, missing or weakly suggested in *ambrax*, while on the underside there are always present chalky-white discal spots. In the female the large white marginal spots which are so conspicuous a feature on the forewings of the female *ambrax* are wanting, though faint stripes may be present. In the hindwing the white area is much smaller than the corresponding area in *ambrax*.

In the typical race *phestus* the male has in the creamy-white band on the hindwing the 4th spot somewhat longer than the remainder and on the underside there are five or six white spots of which the 3rd is the longest.

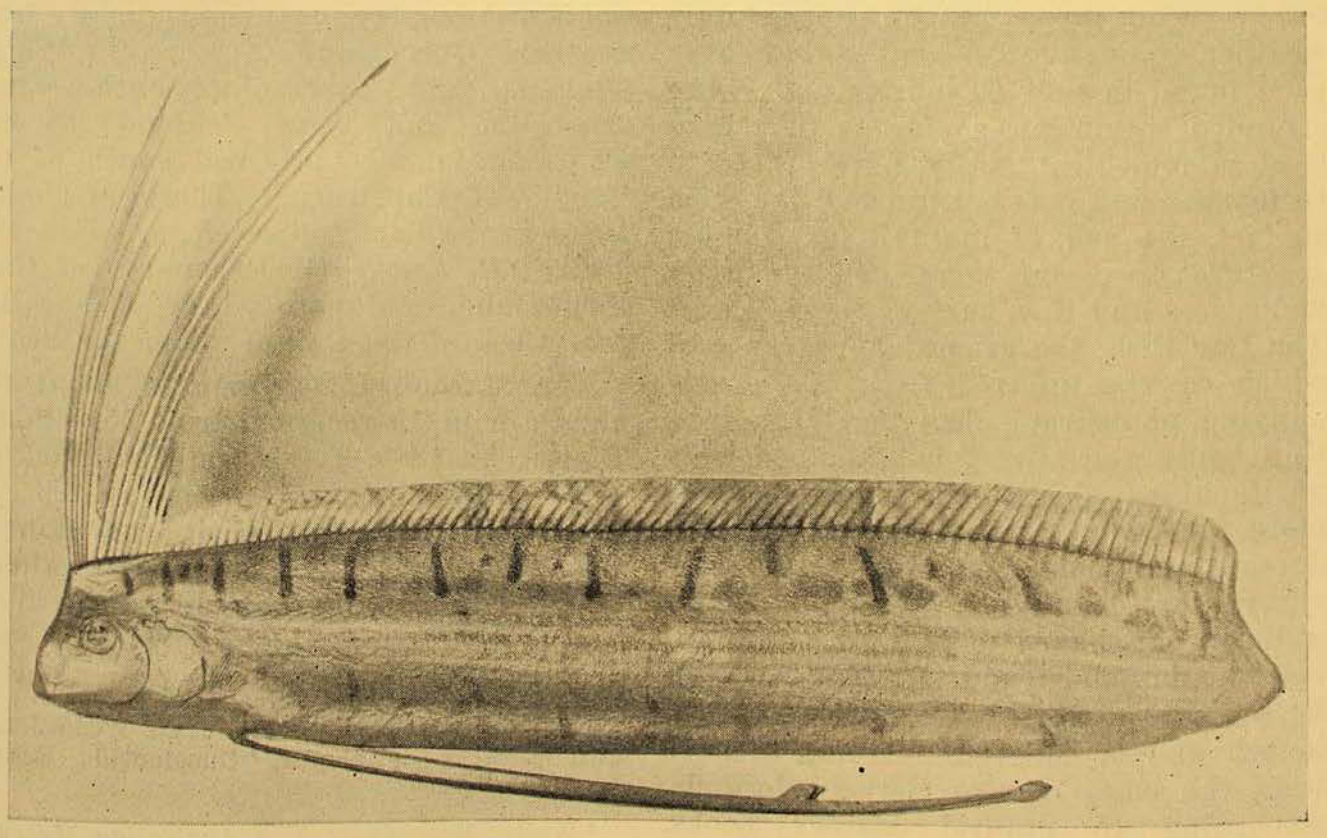
Regalecus Regenerate : The Oar Fish Again

By G. P. WHITLEY

THE Oar Fish has appeared again! In olden times, superstitious fishermen might have taken this omen to presage an exceptional supply of herring and would almost revere this curious apparition as some pagan ocean deity. Some called it Oar Fish because of the oar-shaped ventral streamers, but others termed it King of the Herrings, and its scientific name, *Regalecus* (from *rex* and *halecum*), preserves this meaning. As befits royalty, this fish rarely makes public appearance and then commands admiration because of its magnificence.

One, tired by having "oar'd with nervous limbs the billowy brine", was found floundering in shallow water on Maroubra Beach, near Sydney, at 4 p.m. on March 15, 1945, by Mr. Monty George, a member of the Maroubra Surf Life Saving Club. He was about to take it home for dinner, but his club-mates, impressed by its oddity, telephoned Mr. F. A. McNeill of The Australian Museum and the specimen was secured for our collections. It was about 3 ft. 9 in. long and in excellent condition, except that the end of the tail was missing, having apparently been bitten off just behind the vent, although since healed.

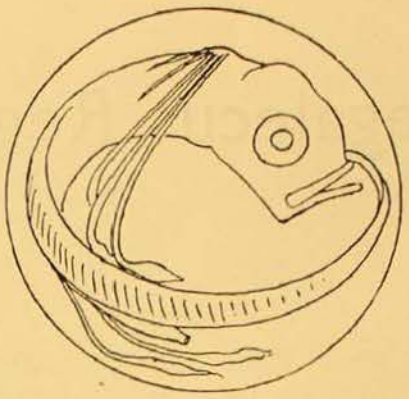
A beautiful cast has been prepared from the fresh specimen by Mr. G. C. Clutton and Mr. J. Kingsley, also of the Museum staff, has specially reconstructed the deli-



The Australian Museum Exhibit of the Maroubra Oar Fish.

cate fins from plastic materials, a considerable improvement on the old method of casting fins in solid plaster. Miss M. Soady recorded the colours of the fresh fish so that the cast could be painted true to life and the result is now on exhibition to the public; the fish itself is also preserved in formalin. Its colours have faded now, there being no satisfactory way to maintain natural colours in fishes after death. When alive, it was said to have been like aluminium on the body with a series of irregular black bars scattered along the back and elsewhere; the extensive dorsal fin and other appendages were red. The front of the face and top of the back are now blackish and there are large greyish spots on the body. It has no teeth in its jaws, but the gill-rakers are slender and numerous and were possibly used to strain its food. The dorsal fin-rays number 5 + 8 + 82 + whatever are missing. It is apparently immature and I cannot determine its sex.

Very little is known about Oar Fishes: it seems they generally live in the great open ocean depths in cold water and only come to light when a dying example may be stranded on a beach after stormy weather, though occasionally they have been found in nets or lobster pots. The stranded specimens, so far as they have been examined internally, have proved to be females and it is not unusual for them to lack the end of the tail, as if some creature preys on them, renders them rudderless and thus hastens their demise. The Oar Fish, the general appearance of which can be inferred from the accompanying photograph, has the large eyes, thin bones and silvery band-shaped body of its allies, the Ribbon Fishes, but is more pug-headed; the front rays of the dorsal fin are long, like a mane, and each ventral fin consists of a long streamer with an oar-shaped lobe at its tip and a leaf-like flap about midway. The Oar Fish is said to exceed twenty-three feet in length and is believed by some to have been the basis of Sea Serpent legends. According to natural history books, nothing is known about the life-history,



An egg with embryo Oar Fish from the North Atlantic Ocean.
After Murray & Hjort.

yet what is evidently a very young one, inside an egg about one-tenth of an inch in diameter, was found off the Azores by the "Michael Sars" expedition and was regarded as a young Ribbon Fish. However, the dorsal "mane" and oar-tipped fins indicate that this was a *Regalecus* egg and an illustration of it is reproduced here.

The typical King of the Herrings is a Palaearctic species (*Regalecus glesne*), known from various parts of the Northern Hemisphere. Our Australasian form (*R. pacificus*) has been seen sporadically from southern Queensland, New South Wales, Victoria and Tasmania, south-western Australia and New Zealand to the Chatham Islands, all well south of the Tropic of Capricorn. There are other kinds in the East Indies (*R. woodjonesi*[1]), India (*R. hawkeni*), Bermuda, off California and in Japan, where it is called the "Cock of the Palace under the Sea".

The Maroubra specimen is about the eighth or ninth recorded from New South Wales. In 1889, Taree and Port Jackson were said to have been visited by *Regalecus*. An Oar Fish, the skin of which is still exhibited in our gallery, came ashore at Shark Beach, Port Jackson, on August 12, 1899, and was described by Waite.[2] Two were reported

[1] Named in 1933 after Professor Wood Jones, author of a delightful "Unscientific Essay" on this species.

[2] Waite, *Records of The Australian Museum*, iii, 1899, p. 163.

from Manly on August 10, 1915, one from Port Kembla on July 27, 1932, and one from Lake Conjola in July, 1940, whilst in June, 1941, there were rumours of others at Kurnell, Botany Bay.[3] The new Maroubra specimen is valuable, because it was so well preserved that an attractive exhibit could be prepared from it by the most modern museum technique, and it was of added interest because it was washed ashore much earlier in the year than is usual in this State.

[3] Whitley, *Records of The Australian Museum*, xix, 1933, p. 70 and fig.; AUSTRALIAN MUSEUM MAGAZINE, iv, 12, 1932, p. 400; vii, 10, 1941, p. 341.

Review

THE STORY OF SHY THE PLATYPUS. By Leslie Rees. Illustrations by W. Cunningham. (John Sands Pty. Ltd., Sydney.) Sq. 8vo, pp. 47, numerous illustrations in colour. Price, 5s. 6d.

IT is appropriate that the successful breeding of a platypus in captivity at Healesville Sanctuary, in Victoria, described by David Fleay in *We Breed the Platypus* in 1944, should have been followed by this attractively produced book which tells and illustrates the life history of Australia's most primitive mystery mammal in a style suitable for children and grown-ups alike.

In the platypus of the eastern mainland and Tasmania, and its spiny anteater relatives, Australia enjoys the zoological privilege of conserving the only egg-laying furred animals which survived from ages past. Incidentally, the skeletal structure is not typically reptilian as inferred on the dust-jacket, any more than the so-called "bill" or webbing of the hands are truly bird-like. It is in the shoulder-girdle alone that retention of a reptilian bone shows traces of pre-mammal ancestry.

The fanciful style, so successfully used by the author in describing the adventures of *Digit Dick* and his Barrier Reef companions, is not as well adapted to the highly specialized life-history of the platypus, but with the exception of such inappropriate terms as "pecking" and "yelping" the narrative conveys a reasonably accurate conception of the habits and behaviour of the unique mammal. In stating, however, that the mother brought her babes some "pieces of fish food" which they "showed no hesitation in eating . . . when only a few weeks old" the account departs from established fact. According to Fleay's observations the young are almost helpless, blind, and with a short "milk-bill" at nine weeks. Weaning began at about sixteen weeks, when there was no sign that the mother masticated food, or foraged, for the youngster.

Evidently based on a wide range of photographic studies, the illustrations give a lively impression of the natural behaviour of the remarkable animal. It may be noted, however, that the worn area on the tail resulting from its use in "pugging" the burrow is on the upper and not the lower surface. Some unnatural variation may be noted in the drawing of the hind-webs, which do not extend beyond the toe-nails, so that there is no folding back of a foot-web (as stated in the text) when combing the fur, such as with the hand when burrowing. The present difficulties of colour reproduction account, of course, for the overstressing of the "foxy" reddish tones. Both artist and publisher will doubtless hope to reduce this to the richer mole-brown of the platypus in future editions.

It is a tribute to the arduous researches of the late Harry Burrell, O.B.E., the late Robert Eadie, and to the exceptional abilities of David Fleay, that we are now able to welcome this popular though factual account of the life-history of this primitive member of the mammalian underground.

The author, illustrator, and publisher are to be congratulated upon the production of an animal book which must greatly aid the conservation of our fauna by bringing the life story of its strangest member within the comprehension of the very young.

E. LE G.T.

Molybdenite

By THE LATE T. HODGE-SMITH

THE Trustees of the Australian Museum recently acquired a very beautiful specimen of crystallized molybdenite with quartz crystals from the Allies Mine, Deepwater, New South Wales. Molybdenite is one of the less common minerals though it is widely distributed, being found in every continent of the world and in all Australian States. It is a sulphide of the metallic element, molybdenum, containing fifty-nine per cent. of the metal and forty-one per cent. of sulphur. Until 1778 it was thought to be identical with graphite or "black lead", when C. W. Scheele discovered its true chemical composition, although it was not until some twelve years later that the Danish chemist P. J. Hjelm isolated the element molybdenum as a metallic powder.

Usually it occurs as tiny flakes sprinkled through a granitic rock or as masses when it resembles graphite; as sheets or large flakes it is not unlike lead foil. It is very soft and pliable and readily soils the fingers and marks paper. It has a greasy feel.

The deposits of molybdenite in the New England district, particularly at Kingsgate and Deepwater, have produced the most spectacular specimens in the world. One mass of large flakes of the pure mineral weighed approximately a ton.

Curiously enough, this soft mineral is employed in the manufacture of a very hard steel, molybdenum steel, used in making rifle barrels, other armaments, propeller shafts, and high-speed tools. Such steels, unlike ordinary carbon steels, possess the property of retaining their "temper" even at dull red heat.

By way of contrast, a salt of molybdenum is used to make a beautiful blue pigment for painting porcelain. Finally, ammonium molybdate is used in chemical laboratories for the determination of phosphorus.

It is never found in alluvial deposits but is generally associated with siliceous granites or their related pegmatite dykes; its presence has been recorded in minute quantities in coal. At Kingsgate it occurs in "pipes" in granite. Strangely enough, when these contain molybdenite they also contain bismuth and usually the molybdenite is confined to the hanging wall and the bismuth to the foot wall; it is remarkable that koechlinite, the molybdate of bismuth, has not been recorded.

The mineral is not easily subjected to alteration. Practically the only minerals found in this way are molybdite, a hydrous molybdate of iron (ferric), and powellite, a molybdo-tungstate of calcium, both quite rare minerals. At Kingsgate delicate thin sheets of calcite with the form of the molybdenite have been found. These are formed by the removal of molybdenite by natural agencies and the replacement of the mineral by calcite which is said to be pseudomorphous after the molybdenite.

Molybdenum is found in other minerals than those mentioned but these are of such rare occurrence as to have no commercial importance.