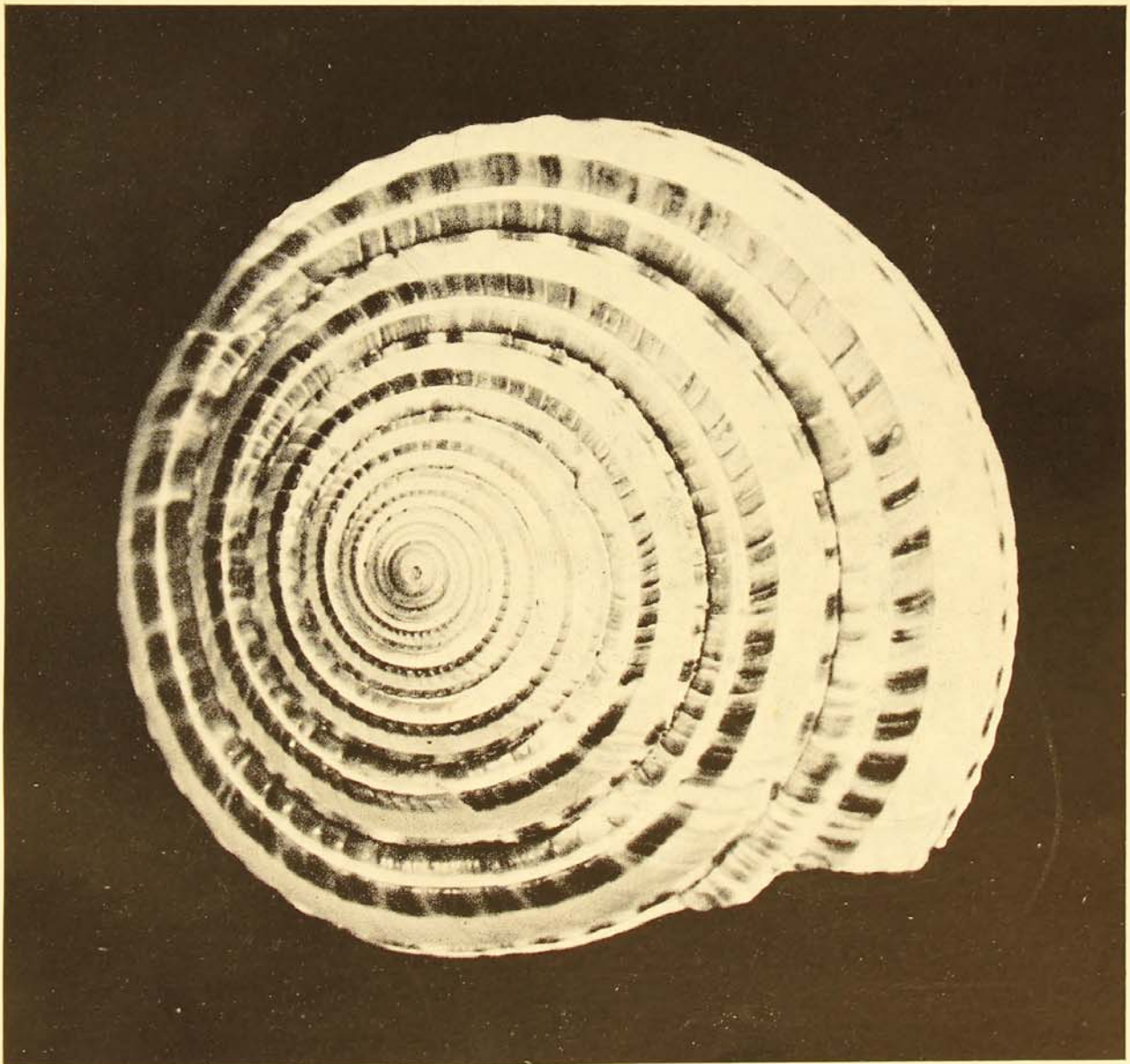


The AUSTRALIAN MUSEUM MAGAZINE

Vol. X, No. 1.

DECEMBER 31, 1949.

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Perspective Sundial Shell.

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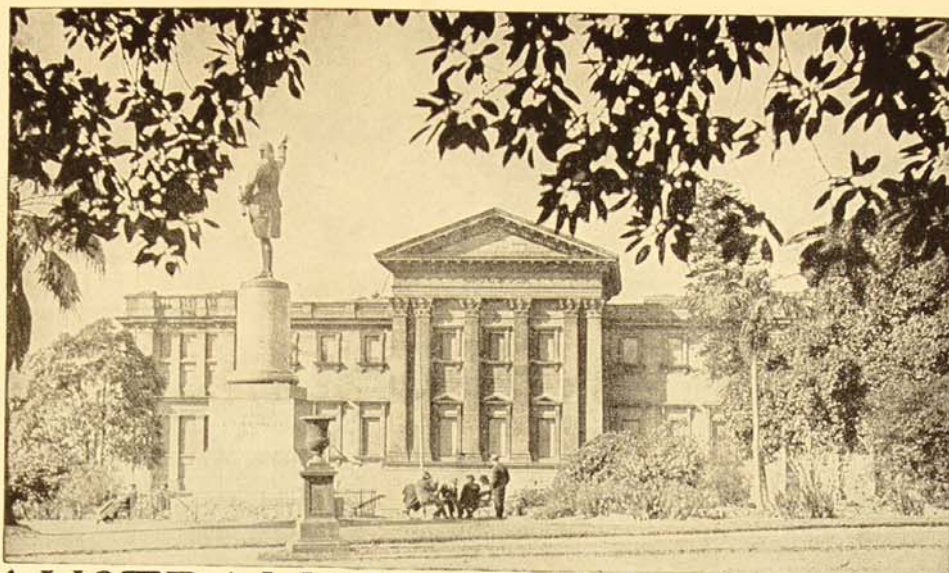
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THE AUSTRALIAN MUSEUM MAGAZINE

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Photography, unless otherwise stated, is by Howard Hughes.

● OUR FRONT COVER. Remarkable uniformity in the growth of its numerous spiral whorls, its regularity of pattern and contrasting colour scheme of cream, yellow and reddish-brown combine to make the Perspective Sundial Shell (*Architectonica perspectiva*) one of the most attractive marine shells of the Indo-Pacific. On the base of this top-shaped shell is a large umbilical opening through which may be seen the crenulated margin of each whorl forming a spiral line which can be followed from the base of the shell right up to its apex. No other shell shows this spiral arrangement so perfectly displayed; the winding staircase effect of these spiral edges has provided an alternate name—Staircase shells—for the group. The Perspective Sundial shell is the largest of the Indo-Pacific species, reaching about two inches in size. It occurs also in northern Australia, fine specimens having been collected in the waters of the Northern Territory. A very closely allied species to this one has been dredged in Sydney Harbour during recent years, the main difference being in the distribution of colour pattern.



A fine Sepik River face mask, thirteen inches high, in which the exaggerated features, particularly the mouth and eyebrows, add a dramatic quality. The features are painted in black and red on a white field. The background is a bark-cloth skirt from Collingwood Bay, Papua.

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31 DECEMBER, 1949.

Sepik River Face Masks

By FREDERICK D. MCCARTHY

WE can all remember the childhood thrill of wearing face masks, but the Melanesians confine this pleasure to the adult men and to the youths undergoing initiation into a secret society, a sacred cult, or into manhood; they employ masks extensively both in public pageants and sacred ceremonies. In primitive societies masks perform the important function of disguising the wearer, and by this means the initiated men are able to retain their prestige by perpetuating a belief among the women and uninitiated that masked actors are really spirits of various kinds visiting the village or camp—one of the great secrets unfolded to the initiate is that all such ceremonial is performed by human beings. Face masks, whilst serving to disguise, imitate and protect the wearer, produce in him an experience of magical transformation, and frequently vivid emotional responses from his audience. These responses may be of pleasure or of the deepest awe, depending upon the function of the mask, and both kinds are used by the Sepik River natives. Generally, too, primitive man has reproduced the human face in his masks because most of them are symbols of anthropomorphic and ancestral spirits, but various animals supply the motives in others.

The great Sepik River flows for some hundreds of miles from its headwaters,

on the northern side of the central mountain range of New Guinea, across vast swamp plains, which are inundated each year during the wet season floods, to the

A mask with a netted and fibre fringe ready to be worn in a dance or ceremony. The design is predominantly red, although black is used, and the field is all white. It is eleven inches high.





A pith-wood face mask decorated with graceful series of red parallel lines on a white field. The eyes are circular bosses. The angled mouth, with the protruding tongue, leaves no doubt about the attitude of defiance and cheekiness which the mask is intended to portray. It is thirteen inches high.

coast. Its shores form the home of a comparatively large population of dark-skinned, frizzly-haired natives, whose food is obtained by the cultivation of a wide range of crops, among which taro and yams are staple items, by fishing in the river and swamps, by trade, and by hunting game in some areas. Intermittent warfare is carried on between villages and other groups, and many of the local languages spoken are unrelated to each other. These natives possess a culture of intense interest to the layman and anthropologist—it is rich in content, lavish in decoration, and skilful in workmanship. Its art, which is produced by professional craftsmen, is a mixture of the grotesque and garish in its treatment of the human figure, with the simplicity of naturalism in its carvings of animals.

The face masks are a good example of the extraordinary skill and artistic sense utilized by the Sepik River sculptors in their bewildering and ingenious variations of the features, but despite this virtuosity certain basic types of masks are perpetuated. In one group the eyes, nose and mouth are given equal emphasis, but in two other important series of masks one character is dominant; thus the nose may be a long-pointed projection, a carving of a crocodile or bird, or the beak of a bird, either sticking out at an angle or joined to the chin. Another group of masks has a huge mouth, which is so enlarged on some examples that the chin is eliminated, but in some of these masks the tongue extends down to the chin. In contrast to this series is a type of mask with a very small slit for a mouth, and on it is fre-

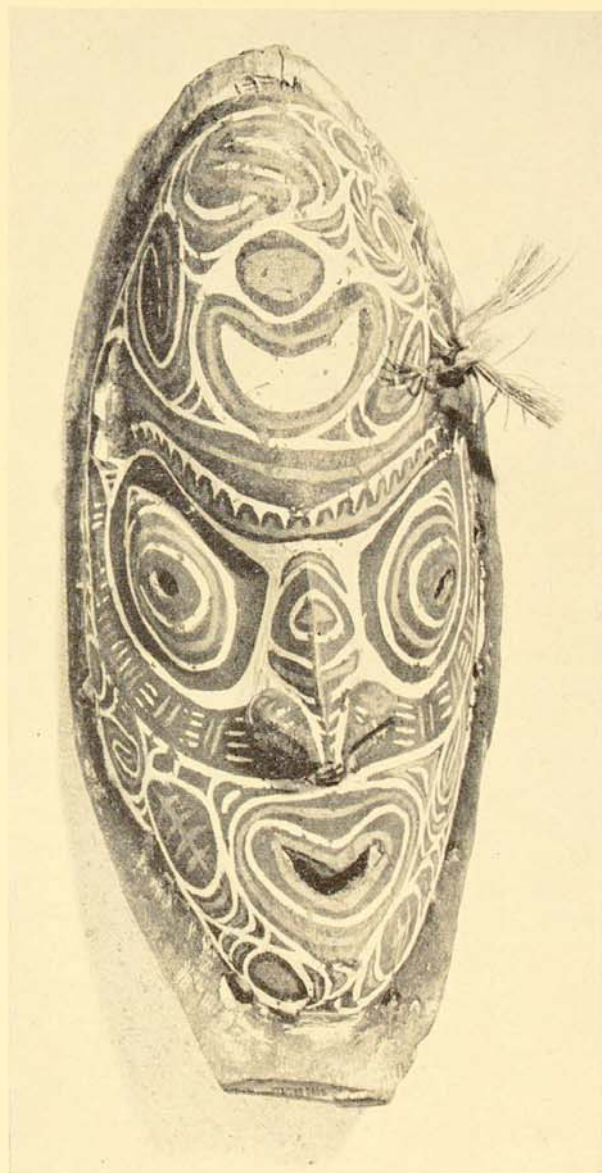


A simple face mask, with black features on a yellow field, and a white border between the large points on the outside. The somewhat lavish grin implies a feeling of evil and malice. The mask is thirteen inches high. The background is a netted bag from the Sepik River.

quently seen a prominent pointed nose. Some of the masks have a bird's face, others have a crocodile or bird carved on the forehead, or on the chin. In each group it is noticeable that a slight alteration in the angle of the eyebrows, in the shape of the nose or mouth, causes a remarkable change of expression, which may include a sardonic grin, a look of wonderment, of mystic awe, and of

defiance, or just a blank, meaningless stare.

It will be noticed that the sculptors have exploited a wide range of technical devices to gain their effects. From masks in which all features such as the forehead, cheeks, eyebrows, nose and mouth are rounded surfaces, there is a gradation of many variations to the opposite extreme in which the face is in two flat oblique planes divided by a median ridge, and the features are sharp-edged and ridged. On many masks a straight line, with convex eyebrow ridges above it and the eyes set



In this face mask sculptural features are subordinated by the decorative design in red and yellow on a white field. It is sixteen inches high.



An incense face mask, in which neither sculpture or colour is emphasized, but one in which a simple symmetry is the dominant factor. It is sixteen inches long and the pointed projections add another three inches at each end.

deeply below it, forms a popular sculptural device. The eyes are either cut-out holes of various shapes, a shell operculum set in a socket, or a circle painted on a rounded boss. The teeth may be shown by two rows of ridged bosses but they are more usually absent than present, as with the chin and ears. Colour is used in attractive decorative patterns, in which curved parallel lines, concentric circles, and other motives, sometimes combined with solid circles and triangles, are painted in red or black on a white field, but any reverse combination of these colours may be seen. Many masks are painted a uniform red or black.

These masks have a variety of functions. Some decorate the gables on the men's club-houses, and at the entrance is usually a large mask representing a spirit who

the uninitiated believe dwells inside. A fine mask is attached to a screen on the carved prow of a war canoe to represent the tribal ancestor after whom the canoe is named. Others are attached to the elaborate costumes worn by performers in the secret society, initiation, and other sacred and public ceremonies, and face masks form a prominent feature of the costumes for dances and dramatic entertainments traded from village to village along the Sepik River. Tiny wooden masks are worn on the breast as amulets. An important group of masks represents the deceased members of a village, and these are kept in the houses of the families concerned. Some masks symbolize a spiritual ancestor of such sacredness that a special initiation is necessary for the men to see them, otherwise a man would be requested to leave by the owner of the mask when it is being displayed. In one interesting ceremony a human face mask forms part of the elaborate decoration of huge yams when they are displayed in a village procession. In another ceremony young men wear a mask which represents murup, mythical monsters which live in the mountain jungles and visit the swamp-land villages for special ceremonies.

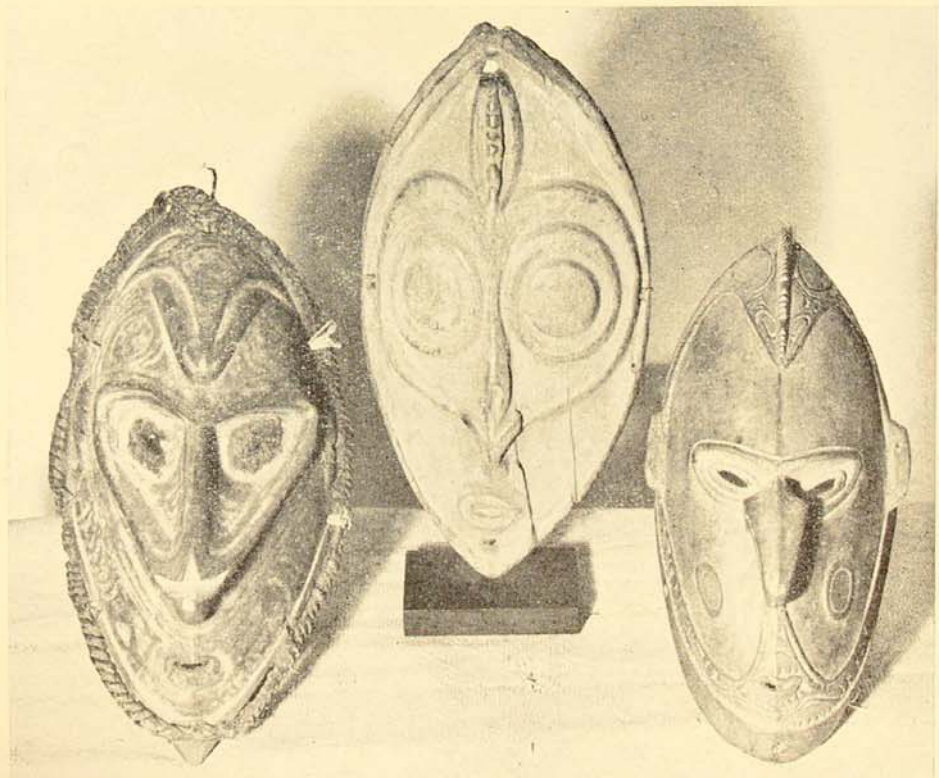
Whilst some of these face masks are purely decorative in value, others actually take the place of the ancestral spirit they represent, and are seen only by the initiated men. Masks made for special ceremonies, and those which have served their purpose in a village may be traded to another village where their function may be reversed from decorative to sacred, or *vice versa*. In many club-houses masks secured by trade are stored in the most sacred part of the structure, where they are held as curiosities, being regarded in some awe, and shown to initiates as one of the treasures of the temple.

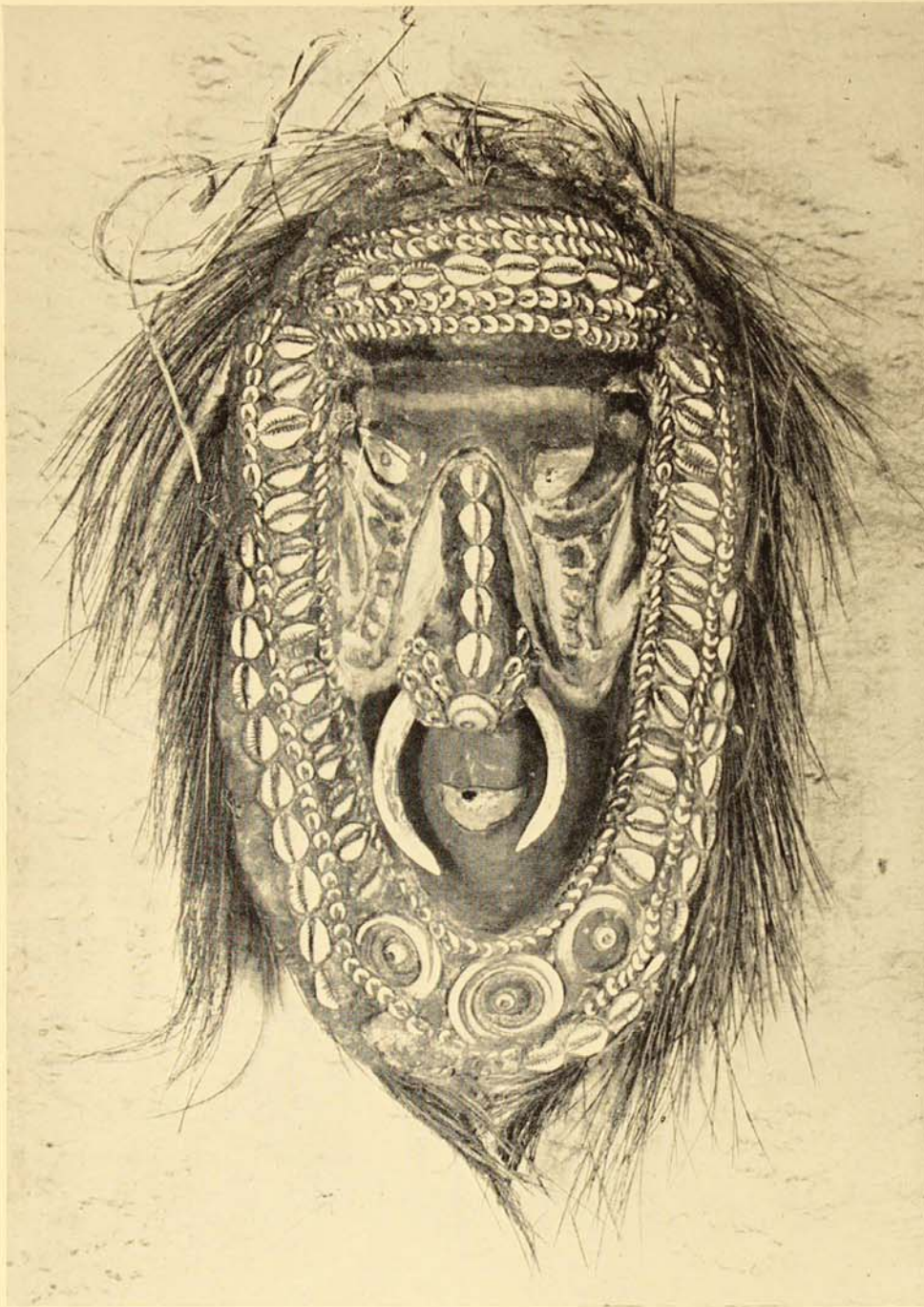
Some of the wooden face masks are transformed into perhaps the most hideous and the most distinctive type of face mask in the whole of the Melanesian region. To the wooden mask is added a plaited border, and both mask and border are then covered with a thick layer of a



Three elongate face masks, all carved in smooth rounded contours and decorated with red parallel lines and patches. A bird totem figure projects from the chin of the one on the right, and the enlarged mouth of the one on the left bears painted teeth. The expression generally of these masks is one of fear and mystery. They are from eighteen to twenty-four inches high.

These specimens illustrate the variation of the manner of portraying the features on Sepik River face masks. Note the very small mouth in this group. The two on the right are plain red in colour, and the one on the left has a red and white line pattern in white on a black surface. They are from fourteen to fifteen inches high.





The pattern of cowry and Nassa shells, opercula and pigs' tusks add a terrifying appearance to this mask, although they are probably intended to be decorative. It is thirteen inches high.

soft black gum-cement into which are set many kinds of shells—cowries, nassa, cone and others—pigs' tusks, dogs' teeth, and shell rings in elaborate patterns. The nose is enlarged and is the dominant feature of the mask. The Australian Museum possesses a fine series of these rare and delicate masks from the Keram and Yuat tributaries of the Sepik river; they are further decorated with coloured sago-palm fibres during the ceremonies in which they figure.

Sepik River masks are bold, impudent,

pert and bombastic, but they are the product of long established and distinctive sculptural traditions, the same types vary in function from village to village because of the widespread trade, and as an art form they possess considerable aesthetic value. Sepik River face masks and those of primitive peoples generally, being foreign in nature to our culture, excite in our own craftsmen a feeling of admiration for the artistic skill of their creators and an intense interest in their unusual inspiration.

Edward Jenner and the Conquest of Smallpox

By EDWARD FORD, M.D., D.P.H., F.R.A.C.P., F.Z.S.

TWO centuries have passed since the birth of Edward Jenner, the Gloucestershire village doctor who discovered vaccination against smallpox. His method of prevention, introduced in 1798, overcame one of the most dreaded of the pestilences, and for this he is honoured as one of mankind's greatest benefactors.

Jenner was one of the great pioneers of preventive medicine, a first investigator of the virus infections, and an acknowledged influence on the later work of Pasteur, upon which modern immunology was founded. He was, as well, a skilled naturalist and a well-loved country doctor.

EARLY LIFE AND TRAINING

On 17th May, 1749, Edward Jenner, the son of a rural clergyman, was born in the small Gloucestershire village of Berkeley, in which he was to spend his long and fruitful days as the local doctor. At the age of 13 years he commenced the usual training for a general practitioner of medicine of that time, by apprenticeship to a country surgeon. He assisted his master in his work and studied under his direction. It is to be expected that he also found time in his leisure hours for the pursuit of natural history, in which he had engaged since his school days, and in which he was to retain a lifelong interest.

At the completion of his apprenticeship in 1770, Jenner went to London to continue his medical studies, and by good fortune became the resident student of John Hunter, one of the masters of British surgery. Hunter was a distinguished comparative anatomist and pathologist, and one of the greatest inves-



Edward Jenner M.D. F.R.S.

tigators of his time. His application of scientific principles, based on his observation and experiment, to the practice of surgery greatly influenced its development. He was an ardent collector, part of his enormous gatherings forming the Hunterian Collection of the Royal College of Surgeons of England, which was largely destroyed by German bombing in 1941. He kept also a private menagerie for his zoological studies. This famous teacher must have had a profound influence on his young pupil, who lived

with him in his great house, filled with natural history specimens, and busy with constant experiments on the structure and habits of animals.

Despite the attractions of the city, Jenner returned to his village in 1772, and there he remained as the local doctor for the rest of his life. Three years after his return Hunter invited him to work at his school in London, but this tempting offer was refused, as many others that followed in the later days of his success.

At Berkeley Jenner lived the life of a busy physician, was involved in local affairs and interested in natural history, poetry and music. From the accounts of his life we see him as a jovial and friendly country man and a capable doctor, loving his home and family, respected by his friends and colleagues, and interested in the welfare of his neighbours.

JENNER'S STUDIES IN NATURAL HISTORY

Jenner was a keen student of natural history throughout his life. From his earliest days he was interested in the workings of nature, and the training in observation and skill in experiment gained in his natural history studies, fitted him for the work for which he is famed.

Hunter must have been impressed by his competence, for, apart from the later offer of an assistantship, while still his pupil, Jenner obtained through his influence a position which marked his appreciation. In 1771 Captain Cook returned from his first voyage, in the *Endearour*, after his discovery of our eastern coasts, bringing with him the great collections of Banks and Solander, a large part of which had been gathered at Botany Bay. Through Hunter's friendship with Joseph Banks, Jenner received the part-time work of arranging the botanical specimens. Towards the end of last century the British authorities presented the duplicates of this collection to the State of New South Wales, and they are now at the National Herbarium. Jenner was later offered a position of naturalist with Cook's second expedition, which sailed in the *Resolution* in 1772,



Smallpox.

(From "The Diagnosis of Small-pox", by T. F. Ricketts and J. B. Byles.)

but was not attracted from the village life he had decided upon.

Hunter's influence upon his pupil was maintained through a friendship that endured till the latter's death in 1793, and they corresponded regularly. The letters from Hunter to Jenner, preserved in the Royal College of Surgeons of England, refer mainly to natural history—begging or acknowledging specimens, seeking information, or criticizing experiments. An idea of their nature can be gained from a letter of 2nd August, 1775:

I thank you for your experiment on the hedgehog; but why do you ask me a question by way of solving it? I think your solution is just; but why think? why not try the experiment? Repeat all the experiments upon a hedgehog as soon as you receive this, and they will give you the solution . . . and let me know the result of the whole.

Personal affairs could not distract the energetic master from his work, and after Jenner had apparently written in disappointment at the breaking off of arrangements for his marriage, he replied:

I own I was glad when I heard you was married to a woman of fortune; but 'let her go, never mind her'. I shall employ you with hedgehogs, for I do not know how far I may

trust mine. I want you to get a hedgehog at the beginning of winter. . . .

And there follows the details of an experiment, and no more of Jenner's troubles.

Included in Jenner's work on natural history were studies on the habits of the cuckoo, hibernation in the hedgehog, and bird migration. In his publication on the cuckoo he described the manner in which the young cuckoo removes its foster nestlings from the nest, and noted, among other features, that the young bird had a

object of universal fear. The historian Macaulay described it as "the most terrible of all the ministers of death . . . always with us . . . filling the churchyards with corpses, tormenting with constant fear all those it had not stricken, leaving on those whose lives it spared the hideous traces of its powers, turning the babe into a changeling at which its mother shuddered, and making the eyes and cheeks of the betrothed maiden an object of horror to the lover."

A mother with smallpox nurses her healthy vaccinated baby.

(From "Modern School Hygiene", by R. Gamlin, 1936.)



depression on its back which appeared to aid in this purpose, and which disappeared about its twelfth day. This work suffered much criticism and was later held in discredit, though in recent days its accuracy has been proved.

SMALLPOX AND INOCULATION

Prior to vaccination, smallpox was one of the most deadly and dreaded diseases. It smouldered in the cities and spread at intervals in devastating epidemics. It killed one person of each six or seven attacked, and probably half to five-sixths of people were infected at some time in their lives. Its heavy mortality and extreme contagiousness, its menace to all who had not yet been infected, and its loathsome manifestations made it an

In the century preceding Jenner's discovery some protection against smallpox had been attained in Britain by the adoption of an ancient Eastern method of immunization. This measure, termed inoculation, was based on the fact that immunity was induced by an attack of smallpox, and was performed by the application of matter taken from a true case of the disease.

This was introduced in 1714 and was strongly advocated by Lady Mary Wortley-Montagu, wife of the Ambassador at Constantinople, upon her return to England. Lady Mary, whose own children had been inoculated, pressed for its adoption with a vivid energy worthy of one called "the she-meteor" by Horace Walpole. Her campaign was successful,

INQUIRY

INTO

THE CAUSES AND EFFECTS

OF

THE VARIOLÆ VACCINÆ,

A DISEASE

DISCOVERED IN SOME OF THE WESTERN COUNTIES OF ENGLAND,

PARTICULARLY

GLOUCESTERSHIRE,

AND KNOWN BY THE NAME OF

THE COW POX.

BY EDWARD JENNER, M.D. F.R.S. &c.

— QUID NORIS CERTIUS IPSIS

SENSIUS ESSE POTEST, QUO VERA AC FALSA NOTEMUS.

LUCRETIVS.

London:

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1798

Title page of Jenner's "Inquiry", 1798.

and the method achieved a limited use, which was sanctioned by the Royal College of Physicians in 1754.

The method generally used was to apply material from an early smallpox lesion to a scratch or incision. This caused an attack of smallpox, which resulted in immunity. In most cases infection was mild, but occasionally severe attacks were incurred, and a case mortality of from 1 to 6 per cent. resulted. Another serious defect rested in the liability of the spread of smallpox from persons so inoculated. These were as contagious as naturally infected cases, and severe outbreaks at times occurred when treated persons were not effectively isolated. From its limited use inoculation had slight effect on smallpox in the mass of the people. Its use waned after the introduction of vaccination, and in England it was prohibited by law in 1840.

COWPOX AND VACCINATION

From his apprenticeship days Jenner was aware of a rural tradition that dairy-maids having contracted cowpox subsequently would not suffer from smallpox. After considering this for many years, he at length carried out the investigations which showed that cowpox infection gave protection against smallpox, and which were the basis of the method which he termed vaccination.

It was at first necessary to show that the cowpox naturally acquired by milk-maids protected them. As Jenner used smallpox inoculation in his practice, this was readily proved by the freedom of reaction to the smallpox material of previous cowpox sufferers.

This was followed, in 1796, by his first experiment on vaccination. An eight-year-old boy, James Phipps, was vaccinated with matter from a cowpox lesion on the finger of a milkmaid, Sarah Nelmes. The boy was successfully infected with cowpox, and was later inoculated from a case of smallpox. No infection resulted—the cowpox had protected him.

Further investigations were made, and in 1798 Jenner published his great work, *An Inquiry into the Causes and Effects of the Variolæ Vaccinæ, a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of Cow Pox*. Certain of his facts, Jenner went to London to demonstrate his discovery. He remained there for some months without finding any persons willing to be vaccinated, and returned home. But his method was taken up enthusiastically by others, and within a few months was in wide use.

During its rapid adoption frequent setbacks were encountered, from such things as faulty technique, the wrong selection of lesions in the cow as a source of lymph, and too early exposure to smallpox, but such defects were gradually overcome. Though Jenner's thesis was based on few cases, within a short time its effectiveness was proved beyond all doubt, both in large scale tests and by its widespread usage.

Jenner thought that the immunity received from vaccination persisted throughout life, but it was in time shown that it gradually decreased, but could be restored by revaccination.

Coincidental with its grateful reception, there arose a vehement opposition to vaccination, expressed in personal attacks upon Jenner, professional criticism, lampoons and caricatures. A modicum of this persists to the present day from persons who disregard all evidence, and most of whom, because of Jenner's work, have never looked on the horror of the disease.

It may appear from this brief account that Jenner's task was merely the easy proving of a country tale. But he went far beyond the obvious implications of this. He considered not only the protection of individual persons by the lymph he obtained from the pocks of the cow disease. This had been already done, in 1774, by a Dorsetshire farmer, Benjamin Jesty. In addition, Jenner conceived the idea, essential to its wide use as a public health measure, of passing the cow virus from person to person. He envisaged the protection of whole populations, and clearly saw in it the means of ending the menace of smallpox to the race.

Vaccination was quickly adopted in Europe and America, and was soon in world-wide use. In 1803 Governor King requested the Secretary of State that a supply of "vaccine matter" should be sent to New South Wales, mentioning that the cows of the Colony had been examined, without result, for cowpox. This was received in 1804, and children were at once vaccinated, and a scheme instituted for its wide utilization. The cowpox virus was maintained on the long voyage by passing it from one person to another, in an unbroken succession of vaccinations. Such uninterrupted arm-to-arm transfer, required to prevent the loss of the protective virus, was continued till about 1881, when the manufacture of storable calf lymph was introduced. Prior to this the virus died out a number of times in Australia and had to be reintroduced.

In the years since its introduction in 1798, the method of vaccination has been little changed. It has passed with unaltered effectiveness to our day, and remains, as Jenner presented it, a great weapon of the public health, and a sure protection from smallpox to all who use it.

THE FAIRY WRENS OF AUSTRALIA: BLUE BIRDS OF HAPPINESS. By Neville W. Cayley. (Angus and Robertson, Limited, Sydney, 1949.) Pp. viii + 88, 9 coloured plates, 10 half-tone plates, 4 distribution maps (showing 15 species). Price 15s.

THIS is a delightfully written and informative book, and to the more serious minded ornithologist it is also a speedy and authentic reference work. As an ornithologist Mr. Cayley has done considerable research on Australian birds, as an artist he has figured most, if not all, of them—but he has excelled himself with fairy wrens. The author settles for all time the vexed question of plumage changes in young and adult, his observa-

tions being made of families of these birds living on his property. The listing of the various specific races may not be appreciated by the layman but is of unquestionable value to ornithologists. The distribution maps are works of art and add considerably to the book from a scientific viewpoint, they are of the type which could be copied with advantage in other zoological groups.

The coloured plates are excellent and also there are many beautiful photographic studies of the birds and their homes. The artist-author and the photographers are to be congratulated on their part, and so are the publishers for the fine quality of the production.

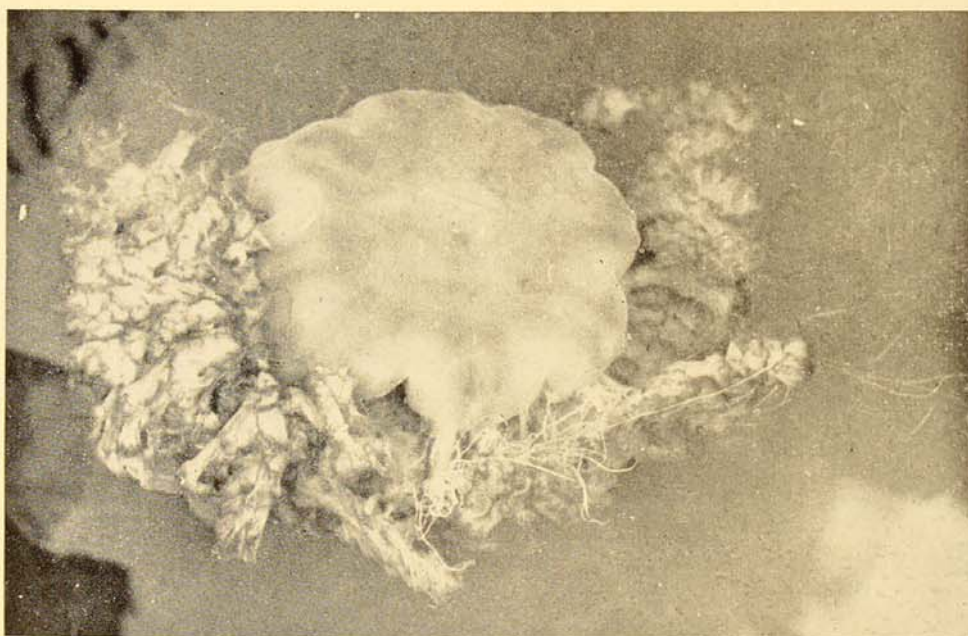
J.R.K.

A Large Medusa in Sydney Harbour

By ELIZABETH C. POPE

IT is not often that so humble a creature as a jellyfish makes news, especially when it hasn't stung anyone or done any damage to property. However, the recent reappearance of the species *Cyanea capillata* variety *annaskala* at Drummoyne in the upper reaches of Port Jackson caused a great deal of interest for several reasons. In the first place it had

the disk or umbrella of the *Cyanea* was about eighteen inches across and we were somewhat dubious about this till we examined the animal itself. The amazing thing was that so large a creature which can move only with the currents and the wind should have run the gauntlet through the numerous ferry lanes and paths of the steamers without sustaining



The giant jellyfish, *Cyanea capillata* var. *annaskala* photographed in the water at Drummoyne. The eighteen-inch disk is flanked on either side by the billowing, petticoat-like, mouth tentacles.

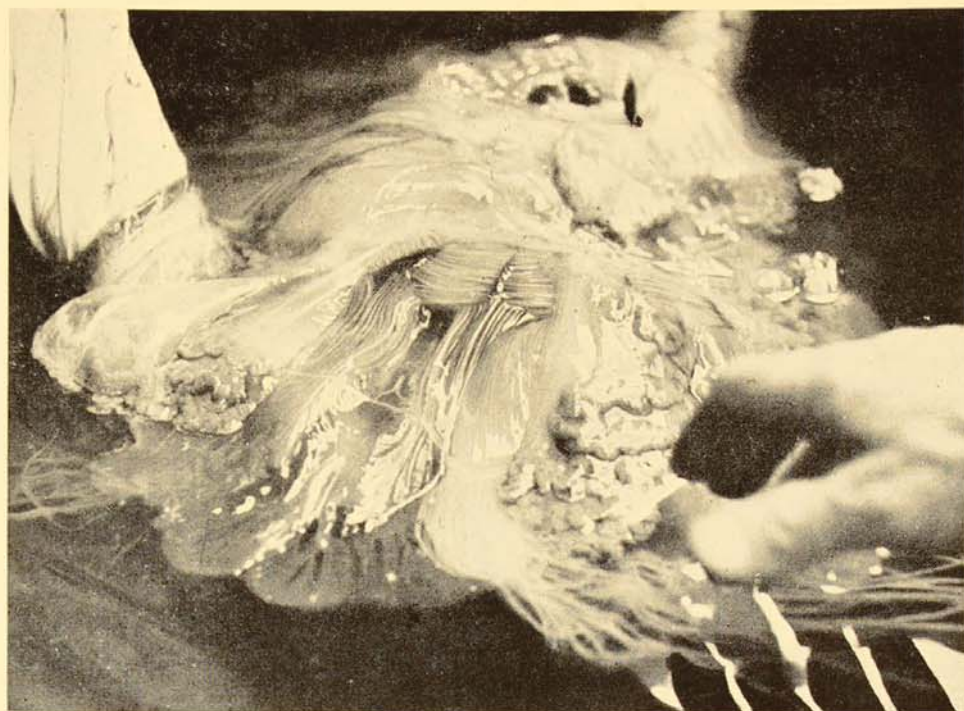
not been officially recorded in the Harbour by the Museum for nearly seventy years. Another interesting fact was that the Drummoyne specimen was very large for a jellyfish and delicately coloured and therefore captured the public fancy.

First news of the jellyfish came from Mr. H. Vincent, who telephoned the Museum and described the creature which had appeared alongside his private jetty. Having some acquaintance with natural history he realized that the *Cyanea* was not one of the more usual types of medusa which occur in the harbour and he, therefore, sought the Museum's aid in identifying it. Mr. Vincent stated that he thought

any appreciable damage. Subsequent measurements showed that the disk was a fraction of an inch over the eighteen estimated by Mr. Vincent and some of the trailing tentacles were 10 to 15 feet long.

As a result of the publicity given to the finding of the first *Cyanea*, the occurrence of another one of the same species was reported, in the same week, from Dawes Point, where a fine specimen, not quite as large as the first one, was captured by the Water Police. It would seem, therefore, that quite a number of these jellyfish had been drifted into the Harbour about that time and that only a few escaped being chopped up by ships' propellers. Indeed this fate must be met by

Portion of the underside of the *Cyanea* to show the circular and radial corrugations which appear to support the huge mass of jelly which forms the disk.



the vast majority which float into these waters. Probably this accounts for their not having been observed often.

We have subsequently received a letter from Mr. D. G. Stead in which he states that he has seen the large *Cyanea* from time to time, sometimes out to sea and occasionally in the Harbour. He also claims to have seen specimens which measured twenty-four inches across the umbrella.

The beautiful shape of the disk may be seen in the photograph of the specimen from Drummoyne taken just before it was removed from the water. At this stage of the proceedings it had been very much pushed about with a pole and in consequence had retracted the fine, rather spaghetti-like bunches of tentacles which could be stretched out to ten feet in length or more. Very few of these tentacles show in this photograph. They are best appreciated in the reproduction of the painting by E. von Lendenfeld of some of the medusa and sponges of eastern Australian seas. On the other hand, the rather voluminous folds of the mouth tentacles with their darker borders are well in evidence in the photo of the swimming animal. They were in ceaseless motion,

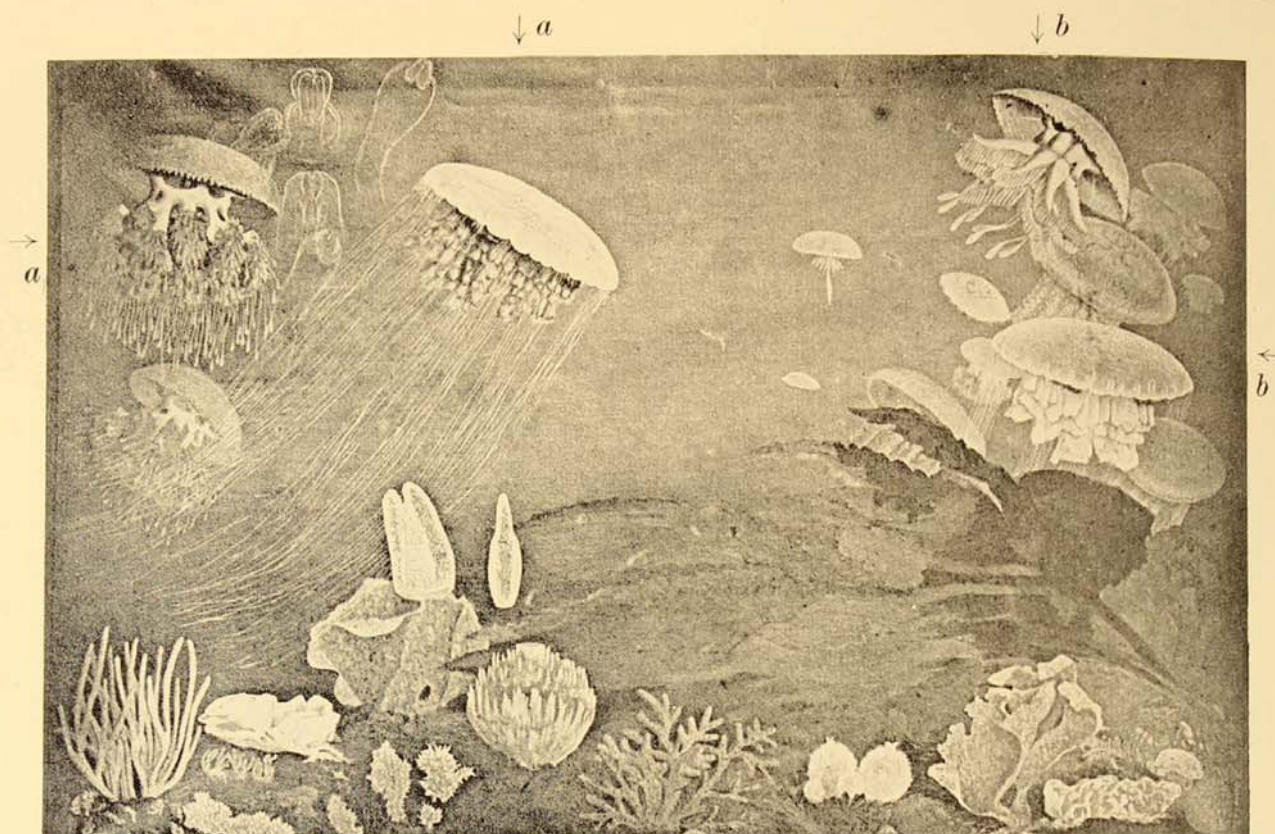
extremely delicate and flounce-like, reminding one of the skirts of can-can dancers.

A small eight-inch long fish was found dead, imprisoned in these folds, evidently captured for food.

The general colour of the disk was a milky white, with the bunches of long, fine, thread-like tentacles much the same colour. The 'skirts' of the mouth tentacles were whitish with a rich purple border. Certain of the reproductive tissues in both specimens were a beautiful mauve and added greatly to the beauty of the colouring of the umbrella-part.

Overseas this species is said to inflict stings on those who handle the live creature, the stinging cells (the nematocysts) being located in the long spaghetti-like tentacles. We did not, however, test out the stinging properties of the local variety. They would, no doubt, be similar to those of their overseas relatives.

Having so large an umbrella composed entirely of soft jelly-like tissue, *Cyanea* requires some sort of strengthening mechanism to keep the wide umbrella open. This support is apparently provided by an arrangement of tissues on the lower surface which look somewhat like



Some of the commoner marine creatures of Port Jackson: sponges, jellyfish and comb jellies. *Cyanea capillata* appears in two places indicated by the arrows, "a a" and "b b". The variety "b b" is the type which is found in Port Jackson.

E. von Lendenfeld pinx.

the corrugations in the sheets of galvanized iron used for tanks or roofs. These corrugations in the jellyfish appear in two systems—one lot being radial (like the spokes of a wheel) and consisting of approximately fourteen ridges in each of the bundles, with two bundles to each of the major segments of the bell—what was originally one of the arms of the larval schyphystoma stage. The other system of corrugations runs in a circular manner round the outer edge of the mouth area. Again there are approximately fourteen distinct, large corrugations in this circular group with a few finer ones towards the mouth area and the circular ridges are interrupted opposite the mid-point where they cross the radial ones and appear to be attached to them. Primitive muscle fibres help to strengthen the ridges and probably cause the swimming movements of the bell by their contractions. A photograph showing the lower surface of one of the major seg-

ments of the disk of the large *Cyanea* illustrates quite clearly how these 'muscles' are arranged.

Only the artist or the careful modeller in plastics or glass can capture the full beauty of such fragile creatures as jellyfish. They should be viewed alive in their native element where the support of the water allows the full beauty of their structure to be displayed.

The opportunity is taken here to reproduce a beautiful plate which was to have been issued with R. von Lendenfeld's *Catalogue of the Scyphomedusae of the Australian Seas*, published in 1887.* The painting was done by von Lendenfeld's mother. The original was in the possession of the Linnean Society of New South Wales, to whom we are indebted for permission to reproduce the picture here.

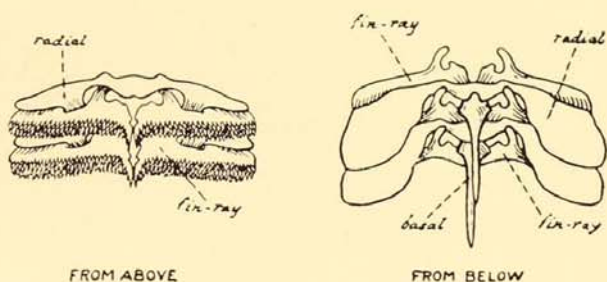
* A limited number of these were subsequently printed but were not generally distributed.—EDITOR.

Sucking Fishes

By G. P. WHITLEY

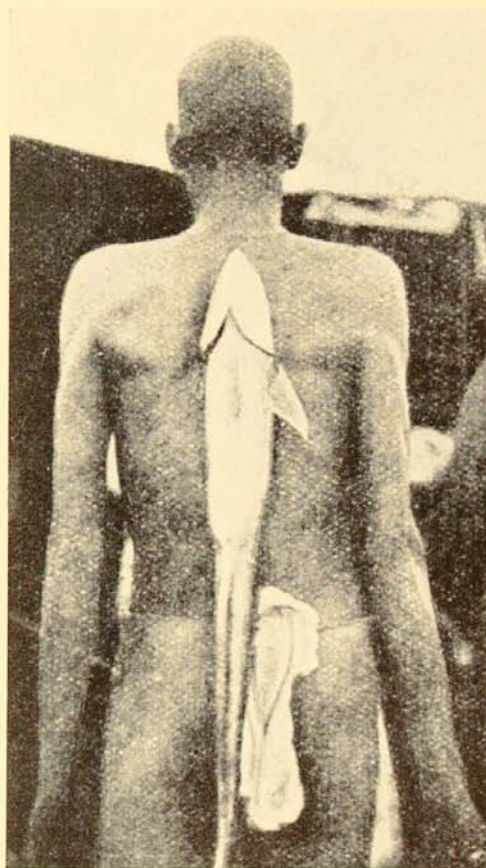
THE Sucking Fishes or Remoras are most easily identified of all fishes because of the "disk" or sucker over the top of the head, yet many people confuse Sucking Fishes with the Pilot Fish (*Naucrates*) sometimes seen accompanying large sharks. The Pilot Fish, however, is a bright blue mackerel-like fish with no sucker on its head. The Remora or Sucking Fish, though itself quite a vigorous wriggling swimmer, has solved its major transport problems by attaching itself by its sucker to sharks, devil rays, boats, whales, turtles, swordfish, barracudas and various other fishes, on which it "hitch-hikes" from place to place. The

slithering of a slimy Sucking Fish over the body of its host has been compared with a skater on ice or a squirrel dodging around a tree-trunk. When quietly adhering by the sucker, the fish is normally relaxed and all motion, other than for breathing, is suspended, but the swimming Sucking Fish can twist and turn



Segments of adhesive disk of Sucking Fish, *Echeneis remora*. (After J. R. Norman.)

sucker is an oval or elliptical organ with a series of roughened slats like those of a venetian blind; these slats are called laminae and are really modified dorsal fin-spines. The Sucking Fish applies its disk to the surface of its host, the oval margin acts as a sucker, and the slats are raised to cause a vacuum so that the fish is very firmly attached and can resist the efforts of its host or the most turbulent water. They can attach themselves very quickly and some have the impudence to shelter inside the gills and mouths of dangerous sharks. One Remora tried several times to fix itself to a swimmer near Dakar, Africa, following him into shallow water like some domestic animal. The quick



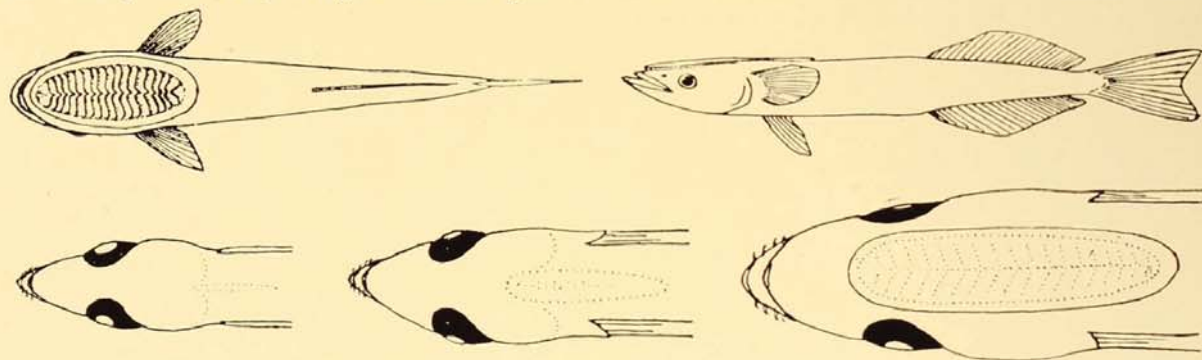
A Sucking Fish which had been placed on the back of a native diver at Manaar, Ceylon. (After Herdman.)

with great alacrity to avoid being eaten by its host. Some species appear to prefer certain hosts, others (or perhaps all) are indiscriminate in their choice; more data are needed before we can say if they are "attached" in more than one sense of that word. The power of adhesion is very

strong, a backward pull only raises the laminae and increases the hold, but by sliding the fish forward the slats are lowered and the fish can be detached. By using the fish's tail as a handle, Waite lifted one end of a heavy marble-topped table to which the sucker had been attached, and experiments have shown that a full-grown *Remora* can withstand a vertical pull of more than 40 lb. without giving way.

Sucking Fishes are not coloured dark above and light below as are most fishes, because they often ride upside down, so they are either uniform in hue or striped; occasional ones are whitish and probably all can change their colouring to some extent. Only the very largest kinds grow

but the likeness is entirely superficial, and the scientific ichthyologist should be no more misled than would be the scientific therologist by the likeness of the marsupial and placental mammals." The ancestors of the Sucking Fishes may have taken, as many fish do, to sheltering under large floating objects, eventually resting the head and back against them and holding on by the dorsal fin. But how the latter became flattened and expanded to form the laminae, framed in a sucker, and how these acquired characters were transmitted to later generations is beyond explanation. Even as far back as Eocene times, there were Sucking Fishes (*Opisthomyzon*) not much unlike those of today. Perhaps millions of years



Development of the disk in young Sucking Fishes. (After A. V. Taaning.)

to between three and four feet in length. The Sucking Fish is a commensal rather than a parasite, generally catching its own fishy food, but it may feed on scraps from a ship's galley or the "crumbs" which fall from the shark's table. It takes any fish bait, fights when hooked, and is itself good to eat.

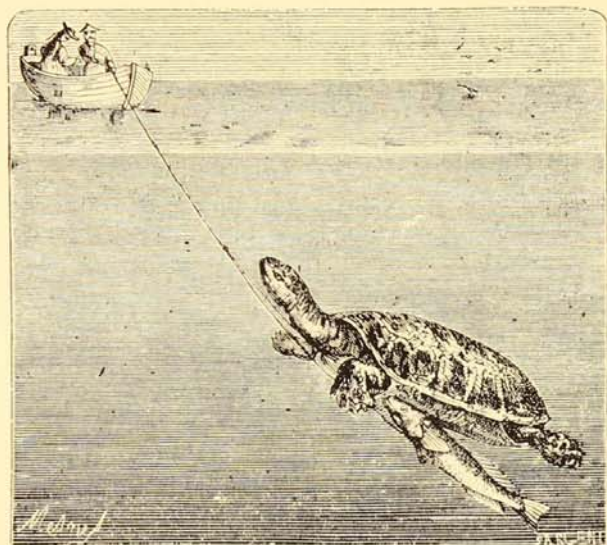
Sucking Fishes may have evolved from some ancestor resembling the Sergeant Fish or Black Kingfish (*Rachycentron*). Apart from the sucker, there is a superficial likeness between the two, but their deep-seated characters (skeleton, anatomy, etc.) are very different. Theodore Gill rather scornfully criticized those who sought a close affinity between the two fishes and concluded: "It is true that there is a striking resemblance, especially between the young—almost as great, for example, as that between the placental mouse and the marsupial *Antechinomys*—

hence, the *Remoras* may become degenerate parasites. The development from egg to juvenile sheds some light on the evolution of the disk from the dorsal fin. Though a popular saying affirms that "a sucker is born every minute", it was not until 1926 that the eggs and early larval stages of Sucking Fishes were traced. A few very young specimens were found amongst the thousands of tow-nettings collected by Danish ships in the Atlantic.

The eggs are evidently spawned in summer-time and the newly hatched fry up to about one-third of an inch long have no disk and float in the open seas; soon an oblong structure appears and moves forward towards the top of the head, the laminae develop and in a fish three-quarters of an inch long the disk was level with the eyes. At about one and a quarter to one and a half inches in length, *Remora* joins its host. Other species have

different growth rates and in at least one species, the middle rays of the tail-fin are lengthened in young specimens but not in old ones.

Sucking Fishes apparently have no effective enemies; their attachment to sharks is protection in itself. They cause little inconvenience to their hosts, slowing them down a little or perhaps irritating their gills and causing swordfish to leap in an effort to be rid of them.



Fishing for Turtle with the Remora. (After Adams.)

Barbour mentions having seen a giant dolphin which, to rid itself of a sucking fish, rubbed it off against the side of a vessel at Port Said and then, making a

quick turn-over backwards, snapped up the fish and ate it.

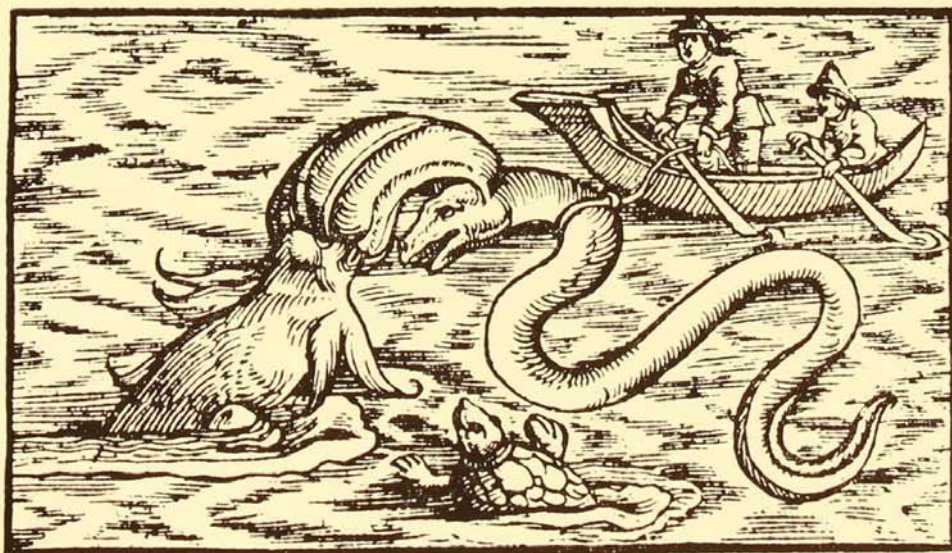
A legendary battle between Remora and a Salamander was related in Cyrano de Bergerac's "Voyage to the Sun". A parasitic crustacean on the Sucking Fish has been featured in this MAGAZINE (Vol. iii, 1927, p. 139 and fig.).

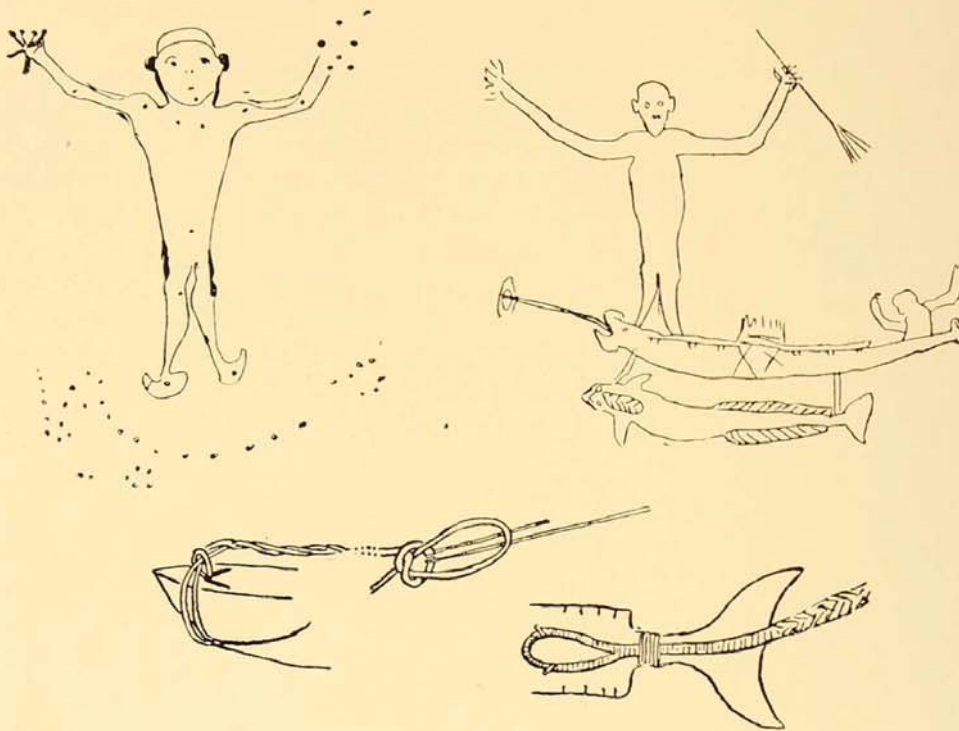
The idea of using a fish to catch fish occurred to several native races in different parts of the world, including Torres Strait. A line is made fast to the tail of a captive Sucking Fish which is released so that it swims towards a turtle, crocodile or shark and attaches itself thereto. By pulling in the Sucking Fish the capture is made, or, in the case of a turtle, the native may use the line as a guide to help him attach a stronger rope.

Fishing with the Remora was first described by Peter Martyr, who saw it with Columbus in West Indian waters in the fifteenth century. The first picture, rather an imaginative one, published by Gesner in 1558, is here reproduced.

Amongst the Torres Strait Islanders a constellation known as *Tagai* or *Togai* was recognized, the stars appearing like a man standing in a canoe with its anchor and Sucking Fish. Four stars in the tail of Scorpio formed the body of the Sucking Fish whilst its head was near the Pleiades. The natives also engraved the Sucking Fish's likeness on pearl shells, on drums and in wood. In the Torres Strait

The earliest illustration of fishing with the Remora. The sucker on the head is fancifully depicted as a sort of reversible hood or cape. (From Gudger, after Gesner, 1558.)





The Constellation of the Canoe-man and the Sucking Fish. (From drawings by a native of Torres Strait.) Also, mode of attachment of the line to the head (lower left) and tail (lower right) of the *Leptecheneis* used in fishing. (After Haddon.)

and at Fiji the natives regarded the Sucking Fish as having almost human reasoning power and Abbé Rougier relates how a Fijian would invoke the Remora to go and catch him such and such a fish and confidently expect to call back the next day to collect it.

An extraordinary legend that Sucking Fishes were responsible for holding back the progress of ships was current for many years. The ancient Greeks seem to have started it but there is much confusion amongst old accounts with lampreys, marine growths and even molluscs or barnacles. The poet Ovid referred to the little Echineis or Sucking Fish which hinders ships. The earliest figure of Remora or Echineis as a shipholder appeared in the *Hortus Sanitatis* of 1497 and the history of the legend has been traced by Dr. E. W. Gudger (*Annals and Magazine of Natural History* for October, 1918) in scholarly detail.

At the battle of Actium a Sucking Fish was thought to have stopped Anthony's ship, putting him at a disadvantage against Caesar.

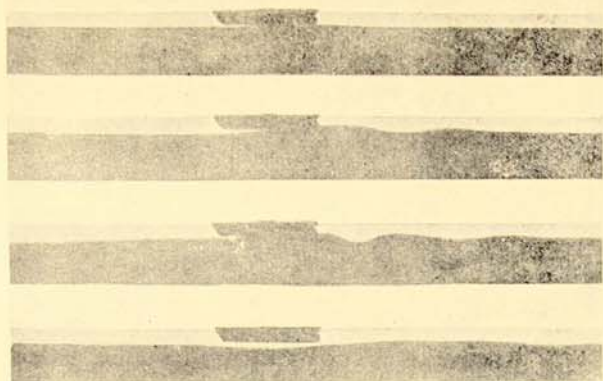
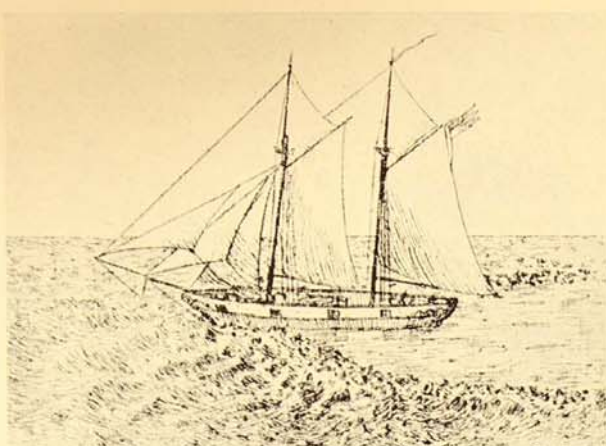
Pliny asserted that the death of the Emperor Caligula was presaged by a Remora stopping his great galley on his

voyage to Antium. The Emperor's fury that such a small fish on his rudder could impede his mighty progress under sail and with 400 rowers can well be imagined.

Small wonder that later generations regarded the Sucking Fish as another device of the Devil to harrass poor seamen.

The explanation of the "shipholder" myth is not marine growths slowing a ship's progress, nor the presence of Remoras on rudder or hull, nor magnetic rocks or supernatural forces, neither was their delay due to longshoremen. The explanation is to be found in what sailors call "dead water" in which a sailing vessel is "stuck fast" in the sea in spite of a brisk breeze which may be blowing her companion vessels at a normal speed. It feels as if something were fastened to the ship and holding it back.

"Dead water" is caused by fresh water flowing over the heavier salt water; a vessel when moving at slow speeds generated large waves in the boundary between salt and fresh water and the resistance of these speeds was anomalously increased, retarding the vessel. When in "dead water", boat, rudder and the surface layer of fresh water are all moving forward at the same rate, hence the vessel



A ship in "dead water" and, below, diagram showing boat in fresh water (light) over salt water (dark). In A, B and C the ship is embedded in "dead water" with boundary waves steadily increasing in size; in D the velocity of the boat has increased sufficiently to free it from "dead water". (After Ekman, from Gudger.)

loses steerage. A change in speed (through freshening wind, or by engine) may cause the ship to pass the critical velocity, the boat is suddenly clear of "dead water", and the waves disappear.

The fish Remora did not stop at ship-ping hold-ups: its delaying actions were believed to be efficacious in law-suits and even cases of child-birth so that plaintiffs and other interested persons of old stayed away from the fish markets lest the mere sight of a Remora have an unlucky effect. The Sucking Fish was even used in love philtres and when preserved in salt was believed able to draw up gold from the bottom of the deepest well. These fables were seriously retailed down to the time of Rabelais and have been used figuratively in classical literature. Jeremy-Taylor advises: "A gentle answer is an

excellent remora to the progresses of anger, whether in thyself or others."

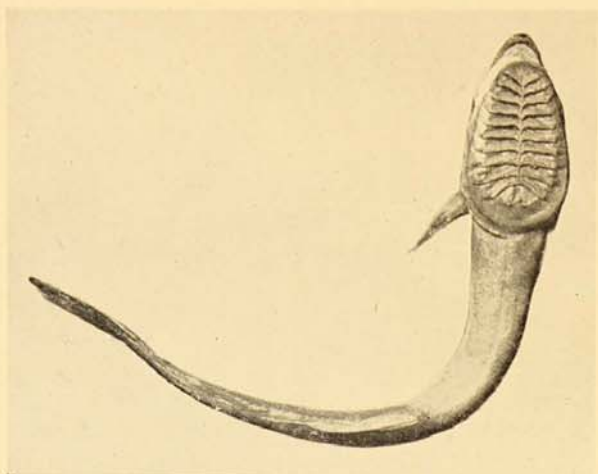
The habits of Sucking Fishes tend to divorce them from the usual laws governing the distribution of marine animals; they seem to prefer tropical and warm seas but can probably be carried enormous distances on ships if not on whales and fishes.

An anonymous author in *Walkabout* magazine (October 1, 1945, page 36) relates how some *Leptecheneis neucrates* accompanied his boat for three months during which it covered 600 miles in the Gulf of Carpentaria and the trip was only ended by the docking of the vessel.

Sucking Fishes belong to the Order Discocephali, family Echeneidae. Ten genera have been named, but the latest, *Pseudoremorea*, was described in Russian, and I know of no illustration of it. Various authors have tried to classify the species, some considering that there are only two principal ones, others that there may be nearly fifty separate kinds in the world. A compromise between these extremes is probably nearest the truth. There are no native Australian species, so far as known, and almost any foreign kind might appear in our waters. Dampier was the first to figure* an Australian "Remora taken sticking to Sharks' backs" in the seventeenth century, and another was illustrated in White's *Voyage to New South Wales* (1790, p. 296, pl. —, fig. 3). In some copies of Griffith's edition of Cuvier's *Animal Kingdom*, 1834, there is a plate of the "Australasian Remora" and there are scattered references to Australian Sucking Fishes in fish literature. The local species have not been dealt with together in one article until now, so that a few notes on each may be of interest. Specimens, especially if accompanied by particulars of locality and host, would be welcomed by any museum.

1. The Slender Sucking Fish, *Leptecheneis neucrates* (Linné). This is the commonest species, the *Gapu* of the Torres Strait Islanders, the "Austral-

* Reproduced in this MAGAZINE, Vol. v, No. 6, 1934, p. 213, fig. 6.



The rare Louse Fish (*Phtheichthys lineatus*) from North West Islet, Queensland.

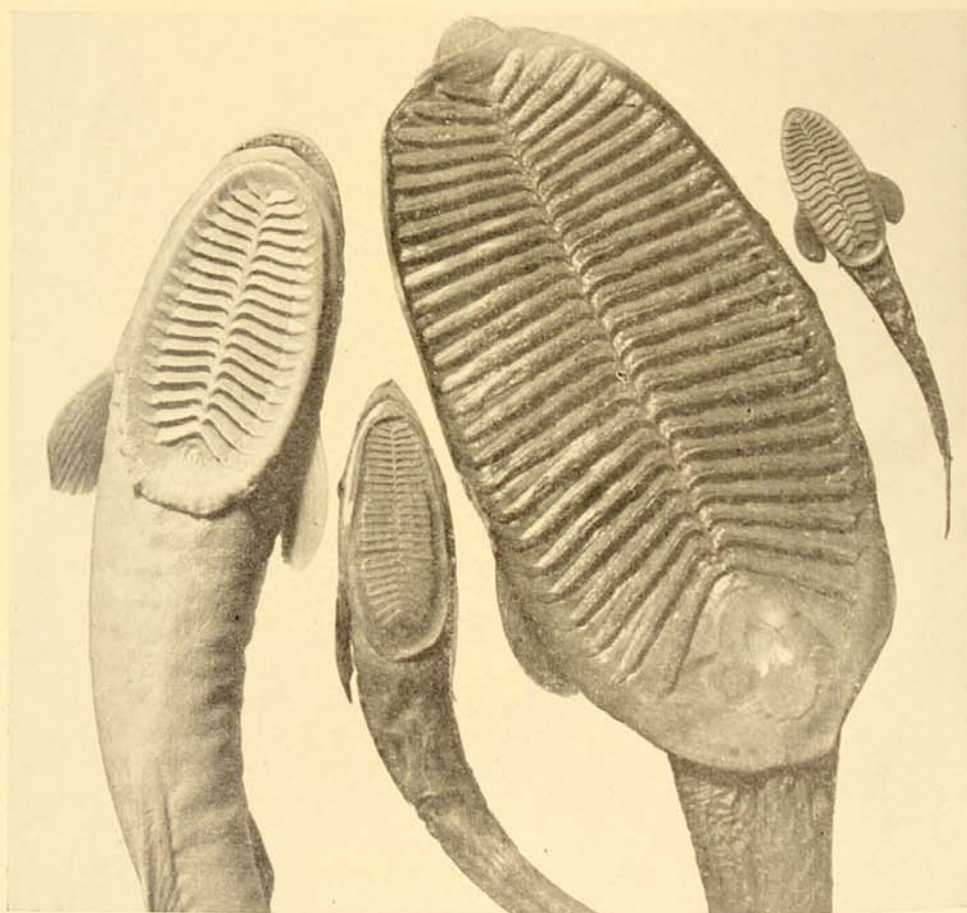
asian Remora" of Griffith, found around the northern shores of the Commonwealth and in other warm seas. Usually about 24 laminae on disk but said to vary from 21 to 28. Colour, greenish to grey or brown, generally cream-striped. Young ones with middle fin-rays of tail black and prolonged; adult with tail slightly

bilobed. Pectoral fins pointed. Grows to 3 feet long.

2. The Louse Fish, *Phtheichthys lineatus* (Menzies), is probably the rarest of all the Sucking Fishes. A small, slender, striped species with only 10 or 11 laminae; the only Australian specimen known was found by me at North-West Islet, Queensland, in May, 1931, but no host was noted. It is 4 inches long, has a black central lobe on tail and pointed pectorals. This species has been recorded from New Zealand and other places and seems to prefer Sea Pike or Barracuda (*Sphyræna*) for its transport. It grows to 20 inches long.

3. The Stout Sucking Fish, *Echeneis remora* (Linné). This and the succeeding species are round-bodied, not so elongate as Nos. 1 and 2, and plain-coloured, usually uniform plum, brown, or grey to blue-black. Game fishermen often find *Echeneis remora* on Black Marlin Swordfish or on Tiger Sharks. Usually 17 to 18 laminae, disk ending before or about tip

The disks on top of the heads of Sucking Fishes. 1. *Echeneis remora* from Fremantle, W. Australia. 2. *Leptecheneis neucrates* from Darwin, Northern Territory. 3. *Remilegia australis* from the Cape of Good Hope. 4. *Rhombochirus osteochirus* from unknown locality.



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of pectoral fin. Length to 17 inches. Specimens in the Australian Museum from New South Wales, Lord Howe Island, New Hebrides and Pitcairn Island. Straggles to Tasmania and South Australia. Pectorals rounded, soft. Middle fin-rays of tail not longer than outer ones. Figured in White's *Voyage to New South Wales*.

4. *Rhombochirus osteochir* (Cuvier). Deep violet-grey; fins and tail blackish, obscure whitish spot on lower lobe of tail. Pectorals rounded, with pectoral rays enlarged and stiffened. Laminae 18, disk extending beyond end of pectorals. Eye tiny. Tail-fin rounded or concave. Known from north-western Australia but can be added to the Queensland fauna as Mr. George Coates obtained a 7½-inch one from a Marlin near Lodestone Reef. Widely distributed elsewhere, exceeding 16 inches.

5. *Remoropsis brachyptera* (Lowe). Uniform brownish to pale grey. Pectoral bluntly rounded. Laminae 16. Disk ending above front half of pectoral. Enlarged

hooked teeth. Recorded from New Zealand but can now be listed from Queensland as specimens have been taken from Marlin Swordfishes off Magnetic Island. Extra-Australian fish are reported to have 14 to 17 laminae and to grow to 12 inches long.

6. *Remilegia australis* (Bennett). Disk very large, covering head and foreparts to beyond end of pectoral fins; laminae 24 to 27. Dark slaty-blue. South and south-western Australia; probably carried by ships, the sulphur-bottom whale and other large agents. A rare species known from very scattered spots on the globe. Length 23 inches.

7. *Remorina albescens* (Temminck and Schlegel). A stout-bodied species with only 12 laminae. A small example from Albany, W.A., may be this species. Dampier's "Remora taken sticking to Sharks' backs" is possibly this, too. Length to about one foot. Usually almost colourless.

There are probably other species to be studied and recorded.

Natural History on Stamps

THE Museum has just installed a display of 192 sheets depicting Mammals, Birds, Fishes, etc., which have appeared on stamps. In view of the increasing interest in the collecting of stamps according to the subjects or scenes shown thereon, this display will make a particular appeal to all who wish to collect stamps in a new way, instead of merely collecting by countries.

This zoological display has been presented by Mr. J. Whitsed Dovey of Roseville, Sydney, and covers a representative selection of his collection of 15,000 zoological stamps, which after winning many awards at philatelic exhibitions, has now been dispersed. About 250 different zoological subjects have appeared on the postage stamps of all countries, and the modern tendency to add variety to stamp

designs by depicting some of the fauna of the country concerned is illustrated by the current Australian stamps showing a kangaroo, an emu, a kookaburra, a platypus, a lyre bird, and a crocodile, besides a merino ram and a Hereford bull representative of our pastoral and grazing industries. Previous Australian issues have featured other subjects such as a swan, a horse and a dove. In all these cases the zoological subject has been the main feature of the design. In other cases interesting zoological features are found in the borders or corners of stamps, as for example the two wrens which appear on the current 3½d. Australian stamp.

The display comprises nearly 2,000 stamps and the scientific descriptions accompanying each have been prepared by members of the Museum staff.

The Snakes of Eastlakes Golf Links

By R. MACKAY.*

Cadet Preparator, Australian Museum.

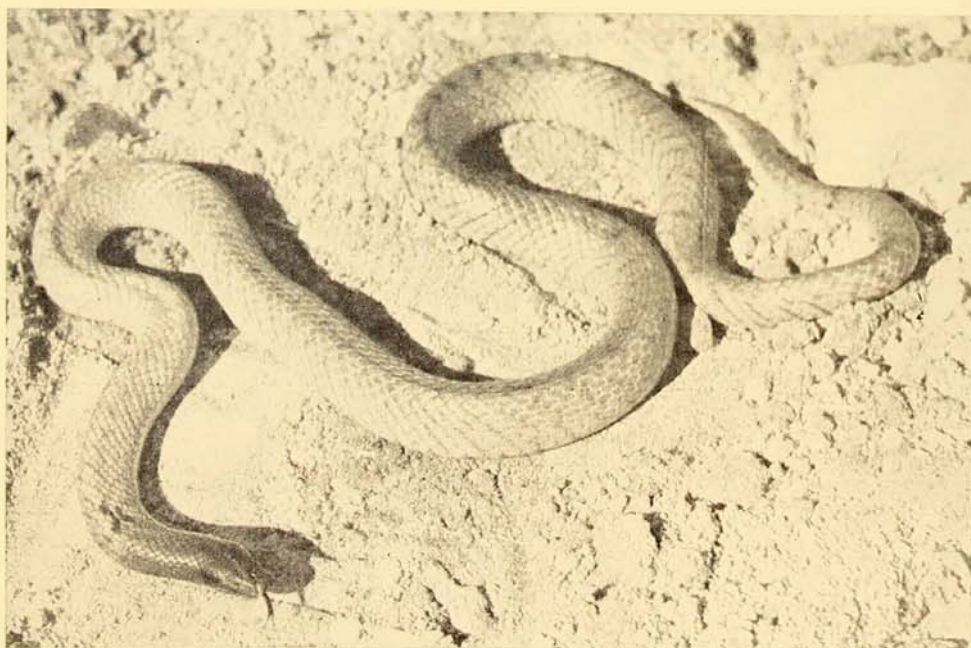
During the past year my friends and I have seen six species of snakes at Eastlakes. They are the Blind Snake, Whip Snake, Brown Snake, Black-bellied Snake, Black Snake and Tiger Snake.

We have seen the Blind Snake only once at Eastlakes. This specimen was found in the sand under a sheet of roofing iron. The length of this species, *Typhlops polygrammicus*, is usually twelve to fifteen inches, but occasionally ranges to thirty inches. At a glance the head and tail are indistinguishable, but a closer examination will show two dark dots at one end where the rudimentary eyes are placed and when the specimen is alive a white or pale pink tongue is protruded frequently. At the end of the tail, which is only about a half to three-quarters of an inch long, there is a pointed spur which digs into the earth to give the snake some purchase while it is

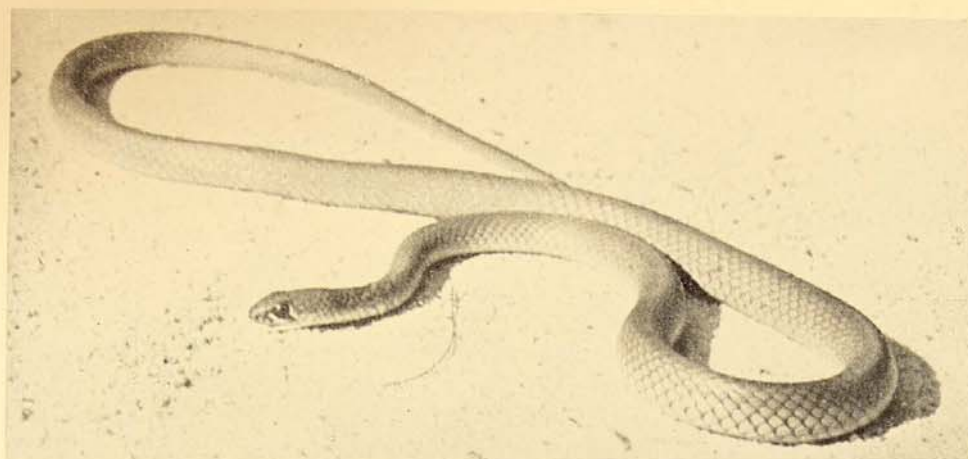
tunnelling through the earth. Its principal food is ants and ants' eggs. In coloration and general shape it is not unlike an oversized earthworm for which it has often been mistaken.

The Brown Snake (*Demansia textilis*) was once very common throughout Eastlakes and surrounding districts, but due to the advancement of settling they have been killed until there are only a few in isolated patches. A month or two ago I came across one, chasing it up and down a hillside until it vanished. This species must be one of our fastest, if not the fastest. About eighteen per cent. of persons bitten have died, yet attacks have been few, for this snake usually glides away swiftly from sight. It possesses a highly toxic venom, but its very short fangs could barely pass through thickish material. Some of the Brown Snakes of the south Sydney area have dark bands across the body, giving it the appearance

* Photographs by Margaret Lovett.



The Brown Snake is one of our most dangerous snakes. It attains a length of seven feet. The young are banded and are frequently mistaken for the Bandy Bandy Snake.



The Yellow-faced Whip Snake is venomous but not dangerous. While the average length is about twenty inches, three feet is not unusual and occasionally much longer ones are seen.

of a Tiger Snake. This banding is characteristic of most of the young brown snakes, but usually it fades away in adult specimens. The greatest known length for a Brown Snake is seven feet two inches and the one at Eastlakes would hardly exceed four feet.

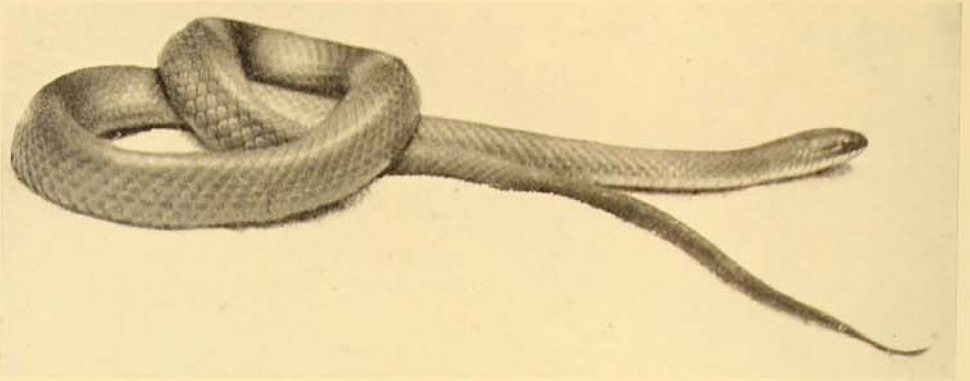
A close relative of the Brown Snake called the Yellow-faced Whip Snake (*Demansia psammophis*) is fairly common in the rocky areas around Sydney but is rare at the golf links. While collecting alone at Eastlakes, I caught the only one observed; it was about eighteen inches long and was very active. The average length of whip snakes found around Sydney is twenty inches, but they are known to grow to a length of almost six feet. It is most often found under rocks on high, dry ground, but the one at Eastlakes, like one or two others I have captured, was found under a sheet of iron on sandy soil. The Whip Snake is very nervous and active and when first captured, if not handled carefully, will bite, but delivers no serious consequences. Like its relative the Brown Snake, the Whip Snake feeds mainly on lizards, but the Brown Snake varies its diet with an occasional rat or mouse. A short time ago a friend of mine saw a six-foot Brown Snake swallowing a full-grown Blue-tongue Lizard at East Lindfield. The Whip Snake eats the "Stripy" lizards, the Metallic Skink and a few of the smaller skinks.

Another small snake, called the Black-bellied Snake (*Denisonia signata*), is

found very commonly at Eastlakes. It is mistaken by the layman for the Whip Snake, but a close inspection will show the different colours, markings and shape. It is stouter and does not grow to as great a length. Until recently the record length for this snake was thirty inches, but a specimen has been caught recently at La Perouse which exceeded three feet. I have caught one specimen of this snake twenty-seven inches long and this snake came from Eastlakes. The Black-bellied Snake is the commonest snake at Eastlakes, if not around Sydney. Some people call this snake the Marsh Snake, as it is mainly found round the edges of swamps or in marshes, but I have found them a couple of times on the sides of hills hundreds of yards from water. At Eastlakes they are found under pieces of tin, roofing iron and boards. They are found under stones in the rocky areas around Sydney. Their food consists mainly of the smaller lizards but they will not hesitate to eat small frogs and tadpoles. They are very in-offensive reptiles but if handled roughly they may bite. A good bite feels like the sting of a bull-ant. Of course, no serious consequences arise from such a bite other than swellings and a feeling of nausea which passes away after a few hours.

Next on the list is the Red-bellied Black Snake (*Pseudechis porphyriacus*) which is classed as one of our dangerous reptiles. Statistics show that about one per cent. of bites are fatal. This is one of the

The Black-bellied Snake is the most common snake around Sydney. It is only slightly venomous but is not dangerous. Its average length is about thirty inches.

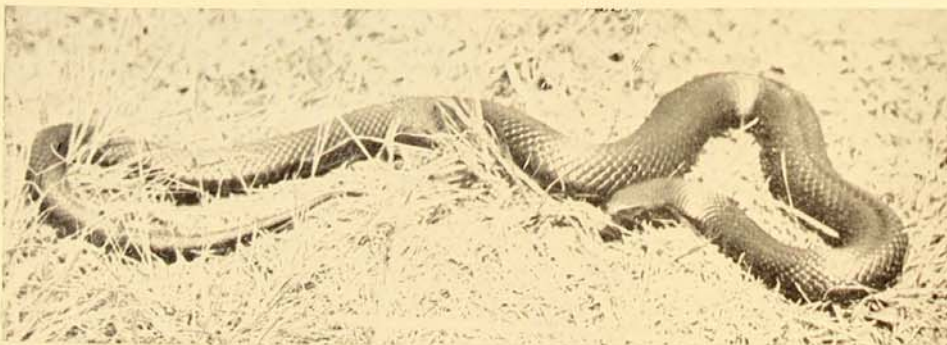


commonest snakes around Sydney, yet only two were caught at Eastlakes. One of these was four feet long, the other about three and a half feet long with a stump tail. These were the only Black Snakes encountered in this area. The two specimens which were caught are alive and very tame. One snake will take frogs from the hand. Frogs are the main item on the Black Snake's menu, although it likes young rats for a delicacy.

The record size for the species is eight feet four and a half inches. A Black Snake which has just shed its skin is a beautiful creature. The black upper parts look like velvet and when the sun shines on its skin a mass of iridescent colours are reflected. This is in striking contrast to the bright red shining scales of the undersurface. This snake, like the preceding one, lays living young; the number of young from the Black Snake varies from about eight to forty. It is never found far from water, for which it will not hesitate to make if antagonized. It is an excellent swimmer and has been known to catch and eat fish,

including eels, while swimming beneath the surface. When enraged a hood is spread at the neck region which shows its relationship to the cobras. The two specimens from Eastlakes were found in the open; one was at the edge of a swamp and making up a sandy bank for a rat-hole, which it managed to crawl down partway but was soon dug out. The other was caught while trying to escape in the middle of the same swamp. It was first seen coiled up on a tussock of grass basking in the sun.

I have purposely left the Tiger Snake till last as I would like to dwell upon it a little longer than I have done with the other species. Our main object in collecting at Eastlakes is to try and capture Tiger Snakes (*Notechis scutatus*) and see if we can find any more Black Snakes. At Eastlakes there are three colour variations of the Tiger Snake. One has a cream background and brown bands which stand out quite distinctly, in a healthy snake, right to the base of the tail, which is a uniform dirty brown. The next two variations have a yellow

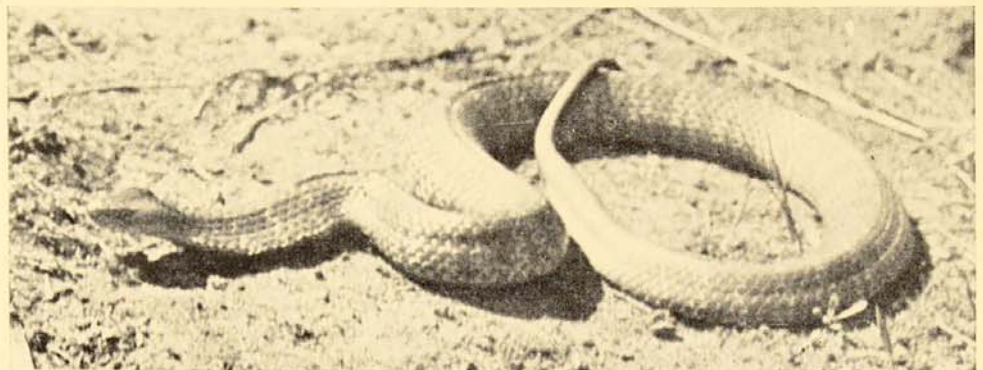


The Red-bellied Snake, popularly considered as very dangerous; about one per cent. of bites prove fatal. The average length is from four to five feet, but seven feet is not unknown.

background. The background colour extends the full length of the belly scales as well as under the bands. In the latter two variations the bands are reddish brown. One of these variants has the bands extending to the base of the tail and the other possesses bands only to the first half of the length of the body. Here the colour is the same as the tail which is either reddish brown or with a tinge of olive colouring. The head of all variations is of a greenish colour, some-

The venom of the Tiger Snake is the most potent venom of any known land snake. This does not mean that it is the deadliest snake in the world, because it does not inject as great a quantity of venom into its victim as some of the other snakes such as the cobra and kraits. Weight for weight the venom is more potent than that of the cobra. The record authentic length for a Tiger Snake is five feet eight inches. At Eastlakes Tiger Snakes are found at the edges of

The Tiger Snake, one of our most venomous, is plentiful at Eastlakes. It attains a length of five feet or more.



times with a reddish brown tinge. An enraged snake is one to be careful with. Usually they are seen crawling away as fast as possible. They can easily be picked up and dropped into a sugar bag in this case. Once in a while a Tiger Snake will be found which will not simply glide away and this snake usually flattens his neck nearly as broad as that of a cobra, to which it is a close relative. It does not strike at anything presented to it as does the Brown Snake but waits until an unwary hand is put too close, then it strikes with a vengeance and very seldom misses.

the lakes or high up on any of the hills or under large sheets of iron. During the past year about fifteen, excluding babies, have been collected. The largest Tiger Snake we have captured at Eastlakes is about four feet. This was caught on one of the islands below (south of) the dam. Adult Tiger Snakes feed exclusively on rats and mice. The young feed on small frogs and lizards. Tiger Snakes are viviparous and lay from nine to ninety young.

The Eastlakes area is one of the very few areas around Sydney where so many different species are found together.

THE articles "Spiders Harmful to Man", by A. Musgrave, which appeared in the two previous issues of THE AUSTRALIAN MUSEUM MAGAZINE, are being reprinted as one. They will be on sale shortly at the nominal price of 6d., postage 1½d. extra.

Mining Old and New in Western New South Wales

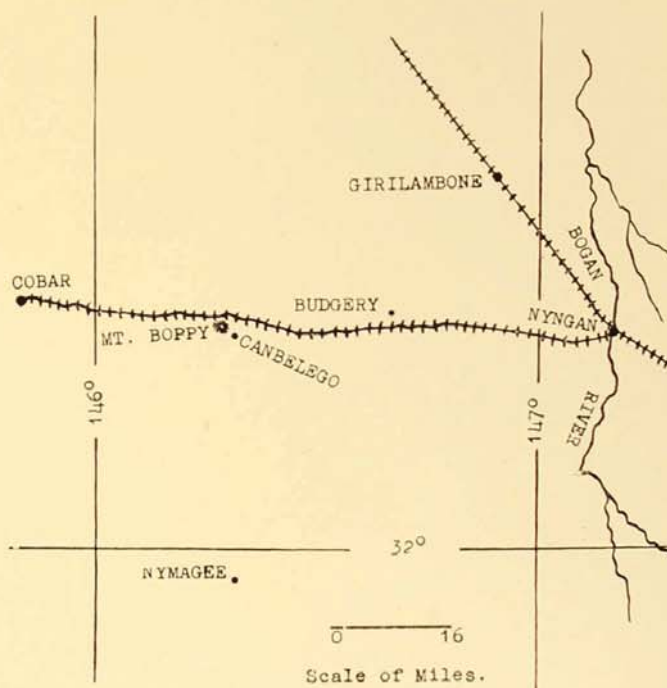
By R. O. CHALMERS

COBAR.

IN October, 1948, the writer had the fortunate opportunity of accompanying Messrs. Daly and Newman of the Geophysical staff of the Commonwealth Bureau of Mineral Resources on a tour of inspection of many old mining centres in Western, Central and Southern New South Wales. In the sub-arid western division of the State Cobar and Canbelego were visited. These are notable names in the mining history of New South Wales, and lie in the central and highest part of the Cobar shield. This name was first coined by the late E. C. Andrews, a former Government Geologist and Trustee of the Museum. It is a low curved plateau measuring approximately 180 miles from north to south and 150 miles from east to west. Over this area rocks of Palaeozoic Age (in age from 350 to 500 million years) outcrop, although frequently they are covered by surface soil. The shield lies between the Darling, Bogan and Lachlan Rivers, but no large streams traverse its area. The shield is a unit of the western plains and to the north and west passes under the Black Soil Plains, which consist of alluvium deposited by the River Darling. To the south it is covered by the extensive alluvial plains of the Riverina. To the east it merges gradually into the Eastern Highlands. Canbelego at an elevation of 1,000 feet is three miles from Mt. Boppy, a railway station 458 miles distant from Sydney on the branch line from Nyngan. Cobar, at an elevation of 800 feet, lies 27 miles further to the west and is the terminus of this line.

This railway line was not built till 1892, yet prospecting at Cobar had begun in 1869, and such was the richness of the

copper ores that by 1876 a company was working the Great Cobar, the most important of the numerous mines in the district. The difficulties were great. Blayney, the nearest railhead at the time, was nearly 300 miles distant, although the

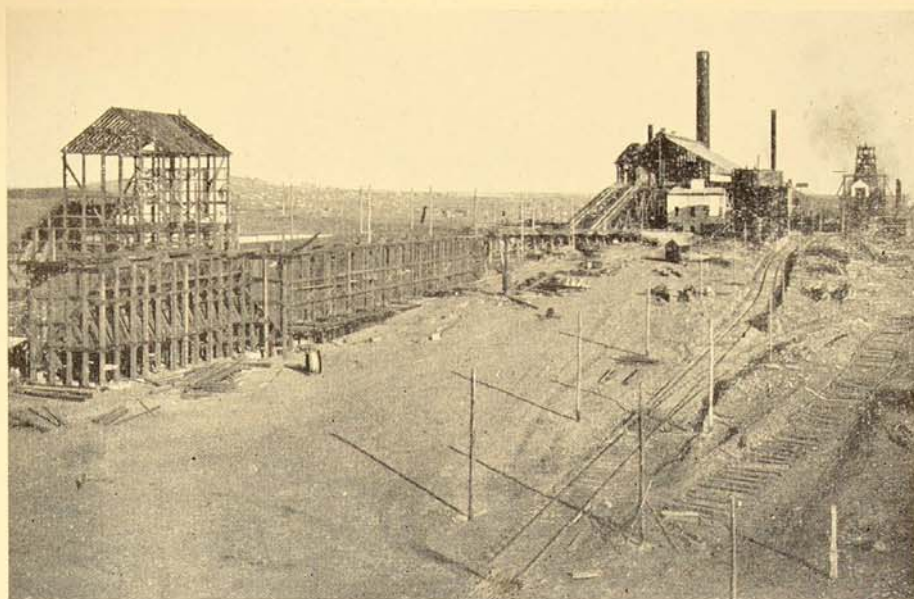


The area designated the Cobar Shield by the late E. C. Andrews.

transport problem was overcome in part by carting the ore by bullock team to Bourke and sending it from there by river steamer to South Australia for treatment. The absence of natural drainage channels on the Cobar shield and the aridity of the climate made the water problem a pressing one. The average rainfall over thirty years at this time was only 15 inches per year. Periodical droughts reduced the annual rainfall to less than 10 inches, and this, together with a drop in the price of copper and great transport costs, caused

The Great Cobar Mine in 1907, when new plant was in course of construction. The 200-foot-high main stack towers above the smelters and the main shaft is on the extreme right. At this time a new main shaft was being sunk to a depth of 1000 feet but cannot be seen. To-day little remains other than the skeletons of a few buildings, the main stack and the great slag dump which extended out on the other side of the smelters.

Photo.—N.S.W. Mines Department.



a complete cessation of mining in 1889. The extension of the railway to Cobar in 1892 and improved methods of smelting the ores led to prosperity again and the Great Cobar Mine continued to lead the field carrying on even through the disastrous drought years of 1897-1903, when all the other mines had to close. This period of prosperity lasted until 1920, and the mine had reached a depth of 1,500 feet, when it became obvious that mining could not be carried on at a profit due to a number of factors, the principal ones being the drop in the price of copper at the end of the war and the high freight and treatment charges. By 1922 the machinery of the Great Cobar, installed at enormous cost, had been sold as scrap. The Cobar field, which had produced £7,500,000 worth of copper and £4,000,000 worth of gold, was entirely deserted and the once flourishing Cobar became a "ghost" town.

Our approach to Cobar through Tottenham, Nymagee and Canbelego in 1948 was in a good season and it was hard to picture what the conditions would be like in drought. There was a reasonable covering of grass though it could not be called lush or abundant. The trees were in good condition. The two that attracted attention immediately were the shapely White Pine (*Callitris robusta*) and that most valued shade tree in the west, the

Wilga (*Geijera parviflora*), also beautifully shaped and the pendant foliage neatly trimmed by sheep to a uniform level round the bottom. Even now the country is still somewhat bare in the vicinity of the former big mining centres like Cobar and Canbelego due to the wholesale cutting down of trees in the past for mining timbers.

Cobar has recovered considerably from the complete slump of the 1920's. In 1935 the Occidental Mine, which produces only gold and no copper, once again began production following the increase in price of gold of the early 1930's. It has worked steadily ever since under the name New Occidental. During the war years the Chesney was reopened and is still producing gold and copper today. Only recently it was announced that in view of the recent further increase in the price of gold a deep diamond drilling programme would be carried out along the line of lode on which these two mines work. A considerable prolonging of the life of the field is confidently expected as a result of this.

In other parts of the Cobar field some distance away from the major mines a big exploration programme is being undertaken by one of Australia's major mining companies with the active co-operation of both the Commonwealth and State authorities. Geophysical and geo-



A geochemical method is being used to supplement geophysical and geological prospecting. Dr. V. P. Sokholov, the central figure, is in charge. Here samples are being taken from the bottom of holes eighteen inches deep. Though the soil is dry and rocky, a thick carpet of wild daisies can be seen.

Photo.—R. O. Chalmers.

logical methods are being employed and these are supplemented by an interesting geochemical method of prospecting introduced to Australia by Dr. V. P. Sokholov of the United States Geological Survey, who was in Cobar at the time of my visit. Soil samples are taken over an already surveyed area, at points where geophysical methods have shown promising indications at depth. The samples are then taken to a nearby laboratory, treated with acid to extract the soluble content, and the percentage of copper determined by a rapid chemical method wherein the phenomenon observed is a colour change in the solution following the addition of a special chemical reagent. The intensity of colour depends on the percentage of copper. The method is so rapid that many hundreds of samples can be tested if desired. The results when plotted on a map may show a concentration of copper in a certain area indicative of the presence of an underlying ore body that does not outcrop at the surface.

Short as was our stay in Cobar, extremes of climate were experienced. A very hot spell was brought to an end by a typical red-dust storm accompanied by slight showers that ushered in quite cold weather and set Cobar people the unenviable task of removing a thick mantle of dust from all their household belongings. Unpleasant as were the conditions on leaving, we looked back at this little flat-

lying town still dominated by the 200-foot-high stack and huge slag dump of the Great Cobar Mine with the thought that its former period of importance and activity may well come again.

CANBELEGO.

Canbelego is the complete "ghost" town today with one hotel, two stores and few houses. Yet from the beginning of the century until 1921 it was the scene of operations of the rich Mount Boppy mine which was the most celebrated and consistent producer of gold in New South Wales during the period. As at Cobar, prospecting for both gold and copper had gone on intermittently since 1879 in the face of the great difficulties brought about by lack of water. The rich Mount Boppy lode was discovered in 1896 and, like the Great Cobar Mine, was able to keep working through the ensuing five years' drought. The gold was associated with quartz in the form of a U-shaped ore body, that is an inverted saddle in mining parlance. The shape of the ore body conformed to the great folds developed in the old slates and sandstones by great natural compressive forces in past geological time. By 1921, when the mine had reached a depth of more than 800 feet and had produced £1,800,000 worth of gold averaging a steady eight pennyweights a ton, the bottom of the trough was reached. Drilling showed no gold values

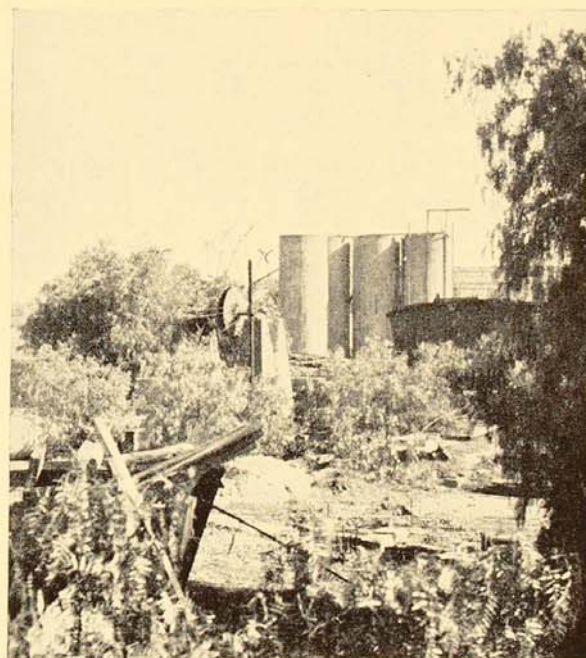
The new plant at Canbelego built to re-treat the old dump of sands from the Mount Boppy Mine.

Photo.—
R. O. Chalmers.



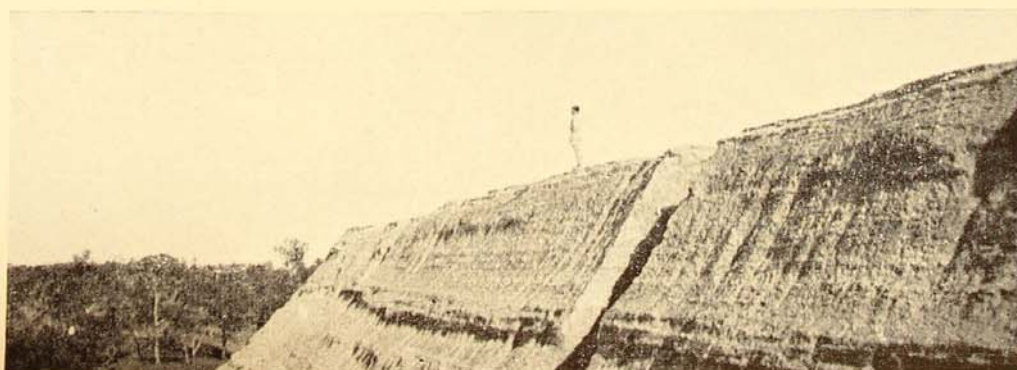
below the trough and it also had no great lateral extent. Intensive prospecting all through the productive years had shown no similar saddle reefs in other fold systems in the vicinity, which might have been expected. The mine had to be closed down and all transportable plant was sold. The chief feature in the town of Canbelego is the great dump of sands representing the waste from the treatment plant after the gold had been extracted. This is in the shape of a huge pyramid of rectangular outline with the top part, of course, greatly truncated. To the south of the dump lie the ruins of the old plant and the sites of the two former main shafts. The pithead equipment has gone completely. To the north is a new plant erected in 1939 to retreat this dump which is estimated to contain some 600,000 tons still carrying two penny-weights per ton. This ceased work during the war years.

Mr. W. A. Medway, Chief Attendant of the Museum, worked in the Mount Boppy



Portion of the remains of the former treatment plant of the Mount Boppy Gold Mine. The top of the old dump can be seen to the right of the concrete tanks.

Photo.—R. O. Chalmers.



Part of the dump of sands from the old treatment plant of the Mount Boppy Gold Mine. The face has been eroded by rain.

Photo.—
R. O. Chalmers.

mine in 1911 and, briefly, he has described the life of the town to me. Every week-end, bicycle racing, the miners' chief sport, went full swing. He also tells of the bare-fist "grouch" fights, frowned on by the police but which took place just the same nearly every Sunday out in the pine scrub attended by hundreds of spectators.

What is left of the old mining plant is a depressing sight. Grass and small trees have grown over the foundation blocks of former buildings and large pieces of equipment that could not be transported and sold such as tanks and the remnants of the big battery that had sixty head of stamps. It was difficult to imagine the activity of former days in this town which once had a population of 2,000.

Australian Insects. XXXVIII

Coleoptera 15 — Heteroceridae, Lathridiidae, and Endomychidae

By KEITH C. McKEOWN.

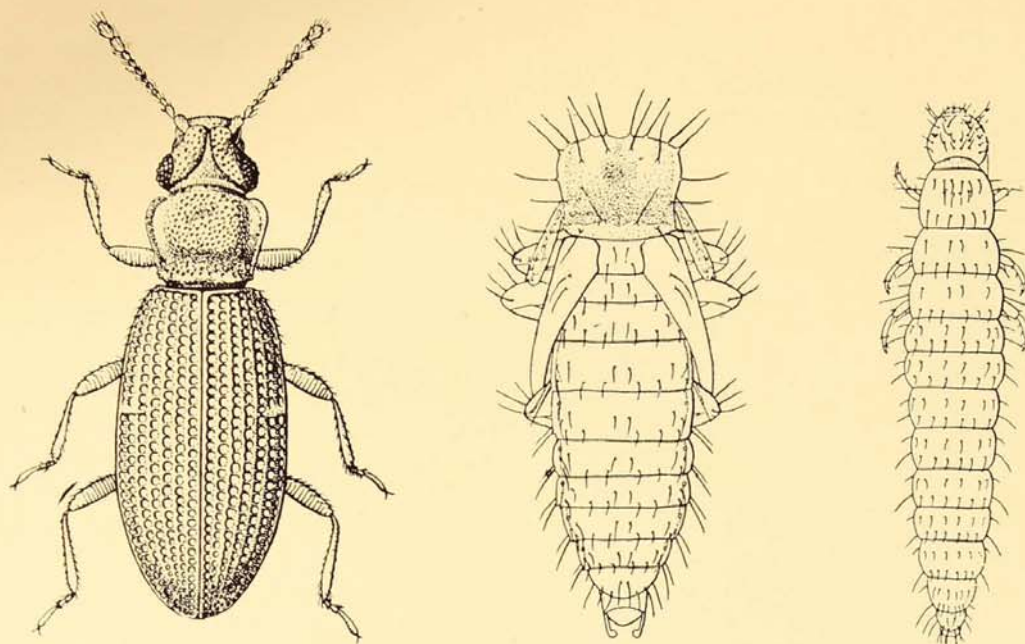
A VERY wide field of study awaits the naturalist who has the time and opportunity to work out the life-histories of some of the small families, the members of which are little known. There is little doubt that strange discoveries await anyone who has the patience to observe and to record his findings; he will also have the satisfaction of knowing that any such discoveries will "break new ground". Three of these hitherto neglected families, the Heteroceridae, Lathridiidae and Endomychidae, are included in the present article of this series.

The family Heteroceridae includes only nine species from Australia. These are small, hairy beetles with the legs spined and adapted for digging; their antennae are short, with the last seven joints forming a rather toothed club; the tarsi (feet) are all four-jointed. Both the adult insects and their larvae live in galleries which they excavate in the soft mud bordering ponds and streams. The larvae are slender, with the thoracic segments much broader than the abdomen, and the mandibles are very prominent.

Of their habits and food nothing is known. Most of the Australian species are placed in the genus *Heterocerus*, and *H. flindersi* Blkb. is our commonest and most widely distributed among them.

The position of this strange little family is obscure; Tillyard places it between the Bostrychidae and the Lathridiidae, but comments that "they have a general resemblance to the Dryopidae". Imms puts the Dryopidae before the Hydrophilidae, the Heteroceridae immediately following the latter group. I am inclined to believe that Imms' classification is a more natural one, and indicates their affinities more clearly.

Thirty-four species of Lathridiidae have been described as native to Australia, but a number of others have been introduced from other lands; these forms, many of them cosmopolitan, have been more closely studied than the native insects for they infest stored food products. They are all minute insects with three-jointed tarsi, and antennae with a club formed of the last three segments. The elytra (wing-covers) are deeply and strikingly sculptured in many species.



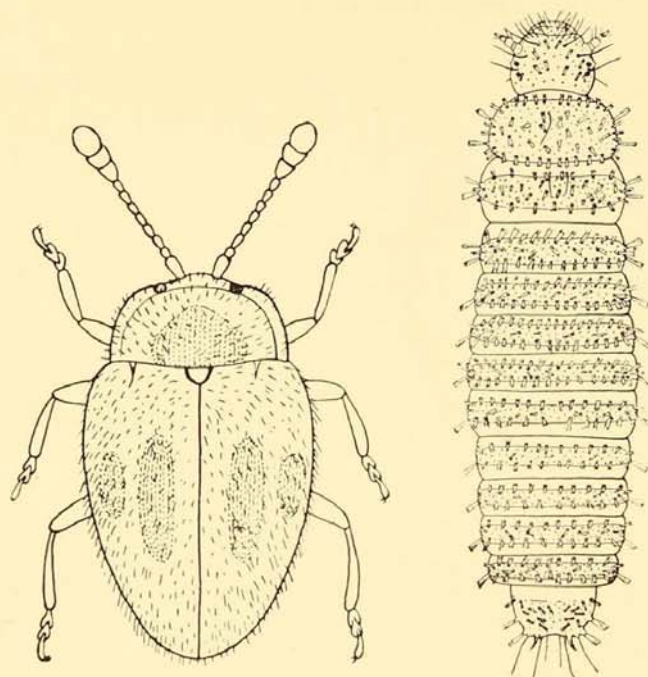
Left: *Cartodere filum*, a beetle of the family Lathridiidae, which has been introduced into Australia. (After Hinton.)
 Centre: Larva of *Cartodere filum*. (After Hinton.)
 Right: Pupa of *Cartodere filum*. (After Hinton.)

The small larva and pupa are white and studded with stiff bristles; their appearance, and that of a typical adult, are well shown in the accompanying illustrations, which show the three stages of *Cartodere filum* Aubé, a cosmopolitan species which occurs in Australia.

As mentioned, the Lathridiidae infest stored plant and animal matter, but they do not do them any direct injury, feeding only upon the moulds and other micro-fungi. Where they occur in food they dirty it, and are objectionable for that reason. The food of both larva and adult is similar. The native species, which live in the bush, feed on moulds on decaying vegetable matter, on bark, and in the nests of ants and termites. Some of the situations in which *C. filum* has been found will illustrate the adaptability of these insects; they have been found in fungi, in herbaria, in damp houses, on damp walls, on mouldy wallpaper, in stored grains, in dried beer yeast, on mouldy bread, in stored drugs, and in soup powder. The spores of some moulds pass through the alimentary canal of the beetle to survive and germinate.

The female of *C. filum* lays at least twenty eggs, which hatch in six or seven

days. The larval period lasts for some twenty-four days; the pupal state varies from seven to eight days, although some workers say "about two months". The shortest life-cycle recorded is thirty-six days, but its duration depends upon temperature, humidity and other factors.



Left: *Stenotarsus 5-notatus*, a typical beetle of the family Endomychidae. (After Tillyard.)
 Right: A typical larva of an Endomychid—that of *Mycetaea hirta*. (After Hinton.)

Lathridius and *Corticaria* are the principal Australian genera. The Australian *Coninomus bifasciatus* Reitter has been found in Europe in stored tobacco.

The Endomychidae are small to medium sized beetles, broadly oval to almost round, and may have the elytra marked with orange or black spots. The family is represented in Australia by about thirty species. The tarsi appear to be three-segmented throughout, but have actually four, one being reduced to a small nodule; this is actually the third joint of the foot.

The larvae are variable in form, ranging from slender and almost cylindrical to more or less oval insects. The pupa of only one species, of European

origin, seems to have been described. Essentially forest insects, both larvae and adults feed on fungi and moulds, but species have been recorded from lichens and in the nests of ants, but they are usually found under bark or among mouldy leaf débris. Nothing is known of the life-histories of our species, most of which belong to the genus *Stenotarsus*. *S. 5-notatus* Lea is a striking little beetle with black blotches upon an orange ground; the wing covers (elytra) are distinctly hairy. The accompanying illustration gives a good idea of the appearance of this insect, which is fairly typical of the group. *S. arithmeticus*, another of commoner species, bears a marking like the figure 3 upon each elytron.

THE Curator of Mammals, Mr. Ellis Troughton, returned in November from six months' long service leave abroad. Mr. Troughton spent some time at the British Museum of Natural History examining recent collections from the Austro-Pacific region, and especially the various species associated with the wartime investigations of scrub typhus and the mammal reservoirs of the infection in New Guinea. As a representative nominated by the Linnean Society of New South Wales, Mr. Troughton attended the International Technical Conference for the Protection of Nature, held at Lake Success, L.I., under the sponsorship of U.N.O., from 22nd to 29th August, 1949.

Delegates also attended meetings of the U.N. Scientific Conference on the Conservation and Utilization of Resources, embracing water, soil, minerals, flora and fauna, and fire control. Subsequently the delegates, representing some forty nations, were guests of the United States Government during a week's tour in the States of Alabama, Ohio, and Tennessee, inspecting national and commercial establishments, the reafforestation of the open-cut coal-mining areas, and the vast hydro-electric project of the Tennessee Valley

Authority. Important benefits observed were malaria control, and fish, wildlife, forest and recreational developments.

During a fortnight spent in Washington as guest of Dr. David H. Johnson, Curator of Mammals at the U.S. National Museum, collections of mammals were examined, especially those obtained by Dr. Johnson, who accompanied the recent expedition to Arnhem Land. Several weeks were spent in New York at the American Museum of Natural History, observing new features in gallery exhibition, and in examining the Richard Archbold New Guinea and Cape York collections with the Mammalogist, Dr. G. H. H. Tate, who had accompanied the expeditions and has frequently studied our Australian Museum collections. While visiting the New York Zoological Park Mr. Troughton "paid his respects" to the two survivors of the three platypuses which made their sensational American début in April, 1947, and are thriving under the conditions set out by naturalist David Fleay, who was responsible for the remarkable feat of transportation.

Brief visits were made to the museums at Philadelphia, Chicago, Los Angeles and San Francisco.