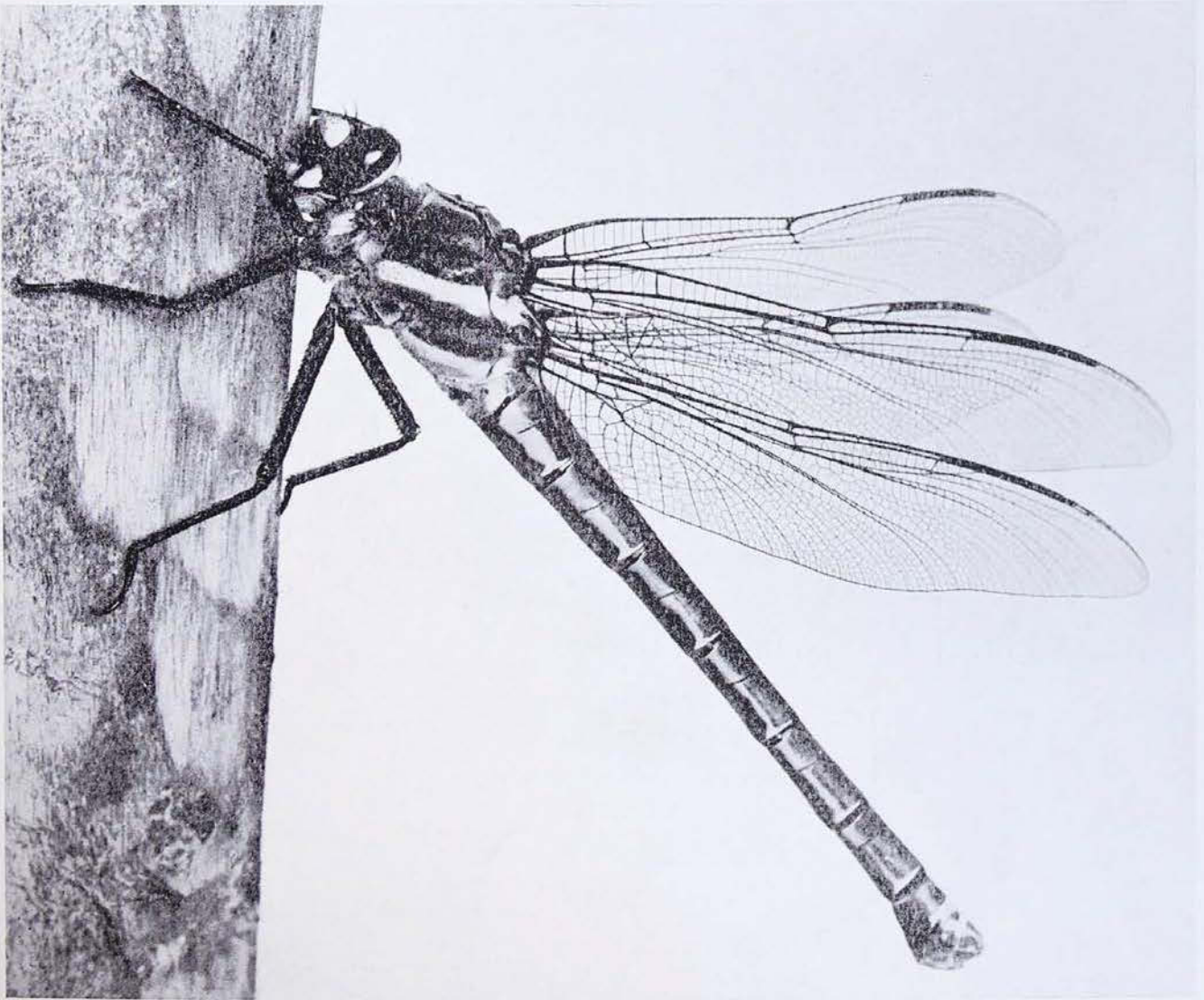




# The AUSTRALIAN MUSEUM MAGAZINE

Vol. XI, No. 6

Price—TWO SHILLINGS



*Petalura gigantea*, one of Australia's largest species of dragon-fly.

# THE AUSTRALIAN MUSEUM

HYDE PARK, SYDNEY

---

## BOARD OF TRUSTEES

### PRESIDENT:

H. B. MATHEWS, B.A.

### CROWN TRUSTEE:

H. B. MATHEWS, B.A.

### OFFICIAL TRUSTEES:

THE HON. THE CHIEF JUSTICE.  
THE HON. THE PRESIDENT OF THE LEGISLATIVE COUNCIL.  
THE HON. THE COLONIAL SECRETARY.  
THE HON. THE ATTORNEY GENERAL.  
THE HON. THE COLONIAL TREASURER.  
THE HON. THE SECRETARY FOR PUBLIC WORKS.  
THE HON. THE MINISTER OF PUBLIC INSTRUCTION.  
THE AUDITOR-GENERAL.  
THE PRESIDENT OF THE NEW SOUTH WALES MEDICAL BOARD.  
THE SURVEYOR-GENERAL AND CHIEF SURVEYOR.  
THE CROWN SOLICITOR.

### ELECTIVE TRUSTEES:

PROF. A. N. St. G. BURKITT, M.B., B.Sc.  
FRANK B. SPENCER.  
O. G. VICKERY, B.E., M.I.E. (Aust.).  
WALLACE C. WURTH, C.M.G., LL.B.  
PROF. A. P. ELKIN, M.A., Ph.D.  
F. McDOWELL.

R. J. NOBLE, M.Sc., B.Sc.Agr., Ph.D.  
E. J. KENNY, M.Aust. I.M.M.  
F. L. S. BELL, M.A., F.R.A.I.  
FRANK W. HILL.  
G. A. JOHNSON.  
PROF. P. D. F. MURRAY, M.A., D.Sc.

---

### DIRECTOR:

A. B. WALKOM, D.Sc.

### Assistant to the Director:

J. R. KINGHORN, C.M.Z.S.

### SCIENTIFIC STAFF:

Birds, Reptiles and Amphibians: J. R. KINGHORN, C.M.Z.S., Curator; J. A. KEAST, M.Sc., Assistant Curator.  
Mammals and Skeletons: E. Le G. TROUGHTON, F.R.Z.S., C.M.Z.S., Curator.  
Fishes: G. P. WHITLEY, F.R.Z.S., Curator.  
Insects and Arachnids: A. MUSGRAVE, F.R.Z.S., F.R.E.S., Curator.  
Molluscs: JOYCE ALLAN, F.R.Z.S., Curator; D. F. McMICHAEL, B.Sc., Assistant Curator.  
Crustacea and Other Groups: F. A. McNEILL, Curator; ELIZABETH C. POPE, M.Sc., C.M.Z.S., Assistant Curator.  
Minerals and Rocks: R. O. CHALMERS, A.S.T.C., Curator; J. F. LOVERING, M.Sc., Assistant Curator.  
Fossils: H. O. FLETCHER, Curator.  
Anthropology: F. D. McCARTHY, Dip.Anthr., Curator.

### LIBRARY AND PUBLICATIONS:

MARGARET W. FRASER.

### DEPARTMENT OF PREPARATION:

J. KINGSLEY.

### HONORARY SCIENTIFIC STAFF:

#### Zoologists.

Asst. Prof. E. A. BRIGGS, D.Sc.  
H. LEIGHTON KESTEVEN, D.Sc., M.D.  
MELBOURNE WARD, F.R.Z.S., F.Z.S.  
TOM IREDALE.

#### Entomologist.

T. H. GUTHRIE.

#### Ornithologist.

K. A. HINDWOOD, C.F.A.O.U., F.R.Z.S.

#### Archaeologist.

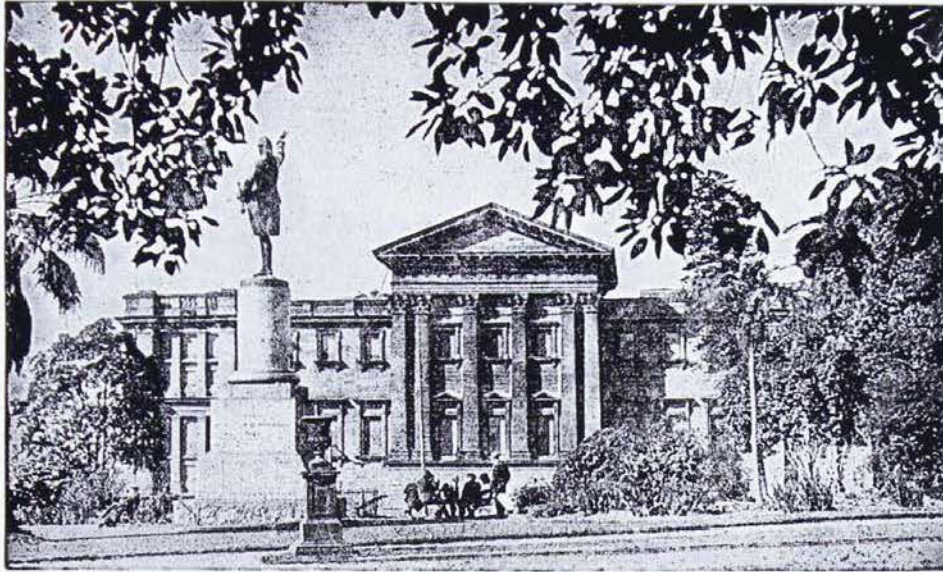
Prof. J. L. SHELLSHEAR, M.B., Ch.M

#### Numismatist.

G. C. HEYDE, A.S.T.C., F.R.N.S.

#### Philatelist.

FRANK W. HILL.



# THE AUSTRALIAN MUSEUM MAGAZINE

WOOD CARVING, NORTHERN RHODESIA .. .. .	<i>Frontispiece</i>
PALOLO: FOOD WORM OF THE PACIFIC— <i>Frank McNeill</i> .. .. .	173
THE INTRODUCED GREY SLUG— <i>Joyce Allan</i> .. .. .	175
A GLIMPSE INTO THE PAST: FIELD INVESTIGATIONS AT SHEA'S CREEK— <i>H. O. Fletcher</i> .. .. .	177
POUNAMU AND TANGIWAI: THE GREENSTONE OF NEW ZEALAND (Part 1)— <i>Frederick D. McCarthy</i> .. .. .	179
GOGGLE-EYED MANGROVE FISH— <i>G. P. Whitley</i> .. .. .	187
POPULAR SCIENCE LECTURES: 1954 SERIES .. .. .	188
BALI: EMERALD GEM OF THE INDIES—III— <i>Frederick D. McCarthy</i> ..	189
SNAKE WITH FUNGOID GROWTH— <i>J. R. Kinghorn</i> .. .. .	193
ARE HUSSARS EDIBLE?— <i>G. P. Whitley</i> .. .. .	194
THE MARSUPIAL "TIGER CAT": BIRTH AND GROWTH IN CAPTIVITY— <i>Ellis Troughton</i> .. .. .	200
A SHY NOCTURNAL PROWLER— <i>Frank McNeill</i> .. .. .	203
LUNCH-HOUR FILM PROGRAMMES .. .. .	204
BOOK REVIEW: A BIRD BOOK FOR THE POCKET .. .. .	204
DEATH OF GENERAL SIR CHARLES ROSENTHAL .. .. .	204

(Photography, unless otherwise stated, is by Howard Hughes, A.R.P.S.)

● OUR FRONT COVER. A specimen of *Petalura gigantea*, a black and yellow dragon-fly, from Jamberoo Mountain, New South Wales. *Petalura gigantea*—one of Australia's largest species of dragon-fly—is recorded by the late Dr. R. J. Tillyard from New South Wales, where it is stated to be rare. It has been taken from the Blue Mountains, Moss Vale and Sydney, during November to January. The specimen illustrated was between four and five inches long. The "most robust species known", according to Tillyard, is the allied *Petalura ingentissima* Tillyard, from the Atherton Tableland, North Queensland.



Wood carving of a woman, in an unusual sitting pose, holding a bowl, from the Awemba tribe, Northern Rhodesia. It is fourteen inches high and was received by the Australian Museum in 1912.

# THE AUSTRALIAN MUSEUM MAGAZINE

Published by the Australian Museum

College Street, Sydney

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

Annual Subscription, Post Free, 8/6

VOL. XI, No. 6.

JUNE 15, 1954.

## *Palolo*: Food Worm of the Pacific\*

By FRANK McNEILL.

THE story of the fabulous Palolo Worm of Polynesia and Melanesia has always been one of intriguing interest to naturalists. Its phenomenal behaviour has, of course, been known for centuries by native populations, but discovery by Europeans did not take place until 1857. There is already much of a detailed and general nature published on the subject, but every now and then new and fascinating data come to hand which seem worthy of recording. An example of this is the story recently told to the writer by Mr. C. Sorenson, who was born in the Fiji Island group. His observations are of value because of their local significance, and can be enlarged upon at a later stage in this article. At first it will be as well to introduce this remarkable worm and give an outline of its unique habits.

The creature provides a classical case of what zoologists term "lunar periodicity". It possesses such a rhythmic productivity that spawning consistently occurs each year in the month of November, always on a day or so following the full moon. Often there occurs what can be called a token spawning, to be followed by the major phenomenon, when countless millions of the greenish worms appear in the sea—long, thin and bristle-footed. Actually, these are only broken lengths of the hind

parts which become free in vigorous movement through crevices in the coral rock on the sea floor. The freed lengths have earlier become swollen with the reproductive elements and when these break off from the main body of the worms, new hind portions are grown. The latter will, in their turn, develop eggs, swell and break off when another annual spawning day arrives. The sexual products escape into the sea in a very violent manner from the broken worm ends, entailing a rupture of the tissues which contain them. Soon afterwards the empty part bodies sink to the bottom to die and decay.

Native populations await a spawning period with anticipation and joy. To them the worms are a bounteous supply of food and a greatly esteemed delicacy.

There is ample warning of an imminent spawning. Accounts have referred to the water becoming turbid, but Mr. Sorenson is much more explicit in his eye-witness story of this condition in the sea at Tokau Reef, Ovalau I., Fiji. At this place he has observed many of the spawning phenomena, and told of a brown coloured scum suggesting an exudation from the hidden worms in the coral rock which appears in patches three to four days before. When this washes ashore and concentrates along the water line, it emits a sickly decaying odour, and this can be detected a hundred or more yards away. While the scum is present the natives avoid eating red-coloured reef fish

\* See also Thorpe, W. W., *The Palolo Worm*, AUSTRALIAN MUSEUM MAGAZINE, Vol. 1, No. 7, p. 220.



Palolo worms of Polynesia; called Balolo in Melanesian parts. Massed hind portions of the animals as freed from crevices in coral rock during an annual spawning period.

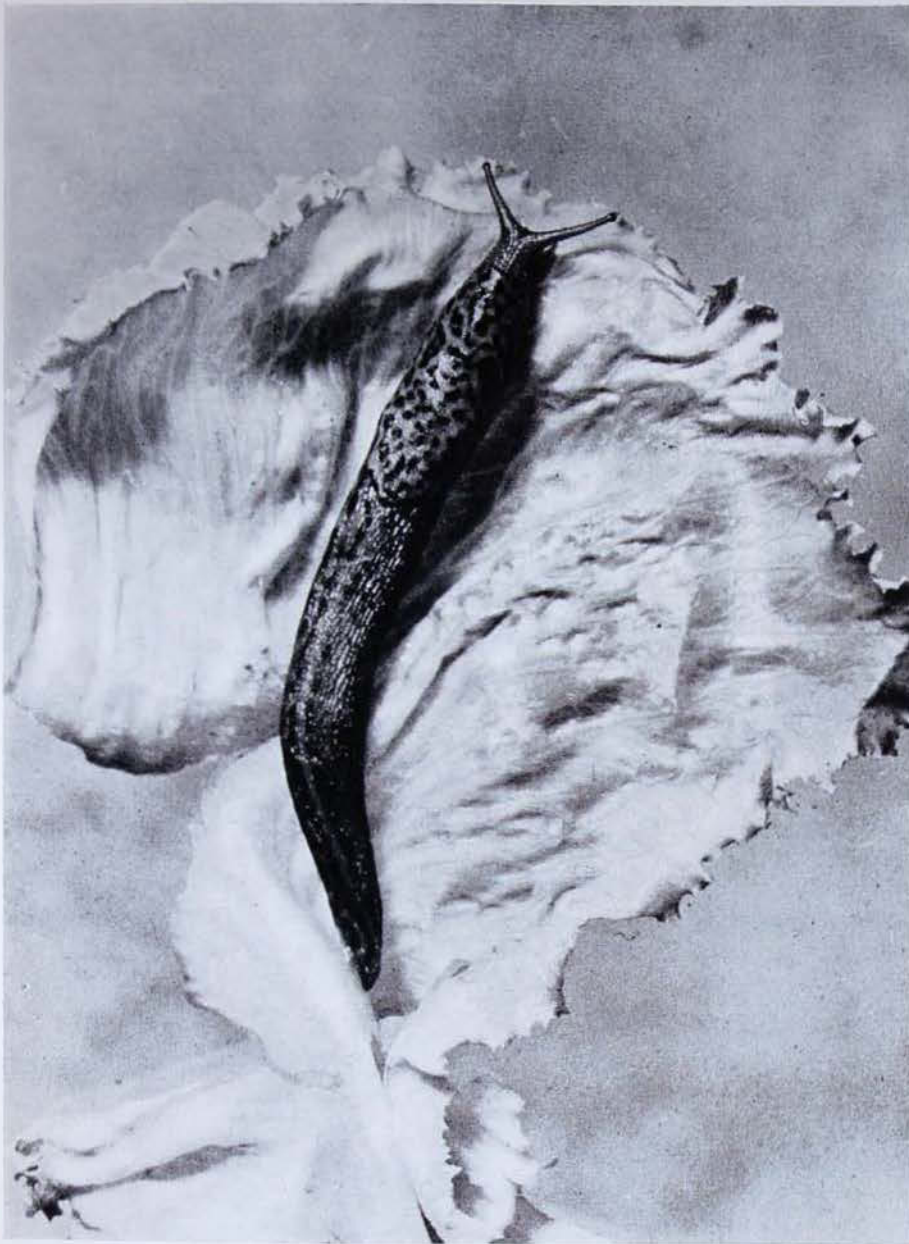
and trevally, as well as certain surface fish, including the local barracuda (giant pike). Even for about a week after, there are some (especially the Europeans) who avoid eating any kind of fish. While Mr. Sorenson claimed that the conditions attending a worm visitation made fish food unwholesome and actually dangerously poisonous, he stated that uncertainty existed as to whether the scum in question or the actual eating of spawning worms brought this about.

At Ovalau Island there were regularly two risings of the worms each year. The second or major one was referred to by the natives as the Big Balolo (Melanesian spelling), when the shallows two to three feet deep over the reef were crowded with the worms in dense patches, acres in extent. The phenomenon occurred between 3 a.m. and 4 a.m., and with the light of a torch the massed worm lengths are seen to rise out of the coral rock in thick rope-like columns, expanding at the top like plumes of smoke. At this stage individuals may be up to two feet long, but soon after reaching the surface they break up into shorter lengths. Final complete disintegration, death and putrefaction follow soon after the coming of daylight and the rising of the sun.

The natives of Ovalau collect the worms literally in tons, lifting them into their craft with hand nets and any suitable kind of utensil available to them. Some of the catch is eaten raw, but it is usually boiled; many local Europeans even consider it a delicacy. Because of the flavour, it is possible to prepare the worms into a sort of mock oyster soup. They may also be fried in batter, and thus likened to fish cakes, or eaten cooked with scrambled eggs.

Mr. Sorenson disclosed that Samoans were frankly crazy about Palolo (Polynesian spelling)—much more so than Fijians. It is their custom to gather quantities in excess of their needs and, with modern facilities of refrigeration, arrange for its export to friends and relatives in New Zealand.

While it is usual for only two risings of Palolo worms to occur at the end of each year, as was regular for the Tokau Reef area at Ovalau Island, there appear to be rare departures from this rhythm. One such is reported by Mr. Sorenson for Wakaya Island, about ten miles away from Ovalau Island, where four risings overlapped 1953 and 1954, the last occurring in January after the third quarter of the moon.



The introduced grey slug (*Limax maximus*) crawling on a large lettuce leaf. This slug is an omnivorous feeder, preferring fungi above all foods. It declined to eat any of the lettuce leaf. The specimen was found at Merrylands, New South Wales.

## The Introduced Grey Slug

By JOYCE ALLAN.

IT is well over seventy years since the grey slug (*Limax maximus*), a European species that now has an almost world-wide distribution like that of the garden snail, *Helix aspersa*, was recorded as having been introduced into Australia. At the same time, a number of other Euro-

pean species of slug were recorded, all of which have become the familiar slugs of the garden, pests and otherwise. Rarely do the few native slugs Australia possesses appear in cultivated areas; when they do, it is in more rural districts. Their home is native bush.

The grey slug is very striking in appearance, and identification of it is simple. For some reason, during the last few years it has become more prevalent in New South Wales. A cool climatic change, a casual shower or fall of dew, results in almost immediate inquiries at the Museum as to its identity. The long, slender, greyish, or yellow-grey body is attractively banded and maculated with black. On its back, towards the head, is a prominent shield or mantle that covers a pulmonary chamber, a heart, kidneys and other internal structure. On the right side of the shield is a conspicuous opening, the respiratory aperture. To indicate its relationship to land snails, a small white oblong shell, less than one-half inch long, lies internally just beneath the skin on the shield. This small shell was held in high esteem by the Romans as a cure for many ailments, and as a charm against accidents and disease. When crawling, the body tapers out to a great length, as much as 10 inches, and a length of 7 or 8 inches is quite common.

Although we all know what pests slugs are in gardens, especially the small black ones, and a yellow one or two, the grey slug should not be killed on sight, on that excuse. It is very omnivorous, refusing plants containing chlorophyll, but greedily devours fungi, which food it prefers above all others. In fact, an experiment has shown that one slug rejected 157 plants out of 196 offered to it, and then only two (one being the root of carrot) were eaten with avidity. Actually, it displays a great preference for kitchen refuse, showing special partiality for custards, milk, bread, raw or cooked meats, fruit and even sugar of various types. That is why this slug so often surprises a householder as it slithers across her kitchen floor, the object in view being obviously of a gastronomic nature. Its preference for the vicinity of human habitation accounts for it taking up its abode in cellars, cracks, or outbuildings. Olfactory sense is very strongly developed, as it is in most slugs. We have one recorded example of this: a plate of dog's dinner, originally 8 feet away from a grey slug, was moved in different directions to four other positions on a lawn and the slug rapidly changed direction, as required, and eventually reached it.

Amongst many interesting letters received on the habits of this slug, an extract from a recent letter from Miss M. Osborne, Bathurst, provides some first-hand observation on its choice of food.

"It must be nearly three years since I first noticed silvery snail tracks along the hearthstone in my bedroom," writes Miss Osborne. "I always put a saucer of milk on the hearthstone for my cat to drink at night. One night I lit my light and was surprised to find a large slug drinking out of the saucer. It happened several times with long intervals between, then some tiny slugs appeared and the big one ceased to come—perhaps he (or she) had died. I discovered that they had their home in a little tunnel near the fireplace which was a hole to give place to a gas pipe long ago. Now, almost every night one slug, and sometimes two, come out of the tunnel, slide into the saucer and drink the milk. The drinking process takes quite a time, at least ten minutes . . . It is fascinating to watch them sliding over the rim of the saucer to have a drink—sometimes the cat gets in first and leaves an empty saucer. I have even seen puss and slug drinking together."

The homing faculty is strongly developed in the grey slug, which usually returns after foraging rambles to the particular spot in which it has established itself, the route of its meanderings being indicated by its glistening mucus-track—a continuous track, in opposition to the series of mucus-patches at regular intervals left by the garden snail along its route.

The grey slug has an extremely interesting sex life. It is hermaphrodite, and shortly after mating, small, yellowish jelly-like eggs are laid and buried under damp soil or in a moist situation; in a few weeks these hatch and young yellowish slugs, about one-eighth of an inch long, emerge. An excellent series of flashlight photographs of the mating of two grey slugs in a wood at night, taken by American nature photographer Lynwood M. Chace, appeared in *Picture Post*, 4th May, 1946, and aroused world-wide interest. The grey slug in the accompanying photograph was found by Mr. W. Lucas, of Merrylands, N.S.W.



# A Glimpse into the Past

Field Investigations in the "Nineties" at  
Shea's Creek, near Sydney

By H. O. FLETCHER.

**M**ORE than sixty years ago Shea's Creek was the only source of drainage for a large salt water swamp south of Alexandria, a suburb on the outskirts of the City of Sydney. The creek rose to the east of Redfern in some low sandy hills and could then be traced for a distance of three and a half miles south-south-west to where it joined with Cook's River.

Shea's Creek in those days was evidently not famed for the beauty of its surroundings, as an early report stated that "the sluggish malodorous Shea's Creek" crept through the swamp area. It was later referred to in the same report as "that odori-

ferous locality", so that it would seem that the passing of time and the progress of the city have replaced marsh and mud odours with ones of industrial origin.

The course of Shea's Creek was almost entirely through estuarine deposits which covered an area of about three and a half miles by four miles. About 1895 a decision was made to cut a canal along the course of Shea's Creek to drain the swamp area and at the same time artificially raise the level of the surrounding land. The greater part of Shea's Creek was little more than a ditch and was tidal only for about a mile and a half above its junction with Cook's River.



Scientists excavating the skull of a dugong from alluvial deposits at Shea's Creek, Sydney. This photograph, taken in 1896, shows two famous palaeontologists, the late Mr. W. S. Dun (extreme left), and, standing alongside, the late Mr. Robert Etheridge, at that time Curator and Palaeontologist of the Australian Museum.

The canal was planned to have a depth of 10 feet below low-water level with a width of 100 feet at the base and 200 feet at the top. As the mean rise and fall of the tide is about 5 feet the canal, when filled, would have a depth of 15 feet of water at high water.

During the extensive excavations for the canal some interesting discoveries were found in the estuarine deposits and these were investigated by leading scientists of that time—Mr. R. Etheridge, Curator and Palaeontologist of the Australian Museum, Professor T. W. Edgeworth David of the University of Sydney, and Mr. W. S. Dun, Palaeontologist of the Geological Survey of New South Wales. A report on the finds in the deposits by Mr. Etheridge, Professor David and Mr. J. W. Grimshaw, entitled "On the Occurrence of a Submerged Forest, with Remains of the Dugong, at Shea's Creek, near Sydney", was published in the *Journal and Proceedings of the Royal Society of New South Wales*, Volume xxx, 1896.

The accompanying illustration (by an unknown photographer) shows the scientists mentioned at work excavating the skull of a dugong found during the construction of the canal. The style of dress suitable for field-work has changed since those days and I should imagine that present-day workers in the field would find our modern style more comfortable for strenuous work. Individual taste in headgear is very pronounced in the photograph, as four styles are evident: a "boater", a "bowler", a "topper" and a "Brown Derby".

The original surface of the swamp area was covered with rank grasses and plants and some swamp oaks along its western margin. The uppermost stratum exposed in the excavations for the canal was a bed of sandy peat about 1 foot in thickness and of recent origin. Three feet below this bed

of peat an horizon of estuarine shells was found embedded in a sandy clay and extending almost uninterruptedly for half a mile.

The dugong remains were unearthed near the Rickety-street bridge at a depth of 4 feet 6 inches below the swamp level. The bones were identified as belonging to *Halicore dugong* (Gmelin) and were in an excellent state of preservation. The bones consisted of the skull, a lower jaw, twenty-six ribs and the same number of vertebrae. All these bones showed conclusive evidence of having been hacked by aborigines with stone tomahawks. The presence of stone tomahawks at various depths in the estuarine deposits is evidence in support of this opinion.

A submerged forest was discovered at a depth of about 10 feet below the swamp level. A large number of stumps of trees was found *in situ*; a few had fallen and were lying on their sides, but the greater number had roots still attached and were standing just as they originally grew. Some of the roots were traced by digging to depths of 6 feet below the actual stumps. Several stumps showed signs of having been burnt off at the top and roots also appeared charred—additional, but not indisputable, evidence regarding the presence of man during the life of the forest. Trees identified from the remains included the Swamp Mahogany and the Honey-suckle, *Banksia*.

The discovery of a submerged forest and dugong remains at Shea's Creek created a good deal of interest at the time as additional evidence was provided regarding a change of coastline level in recent times.

Another important feature of the Shea's Creek discoveries (dealt with at the time by the authors of the report on the specimens) was the evidence of the presence of aborigines at the time when the submerged forest was flourishing.

- A member of the Museum staff would be pleased to purchase the following numbers of THE AUSTRALIAN MUSEUM MAGAZINE which are now out of print: Vol. I, Nos. 1, 2, 3 and 5; Vol. VIII, No. 3 (New Guinea issue).

If any reader has copies of these numbers, in good order, which he or she would like to sell, please let us know.

# Pounamu and Tangiwai: the Greenstone of New Zealand

By **FREDERICK D. McCARTHY.**

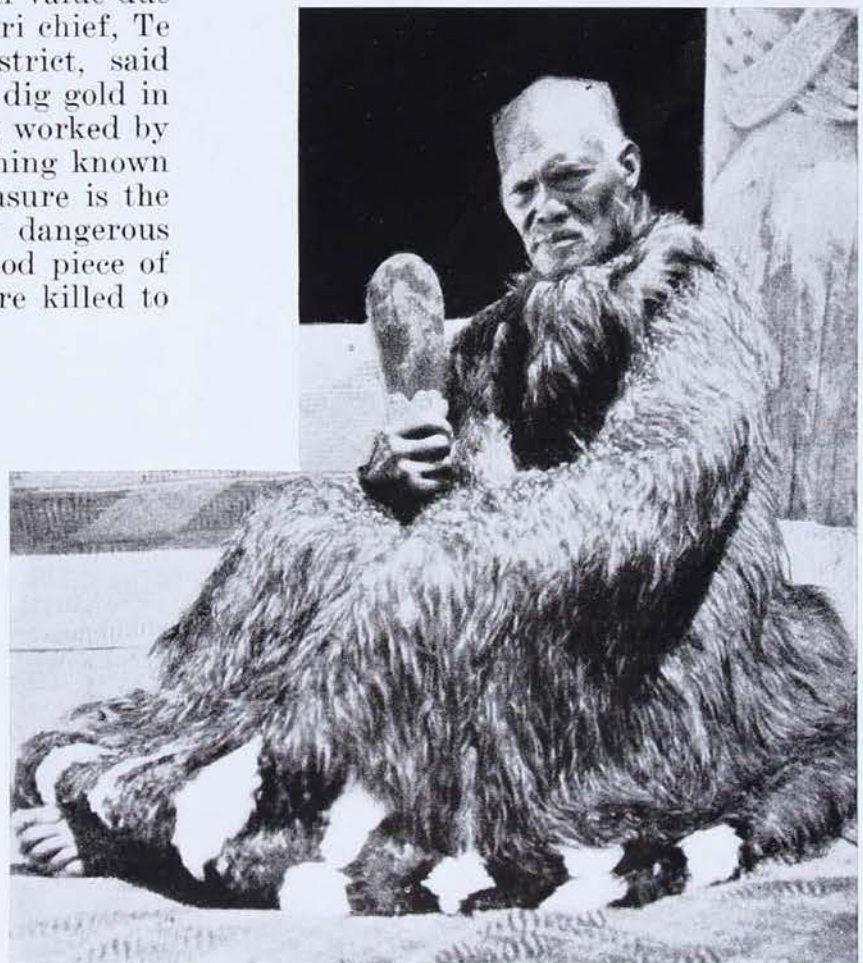
(Part 1.)

**T**HE irresistible urge of the white man for gold, despite the misery, privation and bloodshed that studs its history, is equalled by the almost fanatical desire of the Maoris for greenstone (pounamu) and in the terrible and tragic story of the South Island of New Zealand on which it is found.

Greenstone is not only a gemstone of some beauty, but it also provides implements and weapons unequalled perhaps by any other known stone. To these keenly appreciated utilitarian qualities the Maoris added the highest personal esteem, the sacred character of mana derived from their ancestors, and an historical value due to its associations. As one Maori chief, Te Otatu, of the Coromandel district, said when the white man wanted to dig gold in the Westland, "Let the gold be worked by the white man. It was not a thing known to our ancestors. My only treasure is the pounamu". It was extremely dangerous for a commoner to possess a good piece of greenstone, and even chiefs were killed to gain their renowned examples.

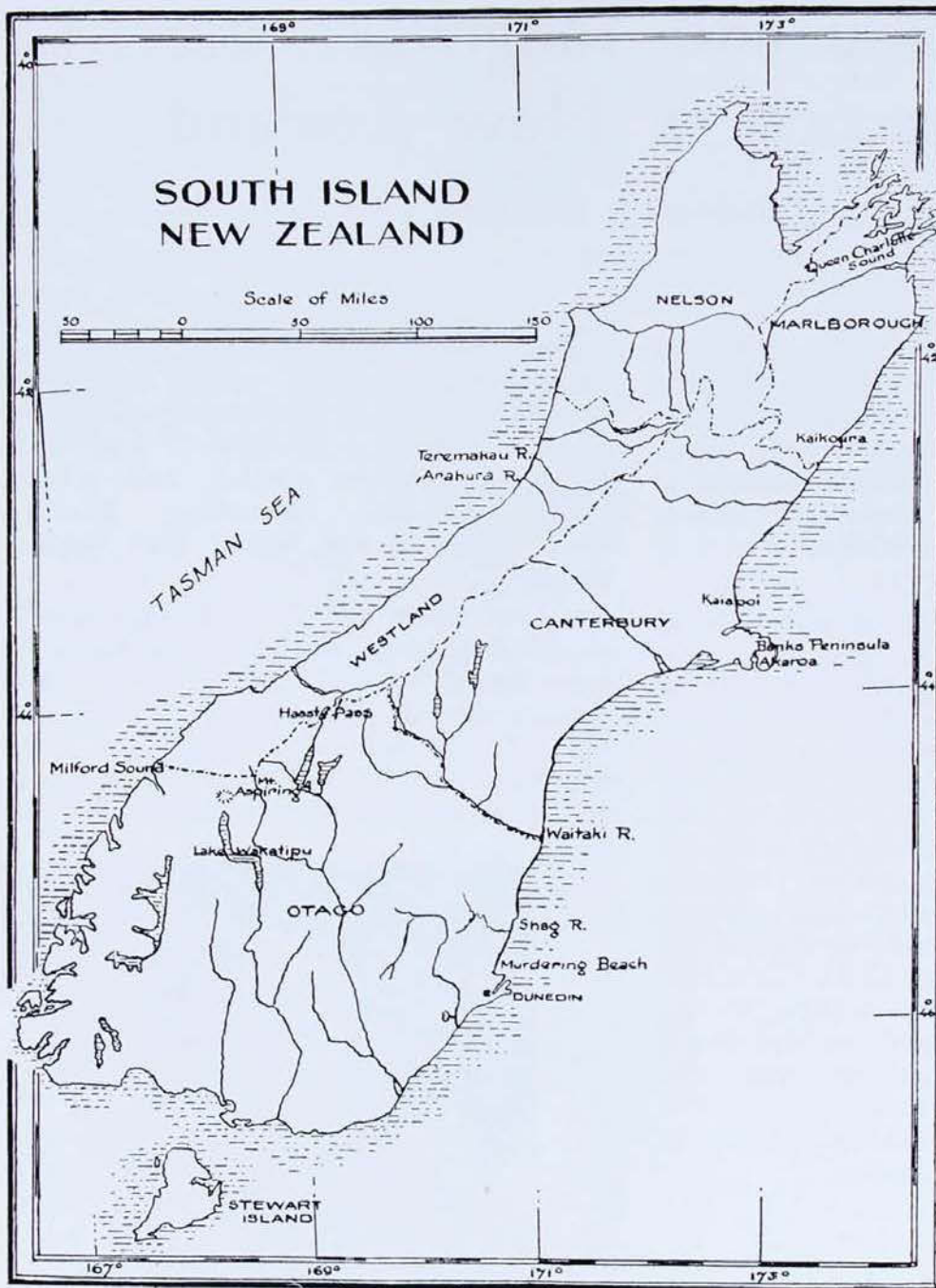
It is interesting to note that in Neolithic times greenstone was valued throughout the world (prior to gold assuming its place of honour), as, for example, in New Caledonia, eastern New Guinea, Asia, Africa, North America (including Alaska), South America, and Middle East civilizations.

According to Dr. F. J. Turner, greenstone includes nephrite and bowenite, which are silicates of lime and magnesia, and contain the minerals tremolite and actinolite. There is another group of semi-nephrites in the serpentines. The toughness and hardness of the nephrites are due



A member of the older generation of Maoris, robed in a rich "kahu-kiwi"—a garment in which kiwi feathers are stitched into a flax foundation. He grasps his treasured family heirloom, a greenstone "mere".

Ill.: N.Z. Govt. Tourist Bureau.



The South Island of New Zealand, showing the Taramakau and Arahura Rivers, Milford Sound and Lake Wakatipu, the sources of greenstone. Shag River and Murdering Beach are ancient Maori campsites which have yielded greenstone implements.

to their peculiar structure, which varies from minute hairs to coarse crystals in twisted and interwoven bundles, the rock apparently having been subjected to heavy pressure in its natural situation. Its hardness ranges from 5.5 to 6.5 on rough and polished surfaces.

The source of the nephrite (pounamu) beds is now known to be boulders among metamorphic rocks in the Pounamu formation, in the Arahura series in the Southern Alps, where the Arahura and Taramakau

rivers rise midway along the coast of Westland on the South Island of New Zealand. The boulders are washed down the two rivers and on to the beaches between them. Most of the North Island supplies came from this area. Nephrites which occur in the Otago and South Canterbury districts were utilized by the local Maoris, and were traded widely. There was a widespread idea among the Maoris that the greenstone came from an inland lake called Tuvai-pounamu, Lake Wakatipu—"the green



A Maori woodcarver at work with a chisel on a decorative slab for a village "whare-manuhiri", or guest house and meeting hall.

Ill.: N.Z. Govt. Tourist Bureau.

water with jade banks"—and the South Island acquired the name for this reason.

At Anita Bay, Milford Sound, in the far south of this island, is to be had the beautiful bowenite (tangiwai) which occurs among the serpentines. It is also found at Pyke Valley. Tangiwai may be scratched with a knife, and splits readily, but it never equalled the value of pounamu in Maori eyes. The name means "the water of tears"—those of Tama-ki-te-rangi, chief of the Tairea canoe, when he wept over one of his three wives who had been lost in a capsized canoe.

#### MYTHOLOGICAL ORIGIN.

The value of pounamu to the Maori was so great that its origin was enshrined in the mythology of Hawaiki, his homeland.

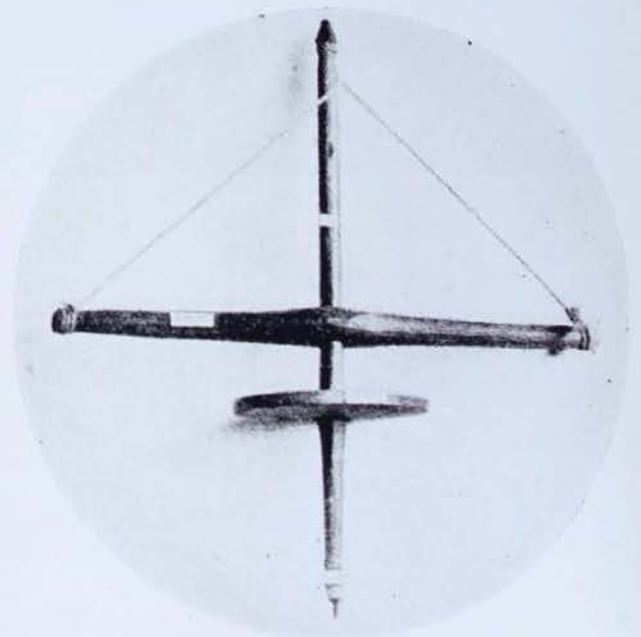


A broken pebble of greenstone which illustrates well the close and tough texture of this prized material for making implements and ornaments among the Maoris.



Greenstone chisels and small adzes from 2 to 4½ inches long in the Australian Museum collection. The specimen on the right shows clearly how the piece of greenstone was originally cut out by sawing into the middle from each side and then breaking the thin portion in the middle between the two saw cuts.

Pounamu was the son of Tangaroa, the god of the seas. In one local legend the pounamu stone came from the inside of a fish and was hardened by the air. In an important legend recorded by Sir George Grey, a great ancestor named Ngahue, during the dream-time of Hawaiki, and his stone, Poutini (pounamu), became much disliked by Hine-tu-a-roanga—"the lady of the stone for polishing greenstone"—to whom Waiapu (obsidian) belonged. Hine-tu-a-roanga, apprehensive of greenstone supplanting obsidian, drove them away from Hawaiki, and also from Tuhua (or Mayor Island, of obsidian, in the Bay of Plenty). They travelled down the North Island coast to the South Island where Ngahue found in the Arahura river a perfect home for his fish, Poutini. He tore off a piece of the latter's skin, which became pounamu, after it hardened in the air, and returned with it to Hawaiki where he aroused great interest in this new land by his discovery of the wonderful greenstone and of the moa. Out of this piece of stone



A stone-pointed drill for boring holes in greenstone implements and ornaments. Urewera country, New Zealand.

After Hamilton.

were made two famous adzes, named Tatauru and Hauhau, and with them were built the Arawa and Tainui canoes used in

A greenstone adze mounted in a carved handle.

After Hamilton.



the great migration to New Zealand in 1350 A.D. From it hei-tiki and other ornaments were also made.

Another myth tells how a famous ancestor named Tamatea-pokai-whenua was searching for three wives who had deserted him. He heard their voices on the Arahura River but could not find them because they had been transformed into pounamu. He also lost his slave, Tumuaki, because the latter licked some birds, thought to be crows, that he was cooking for the chief, and immediately turned into the mountain which now bears his name. Discolorations and flaws in pounamu are called *kutae-koka*, the excrement of these birds.

#### WESTLAND'S FATEFUL STORY.

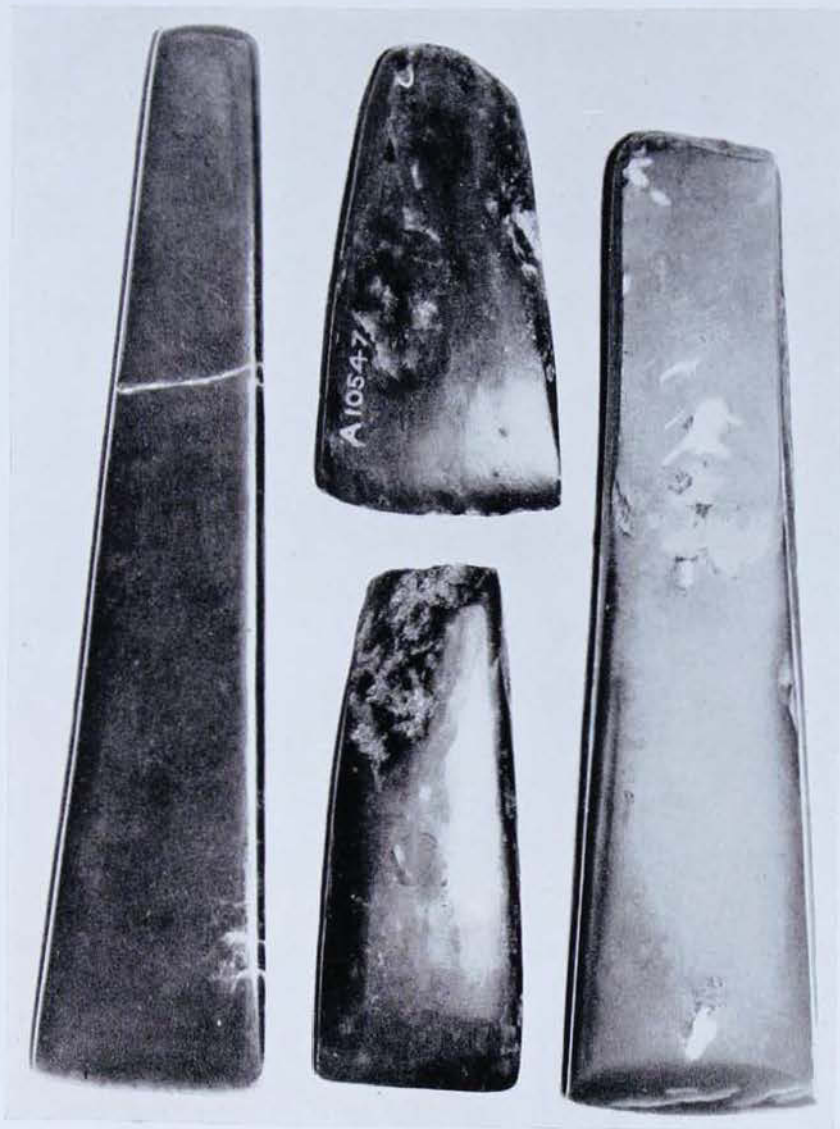
The history of Westland is a fearful tale of men urged on by their burning desire to possess pounamu, men who massacred mercilessly, either eating the survivors in celebration of a successful expedition or turning them into slaves.

Westland is shielded by a rugged coast battered by heavy gales, and seas difficult

to navigate for all but the most skilful and powerful canoeists. From the coast its precipitous slopes, rising to the great Southern Alps, are covered with a forest nurtured by a 100-inch rainfall and so dense that the usual mode of travel by the Maoris was along the broad pebbly river beds. These rivers are short but numerous and flow strongly when augmented by rain and thawing snow. Nature thus kept Westland's great secret for a long period and made it difficult for all but its own inhabitants to get pounamu.

When a party was collecting greenstone boulders, its *tohunga*, or priest, dreamed where they were and at a specific time the men entered the water, guided by the brilliant colour of the stone when wet, and dragged out the pieces on a rope. Allegorically, they were spearing the fish Poutini which they took ashore to turn into pounamu.

Any approach from the north or south along the West Coast to the Arahura and Taramakau Rivers was extremely difficult owing to the rugged terrain and the many



Greenstone adzes from New Zealand. The groove on the adze on the right is the beginning of the process of sawing off a slice of stone to make a pendant. The one of the left is 13 inches long and is from the Sir William Dixson collection, Australian Museum.

rivers to cross. From the east the only way of access was through high alpine passes from the Canterbury and Nelson districts, and the Southern Alps formed a mountain barrier for all but the strongest and bravest to cross.

Westland was first occupied by the Waitaha tribes who came from the east coast of the North Island many centuries ago. The moa formed an important part of their diet. In about 1700 A.D. another North Island tribe, the Ngati-Mamu, conquered the Waitaha and remained the ruling people for about 100 years. They, too, did not work greenstone very much, but they were the last of the moa-hunting people. Then from the North Island again came the Ngaitahu from the Wanganui district, who occupied the east coast until one

of their tribe, a mad woman named Rau Reka, found Browning's Pass and the route into Westland. She also found the pounamu, and on her return showed it to some canoe-builders who realized how great would be its superiority to their own implements.

The Ngaitahu then invaded Westland, now occupied by the Ngati-wai-rangi, who were almost exterminated in the fighting. Their survivors, however, united with the invaders to form a group which took the traditional name, Poutini, of the pounamu fish. It is believed that the Ngati-wai-rangi traded pounamu to the North Island long before the Ngaitahu knew of its place or origin. Other raiders followed, notably Rauparaha and his Ngatittoa warriors, to avenge a long-standing insult uttered by



a Ngaitahu chief, Rerewhaka, who boasted that he would rip open Rauparaha's belly with a shark's tooth. Rerewhaka was killed and many of his people became slaves to Rauparaha's men, and the latter gained much greenstone and its associated prestige.

Another important invasion was led by the chiefs Niho and Takerei, whose party journeyed down the west coast of the South Island from Cape Farewell, using vines to scale cliffs, rafts and canoes to cross rivers, and massacring the inhabitants of villages wherever found as far south as the Hokitika River. They captured a chief named Tuhuru, of the Poutini-Ngaitahu tribe, who was ransomed and returned to his people for a great mere called Kai-kanohi (Eat the Eye). Subsequently another party of these invaders swept further south down the coast, but they met the same fate as their own victims when they were routed by a strong force at the mouth of the Matauru River whence they had come on flax rafts. Their survivors became slaves. Thus when the first white men visited the Arahura district the population consisted of Poutini-Ngaitahu, Ngatitua, Ngati-raukawa, Kaiapoi, and Otago Maoris, all of whom had consolidated in this area after the decimation of the island's tribes in the above campaigns.

#### COLOURS.

The Maoris recognize a wide variety of colour patterns in pounamu. Chapman listed twenty varieties ranging from cream to almost black, the various shades of green being predominant. Among them the following are important varieties distinguished by the Maoris:

*Kawakawa*, very bright or deep green, usually dense and opaque and spoken of as leaves of a tree, with its varieties *Totoweka* bearing red oxide stains, and *Kahotea* with black markings; *Inanga*, dense, highly translucent pearly green ranging to grey and almost white, spoken of as "whitebait"; *Auhunga*, an opaque pale green; *Kahu-rangi*, translucent bright and mottled green; *Kahuwai*, like green moss; *Rau-karaka*, olive-green with a yellowish tinge; *Tangiwai*, transparent pale green; *Aotea*, poor quality greenstone.

Some of these varieties are clouded or streaked with paler or denser shades. *Inanga* was most highly prized by the Maoris. *Tangiwai* was the least esteemed, probably because it lacked the hardness of pounamu, but it makes beautiful pendants.

#### METHODS OF WORKING.

The boulders of pounamu were split into convenient pieces for transport by pecking grooves in them and then knapping off the lumps with a heavy stone maul. Well-known working sites where this rough work was done exist on the Arahura and Taramakau Rivers. The lumps were then sawn into the approximate size required, the line of the groove being marked with a hammer. Flat pieces of sandstone, limestone or slate, set in a handle, served as saws, and sometimes hard stone, including greenstone and hardwood, was used. Gritty sand and water placed in the groove added friction to the abrading process. The water dripped steadily from a gourd suspended over the stone being cut. The groove was cut on both sides of the stone, and the two pieces separated by a hammer blow, leaving a cleavage face up to one-third of an inch wide, to be ground down.

Then began the long and laborious process of grinding the blank to shape. It was placed on a hardwood slab and ground with sandstone, usually by the young and old men, but was a common task for all the men on wet days. The surface was polished by rubbing it on oiled wood, or on the owner's body and with his hands. A mere could be cut out in a month and fully fashioned in another six weeks, according to Major Heaphy. Small pieces cut from the blanks were worked up into pendants, sometimes by the women and children. Chapman pointed out that the Maori not infrequently spent a vast amount of labour on very poor greenstone if it was the only kind to be had. It is believed that heitiki were made only by the tohungas. They were difficult to carve because of the large number of perforations required in them.

The drilling of holes in greenstone implements and ornaments was a difficult task carried out by recognized craftsmen. The drill consisted of a borer of basalt, obsidian or other stone, set in the end of a split stick.

Two stone weights were bound on the stick to increase the penetrating power of the borer, and a string tied at the top enabled the operator to twirl the drill more rapidly. Sometimes a carved wooden top was added to the shaft to keep the drill steady. The hole so bored, from both sides inwards, is cone-shaped, and the opening is often much bigger on one side than the other, due partly to the inefficient apparatus used. There are many well-known ancient village sites at which the working of greenstone was an important industry, and from them many fine pieces have been obtained. Murdering Beach, near Dunedin, is a famous site in the Otago district.

#### THE VENERATION OF GREENSTONE.

Apart from their high intrinsic value, greenstone weapons, implements and ornaments became the focus of the magico-religious power of mana through their association with ancestors and important events. Thus a mere wielded successfully in notable combats, an adze used for carving famous canoes or other work, a hei-tiki or pendant worn by important chiefs and leaders or their wives, acquired this intangible power, which was increased immeasurably as the object passed through generation after generation. It is not only a personal mana but symbolizes that of the people ruled by the chiefs.

Greenstone was also called "whatu-kaiponu", because of its association with people of high rank, and was esteemed beyond any price when Captain Cook visited New Zealand. It was fatal for a commoner to obtain possession of a fine piece, his death being certain unless he gave it to a chief. Gifts of greenstone were exchanged between chiefly families as part of marriage rites, and babies were adorned with jade ornaments during naming rites. Meres and fine adzes of pounamu were exchanged by chiefs as a guarantee of peace or support, and the expression, Tatau-pounamu, "the greenstone door", symbolized a final truce in war. The theft of greenstone from a grave was a very serious crime and led to war or to the culprit's death. Greenstone artifacts were a prized trophy in war, and one of the frequent causes of raids. When an attack threatened

a village, its chiefs hid their greenstone in swamps or in the ground, and this was often done for general safe keeping. Some of these hiding-places were never revealed if the owners were killed. The greenstone objects were buried with their possessor, and either recovered when the bones were exhumed for final disposal, or left in the grave when he or she was the last of the family line. To the Maori bi-coloured greenstone suggested a two-faced person—one of two minds—and to dream about somebody carrying greenstone was an ill omen.

The Maoris attached no medical properties to this symbol of power and wealth. When, however, a named artifact was recovered a joyful celebration was held. Thus an ornament called Tuohungia was lost after 1700, and when recovered the people wept over it, displayed it with ceremonial vestments, and took it in solemn pomp to Te Wherowhero, their Waikato chief. At a public display they mourned for their forefathers with whom it had been associated, and it was finally placed in the safe keeping of Takere-te-rau.

In 1846 a landslide overwhelmed the village of Te Rapa and the famous mere called Pahekaure of the chief, Te Heuheu, was lost. His brother composed this lament about it:

Sleep on, O chief, in that dark, damp  
abode,  
And hold within thy grasp that  
weapon rare,  
Bequeathed to thee by thy renowned  
ancestor,  
Ngahue, when he left the world.

This mere was finally unearthed by a search party of 100 men. It was buried five times with ancestors and was believed, on occasions, to become invisible to all but its owner.

A famous pendant, called Kaukaumatua, was brought by Tamata-te-kapua from Hawaiki, supposedly made from the piece of pounamu taken there by Ngahue, and it is frequently mentioned in songs and legends. Objects valued so highly as these were not parted with unless under great stress or unavoidable obligation. A chief captured

in war, or his head if he were killed, could be ransomed for a fine mere. The wives of a conquered chief were obliged to give their hei-tikis and other pendants to the wives of a victor. A chief would not venture into combat without his own cherished mere and

its inherent mana which made him so brave, skilful, and successful in fighting. Sometimes a replica of a lost or treasured greenstone heirloom was made to preserve the name of the original.

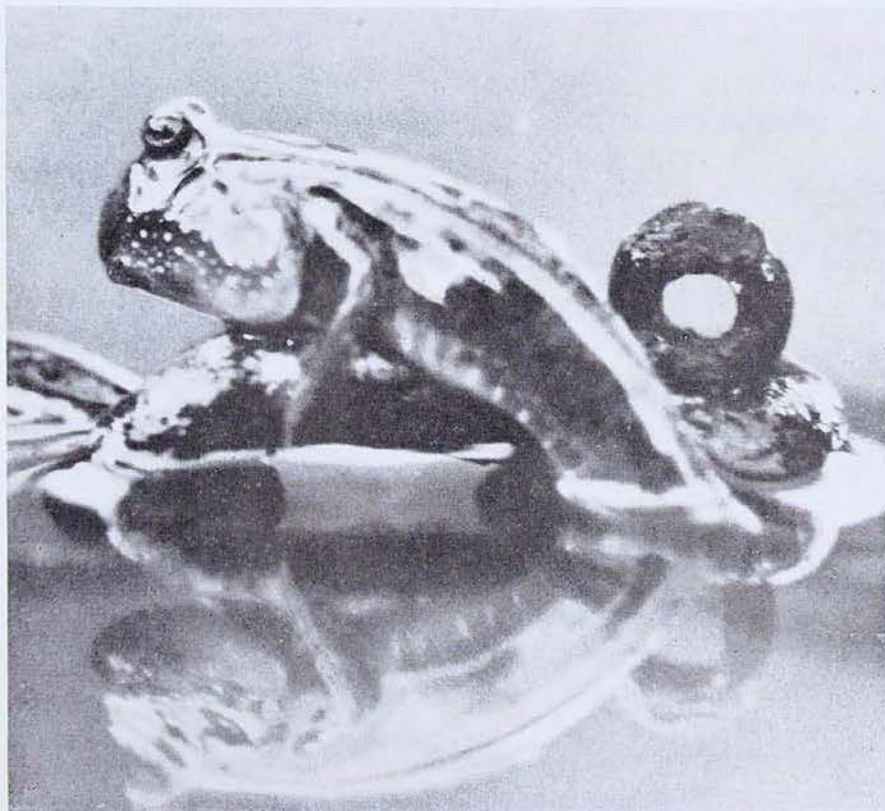
(To be continued.)

## Goggle-eyed Mangrove Fish

By G. P. WHITLEY.

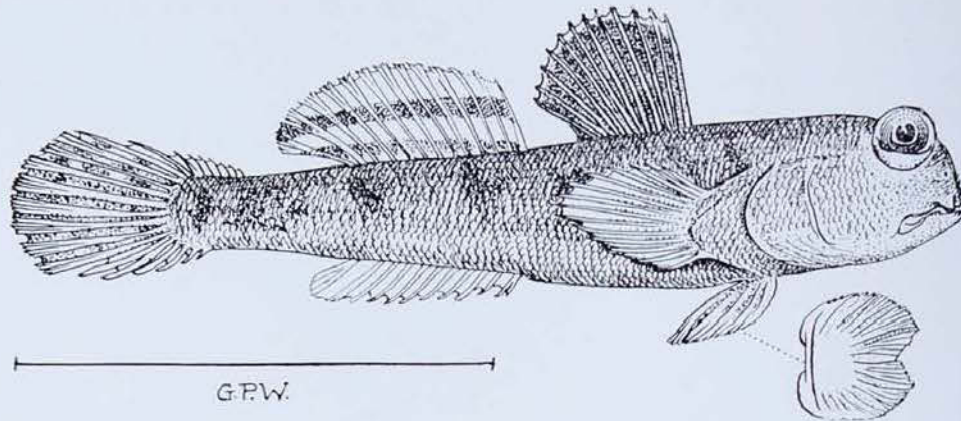
**H**E seems in a reflective mood, this quaint little fish, more out of water than in it, as he rests on a chain in a Queensland mangrove swamp, yet he is really very alert and active and credit is due to the photographer, Mr. A. Embury,

for this remarkable study. Usually this Goggle-eyed Mangrove Fish (*Euchoristopus kalolo*) skips rapidly away when approached or it likes to slide over the exposed mud, "rowing" itself along with its elbow-like side fins, or it may even climb



A Goggle-eyed Mangrove Fish with its tail in the water of a Queensland swamp.

Photo.—A. Embury.



A new species of Mudskipper recently discovered at the Forest River Mission, North-western Australia, by an Australian Museum Expedition. The line on the left represents one inch to the same scale and the inset, lower right, shows the sucker formed by the united ventral fins.

the exposed mangrove roots. The prominent eyes can be moved independently or rolled over into their sockets. The dorsal fins are erected during fighting or courtship displays. The fish breathes water retained in the pouch-like gill-chambers, or through its skin; it is said to drown if held long under water. It inhabits burrows at times, with turret-like "watch-towers", and feeds on crabs, flies, and other small animal life of the swamps. The young, hatched from eggs, are dispersed by the tides and soon take up their amphibious life. The colour is muddy-grey, flecked and variegated with lighter and darker markings. This fish is also known as Mudskipper,

Johnny Jumper, and Kangaroo or Hopping Fish. There are five Australian species, all tropical, and slavishly miscalled "*Periophthalmus koelreuteri*" in many popular books and articles. The one shown here is the commonest and grows to 4 inches in length. A smaller kind, *P. expeditionium*, was recently discovered in northern Australia as a result of the Australian Museum Expedition. Our largest species, *Periophthalmodon australis*, has larger scales, plainer colouring, reaches 10 inches in length, and used to be esteemed as food by the Chinese in Queensland. In their search for food and "lebensraum", these very unfish-like fishes are well on their way to becoming land-animals.

## Popular Science Lectures—1954 Series

Popular science lectures, usually illustrated by films or lantern slides, will be given in the Lecture Hall of the Australian Museum twice monthly, up to and including October. Admission is free, the hall is open from 7.30 p.m. on the dates mentioned below, and lectures begin at 8 o'clock.

### Subject and Lecturer.

- |   |   |
|---|---|
| July 8—"The Dingo"—N. W. G. Macintosh, M.B., B.S.                               | Aug. 5—"A Zoologist Abroad in Coronation Year"—Miss Joyce Allan, F.R.Z.S.           |
| July 22—"The Future of North Australia"—Prof. J. Macdonald Holmes, B.Sc., Ph.D. | Aug. 26—"Australian Sector of Antarctica"—H. O. Fletcher.                           |
|   | Sept. 9—"Prairies to the Arctic Ocean"—Prof. Griffith Taylor, D.Sc., B.E., B.A.     |
|   | Sept. 23—"Astronomical Measurements"—H. Wood, M.A.                                  |
|   | Oct. 7—"Nature and Man in New Guinea Highlands"—Ellis Troughton, C.M.Z.S., F.R.Z.S. |
|   | Oct. 21—"Some Household Insects"—E. H. Zeck, F.R.Z.S.                               |



Two young girls dancing the *legong* accompanied by the *gamelan* orchestra. The mountings of the instruments are decorated with intricate carving.

Photo. by Author.

## Bali : Emerald Gem of the Indies, III

By FREDERICK D. McCARTHY.

### DANCING AND MUSIC.

THE tourist does not usually witness the theatrical performances, but sees the dignified dances and hears the extraordinary music of the *gamelan* orchestra, or *gong* as it is also termed. There are numerous types of *gamelan*, in fact, its constitution varies according to the purpose of the music and the nature of the occasion. The instruments comprise several large bronze gongs hanging in carved frames and sets of pot-bellied bells known as *reyong* (12 or 13 bells) or *trompong* (14); there are metallophones with varying numbers of keys, double-ended skin drums, flutes, and rattles. A violin, introduced into Java some centuries ago by Arab traders, and other instruments are sometimes used. The drummers sit in the middle and lead the players. The music consists of a cadence of percussion, ranging from a delicate tinkle to a violent clash of metallophones

and bells, backed by the sonorous gongs. There is usually an introduction, a central motif, and a finale. Apart from the classical music of the religious and dramatic performances, a wide range of compositions is played, including love serenades and other delicate items, dance accompaniments, and stirring war music. The pieces are not written, but are composed with the aid of the orchestra during long and patient rehearsals, when they are gradually shaped into their final form. The players are selected from the village men irrespective of the nature of their work, so that the *gamelan* may have the best available talent. Twenty or thirty players form the full orchestra.

Like the music, the traditional Balinese dances vary according to the drama or religious ritual with which they are associated. The technique is classical, so that every movement is an essential part of the



The gilded headdresses of the girls set off their beautiful costumes during the *Djanger* plays.

Photo. by Author.

dance and cannot be improvised. The excellence of the performance lies in the mastery of the set movements and gestures, the control of facial expression, and the emotional values brought into play. The training of a dancer is a job for a skilled teacher because the dances are most uninteresting and stiff when performed by a mediocre artist. The costumes worn vary in the different dances.

Apart from the dance dramas already described, the *legong* is the best known of the classical dances. The beauty and incredible delicacy of the young girls who dance the *legong* in public must be seen to be believed; at the age of 12 or 13 they retire from *legong* dancing.

The *legong* is usually performed at a feast in the late afternoon, and is a feature of many festival and ritual occasions. The most popular theme is that of the Princess *Rangke sari* abducted by a rejected suitor, King *Lasem*. He tries to gain her favour by offering not to wage war on her father, and when this ruse fails he threatens to kill him. *Lasem*, however, dies in battle after the appearance of a bad omen in the form of a blackbird. The *legong* dancer wears a long silk sarong, her body is tightly

bound from hips to armpits in magenta brocade bearing a pattern in gold leaf; a gilded buffalo-hide headdress and shoulder-vest are worn, also gold ear-plugs and finger rings. The face is made up to accentuate the forehead line, and frangipanni blossoms are set above it. Three dancers



Balinese silver bracelet set with agate.

Photo.—Netherlands Indies, Vol. VI, 1936.

perform the *legong*, one of whom, the *tjondong*, dances the introductory part, followed by the other two in the main portion. The movements of the legs and feet are unimportant, emphasis being laid upon the subtle twistings of the body and head, the expressions of the eyes and

face, and on the lovely butterfly-wing sequence of fans. The *gamelan* accompanies the dance.

Several other old dances, such as the stirring *baris* or war dance, are not often seen.

In recent years there has crept into Balinese art a school of expressionism comparable with that of the revolutionary French impressionist painters. One famous dancer, Mario, from south Bali, developed a sitting dance, the *Kebiyar*, in which he used a fan, and by movements not unlike those of the *legong* but absolutely unfettered in their range and sequence, he interpreted the music played by a *gamelan*. In this dance the composers have introduced a wide range of meaning, from the most delicate moods to violent and playful contrasts, from languid and coquettish passages to those of extreme emotional ecstasy. To perform the *kebiyar* the dancer requires a fine expressive face, a strong personality, and a deep knowledge of the music. Artists of Mario's ability are few and far between.

The *Djanger* is another product of the new movement of freedom. It is usually a love story or comedy in which the performers act in a square composed of twelve youths and girls elaborately dressed. It has little standing among the natives, but it is well presented and is greatly appreciated by visitors. The full concert *gamelan* plays. Finally, there is the *Ketjak*, a weird and wild performance in which a large number of men, who are seated round a central figure, rise up in sequence with their arms outstretched and yelling *Ketjak, jak*; the aim seems to be to drive away evil spirits. The Bedoeloe village is famous for its *Ketjak*.

#### CRAFTS.

In accordance with the high status of their culture, the Balinese are skilled craftsmen. Formerly, the carvers, stonemasons, metal and gem workers and others were organized into guilds, but modern conditions have caused their disbandment. The inspiration of art lies in the pantheon of Hindu gods and goddesses, in the characters of local folk-lore, and the fantastic creatures associated with them.



Gold hilt of a Balinese kris, set with precious stones. Collection Royal Batavia Society of Arts and Sciences.

Photo.—Netherlands Indies, Vol. VI, 1936.

Siva on his mount Nandi, the reclining bull, is more commonly seen than Vishnu with the Garuda bird and Brahma with the goose, Angsa. The temples are identified by the presence of such figures or those of the secular gods and goddesses. Figures from the mythology and legend of the epics include Rangda, Durga (goddess

of death), Dewi Sri (goddess of fertility), Ravana, enemy of Brahma, and mounted on Wilmana, a bird with a demon's head and no bill, is a popular carving offered to tourists. In the murals the activities of the legendary characters are shown, together with various animals such as lions, monkeys, tortoises, snakes, and cocks. Floral elements cover every inch of the remainder of the surface of a mural. Humorous touches in modern temples are panels which caricature Europeans and their ways.

The master sculptor is one who can design and carry out the whole of the carving necessary on the temples, palaces, baths and other public buildings. The aptitude of the Balinese for such work is well demonstrated by the richness of carving to be seen everywhere on the island. The stone used is a soft volcanic ash which is obtained from valleys and river banks; large figures are roughly shaped at the quarry and finished at the temple or other site. The stone is rapidly affected by weathering agencies and its life is comparatively short. Terra-cotta also forms a medium for plastic work, and masses of red bricks are interspersed between the carved panels of the temples of south Bali.

The above-mentioned motifs in high and low relief are to be seen on the wood-carvings, and on the brass, silver and gold vessels. The wood-carvings, and objects made of buffalo-hide, are often painted in various colours. The women's crafts also display a high technical and aesthetic excellence. The pottery and basketwork is notable for the variety of well shaped types. The beautiful woven cloths, or *kains*, which have patterns in gold and silver thread worked into them, form a highlight of Balinese art.

In Bali a localization of crafts has taken place. The metal-workers are grouped in the Klungkung district, and many wood-carvers in Badung. Painters and sculptors are to be found everywhere, of course, but some villages have developed the one or the other so highly that they are renowned for their products.

Into these crafts has been introduced a new movement of the same revolutionary

nature as in the music and dancing. Most of the wood-carvings now produced comprise figures of dancing girls and men, musicians, girls bathing or otherwise posed. They are carved in satin-wood, teak, jack-fruit and *sawo* (a rich red in colour). The usual intricate detail of Balinese art is replaced by an emphasis on the curve and line of the subject, and the finest carvers produce pieces of great merit. In painting, a new style on paper has replaced much of the old sacred work on cloth. The Ubud village initiated a style in which realism, highly formalized, is the inspiration. Thus to-day paintings of *gamelan* orchestras, temple ceremonies and dancers, rice-fields and village scenes, and landscapes may be obtained en masse in almost any part of Bali. Included in the scenes portrayed are the fantastic animals and other figures from the Hindu epics, ever engaged in the eternal struggle between good and evil. Every inch of the surface is covered with intricate detail; some are drawn only in black on white, others have various colours added in judicious tones or striking masses.

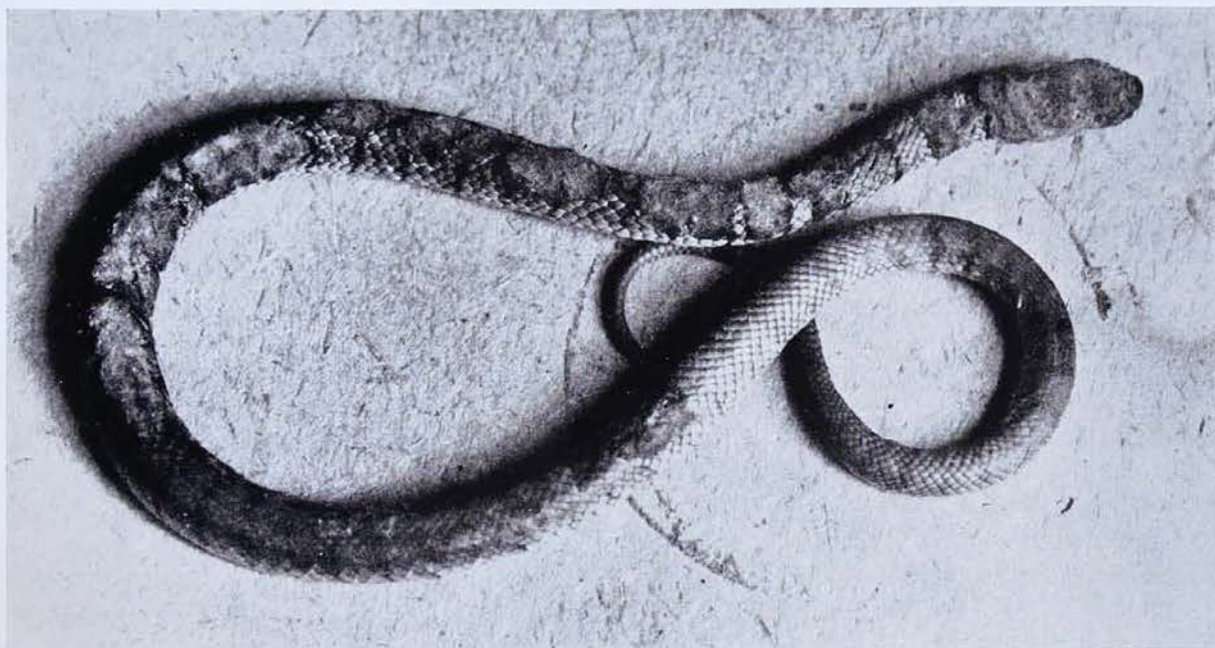
One of the oldtime crafts which will probably remain unaltered is that of kris making. The craftsmen belong to the highest caste, the *pandi*, of the common people, and they are powerful magicians who worship the volcano Gunung Batur. The blade is the most important part of the weapon and it is made of alternating laminations of nickel and iron, the wavy edges of which are treated with a mixture of antimony and lemon juice to produce a light and dark pattern. The handle may be in the form of a god, demon, or some beneficial being, carved in horn, ebony or some precious wood. The finest examples are covered with beaten gold and are inset with large rubies and rose diamonds. Krisses are the most valued family heirlooms. After several generations have elapsed a kris becomes a tangible representation of the family deity, and acquires the life-giving powers of the ancestors, attributes which are kept within the weapon by the sheath. A man wears a kris only after he is married, and it may thereafter represent him by proxy.

The above review of Balinese arts reveals them as the product of a people with a genuine aesthetic urge and emotional sense



which can only be satisfied by actual participation. They have borrowed freely from Java since ancient times and, more recently, from Europeans, but they have so blended the newly introduced elements into their own warp and weft, and so imprinted upon them their own artistic ideas, that they

form a genuine enrichment of their culture; otherwise, they are soon abandoned. At the present time the Balinese are passing through a developmental period in which creative and realistic ideas threaten to triumph over the bondage of Hindu stylism.

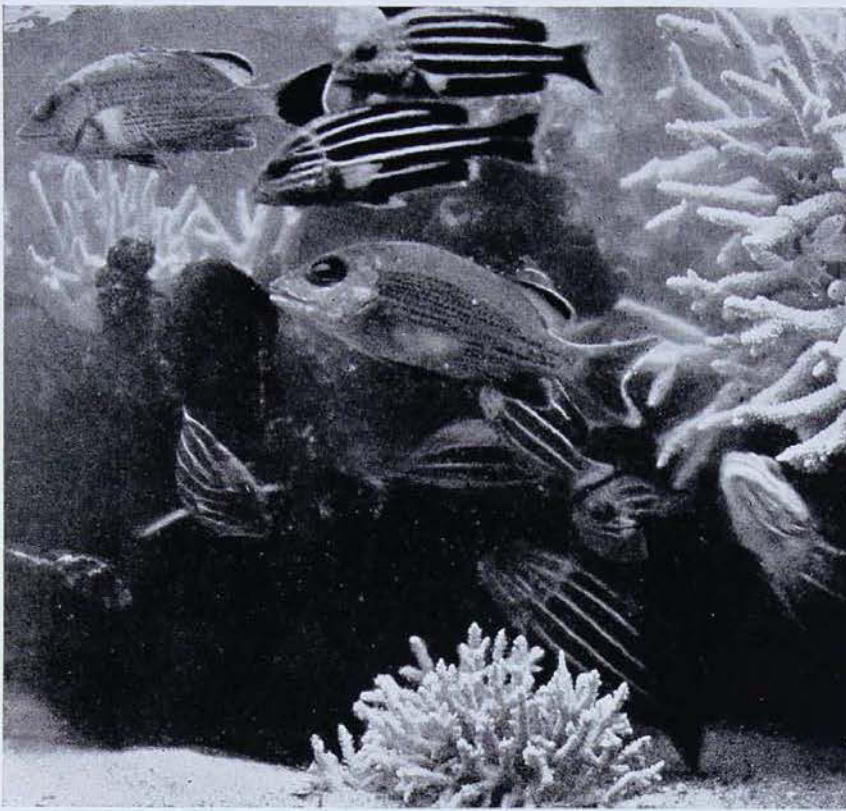


## Snake with Fungoid Growth

By J. R. KINGHORN.

This young specimen of the Common Brown Snake (*Demansia textilis*) was covered with a type of fungoid growth, the like of which has never before been recorded at the Australian Museum. The snake was practically blinded by the growth, which also made the opening of the

mouth rather difficult. Had the specimen lived it would have been interesting to note whether the fungus was cast off with the sloughing of the skin, but as the snake was injured it had to be preserved in spirits. If any reader finds a similar example, please send it alive to the Museum.



# Are Hussars Edible?

By G. P. WHITLEY.

Hussars (*Lutjanus fulviflamma*,  
*bengalensis* and *L. sp*) in a  
coral grotto, Dauco Island, Port  
Moresby, Papua.

Copyright photo.—  
Captain Frank Hurley.

**B**ESIDES being a soldier, a Hussar can be a fish, so it is to the latter that the question asked in the title refers. There are nearly thirty different kinds of hussars (*Lutjanus* and near genera) in Australian seas, including one (*L. argentimaculatus*) which enters fresh water. They are most numerous north of the Tropic of Capricorn and their colours range from striped with yellow and blue or silvery, to plain ruddy or coppery, with blotches or bars, or having a dusky "thumbprint" on each side of the body (in the case of the Moses perch<sup>1</sup>).

These rather large-mouthed, scaly fishes are the true snappers in the West Indian sense of the name. Though superficially like the breams and the fish called snapper in Australia, hussars differ in having no molar teeth; there are usually two isolated rows of scales sloping along the temples,

<sup>1</sup> "The gentleman who christened it was, I imagine, confusing Moses with Peter and should not be accepted as a biblical authority. He reminds me of a friend who, speaking of the 'samson fish' remarked that he knew all about Samson—'cove who killed Goliath with the jawbone of an ass'."—Ogilby, *Commercial Fishes of Queensland*, 1915, p. 22, footnote.

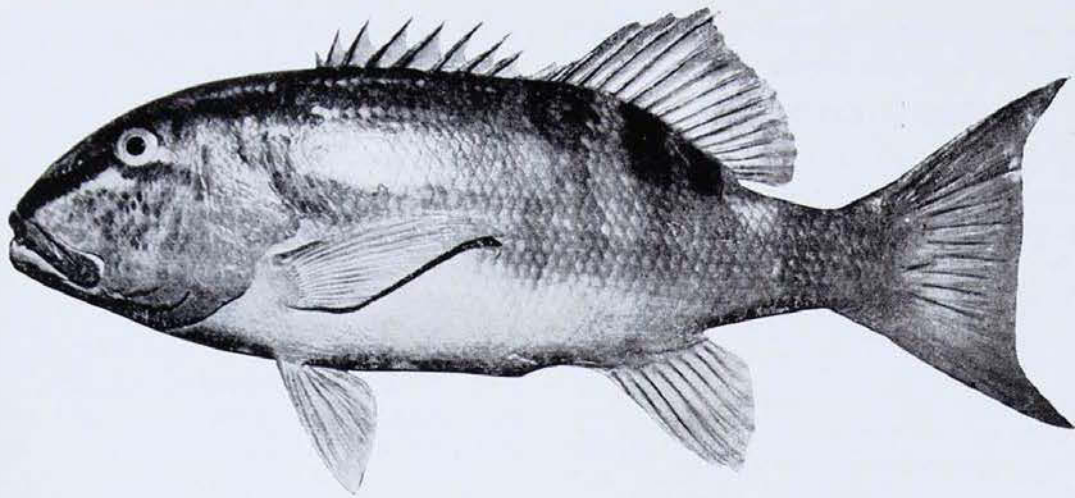
and the preopercular margin is serrated, often notched to receive a knob. The illustrations here give some idea of the appearance of certain Australian species; others are well depicted in Georges Coates' *Fishing on the Barrier Reef*.

Anyone who has tasted the famous Government bream or king snapper (*Diacope sebae*), or many of the "sea perches" which are also hussars, knows how delicious they are. Yet, for some reason yet unexplained, some hussars may be poisonous as food, contradicting the time-honoured biblical injunction—

These ye shall eat of all that are in the waters: all that have fins and scales shall ye eat: And whatsoever hath not fins and scales ye may not eat; it is unclean unto you.<sup>2</sup>

Even wholesome fish may become poisonous if left with heads and viscera intact for a few hours, and in the tropics it is possible for a fish to "go bad" in the short time elapsing while it is carried ashore from the reef whereon it was caught. Some cases of fish poisoning in the early days were doubtless due to imperfect cleaning, careless

<sup>2</sup> Deuteronomy 14, 9-10; Leviticus 11, 9.



The Chinaman fish (*Paradicichthys venenatus*), Queensland. From a cast about 2½ feet long in The Australian Museum.

“Pix” photo.

handling of fish, and eating stale or badly pickled ones. In these days of refrigeration the same kinds of fish could be eaten safely, unless by those allergic to them. The earliest explorers and navigators, however, suffered severely and their published observations are still of value as the subject of poisonous fishes is yet incompletely studied. Ciguatera is the Spanish term for fish poisoning in the West Indies and is widely used in medical and ichthyological literature. It is derived from Cigua, the name of a poisonous marine snail (*Livonia pica*) in Cuba. A more modern word for this fish poisoning is ichthyosarcotoxism, a special elaboration of the earlier name, ichthyotoxism.

Fishes have been thought to be poisonous because of feeding on some periodical supply of worms, coral, echinoderms, medusae, etc., or even seeds or fruits, dropped in the sea, which may have contained poisonous alkaloids (Forster, 1778, Gill, 1876, Gudgeon, 1930, Norman, 1936, and Gilman, 1942).<sup>3</sup> At Funafuti, Ellice Islands, all reef fishes were condemned one winter when pumice was thrown up on beaches. “As pumice is harmless, it was thought that its occurrence was coincident with the arrival of some organism which might viti-

ate the food supply of the fish”. (Waite, 1897). Fishes have also been reported from various parts of the Pacific as edible on one island and poisonous on another. W. W. Gill (1876) noted the matakiva of Mangaia, Cook Islands, was poisonous at Mitiaro, another island in the same group.

A reason why fish are poisonous from one side of an island and not another was advanced by Dr. Geogaghan, Medical Officer of the Turk Islands, quoted by Mowbray (1916):

“I have reached the conclusion that the reason they are poisonous in one region and not in another, is that in Bermuda and Key West almost all fishing boats have live-wells, and therefore usually bring their fish to market alive, while in the Turk Islands and Bahamas the fish are killed and allowed to remain in the sun until the shore is reached—sometimes five or six hours after they are caught.”

Mowbray (1916) inclines to the opinion that most, if not all, cases of fish-poisoning (ichthyotoxism) are really forms of ptomaine poisoning.

Fishes killed by explosives are good to eat, provided, of course, that they are cleaned and fresh. Subject to those provisions, too, such fish with green or blue bones, as certain tropical parrot fishes (*Scarus*, *Pseudoscarus*, etc.) and Long Toms (*Belone*, *Strongylura*, *Tylosurus*, etc.), are good to eat. The flesh of fishes

<sup>3</sup> Authorities quoted in this article are referred to in full in an annotated bibliography by G. P. Whitley and B. W. Halstead, just prepared for publication (in the *Records of the Australian Museum*).

with venomous spines (stonefish, stingrays, etc.) is also safe when fresh.

#### THE RED BASS GROUP.

In Queensland and some of the Pacific Islands, certain large red or pinkish hussars have caused severe fish-poisoning. The Queensland ones have been described and named in technical publications (Whitley, 1930, 1932, 1934 and 1943) and specimens are preserved in the museums in Brisbane and Sydney.

In the case of the Island fishes, no specimens appear to have been obtained for scientific study for many years, so their precise identification has not yet been settled. Practically all we know about them was recorded by the old explorers, notably Quiroz in 1606 and Captain Cook in 1774, who called them *Pargos*, *Pagrus*, or *Sparus*. But during World War II, armed forces, allied and enemy, occupying the Pacific Islands, experienced so many cases of fish poisoning that the problem is still being scientifically studied.

In August, 1944, at Palmyra, Line Islands, and in September, 1944, at Tarawa, Gilbert Islands, several cases of red snapper poisoning occurred and detailed case-reports on them were made by Halstead and Lively (1954) in a report on the relation-

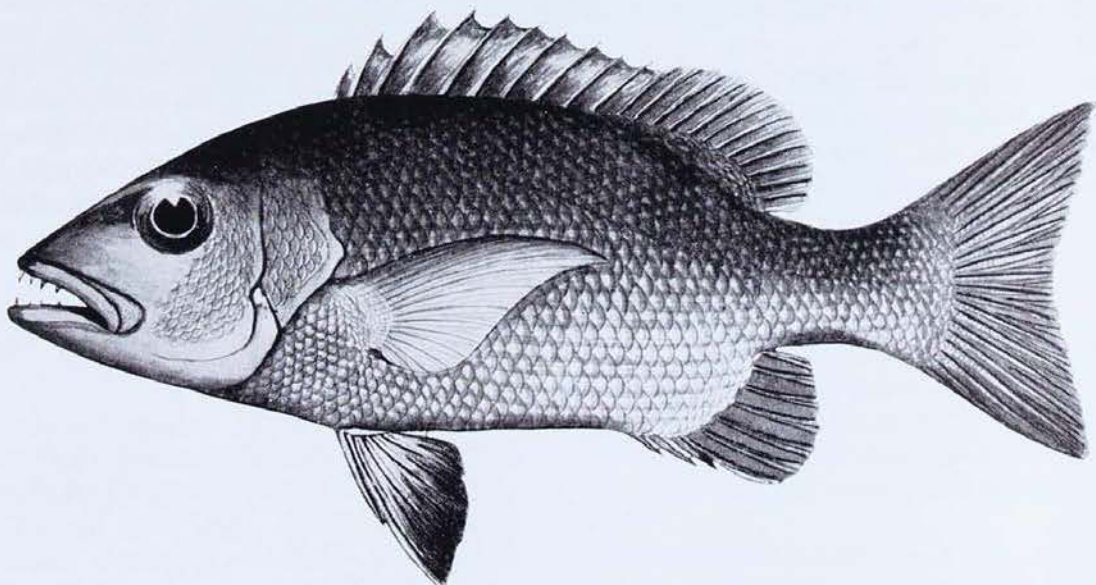
ship of poisonous fishes to the U.S. armed forces. Fortunately no case was fatal. Similar outbreaks of red snapper poisoning were noted from Palmyra Island and Okinawa. According to the Japanese investigator, Hiyama (1943), one *Lutjanus vaigiensis* poisoned fourteen men who had partaken of it at Saipan.

With reference to Quiroz's experiences on 27th May, 1606, in the Bay of St. Philip and St. James, Solomon Islands, Sir Clements Markham (1904, i, p. 263 and ii, pp. 390 and 447) relates:

"It happened that they fished in a certain place whence they brought to the ship a quantity of *pargos*, which are considered poisonous, like those in Havana and other ports. As many as ate them were attacked by nausea, vomiting, and feverish symptoms.

"In the *Capitana* alone as many as fifty-five persons were laid up. . . . The ships were like a town hospital with the plague, and none could stand on their feet . . ."

The *Pargos*, *Pagrus* or *Porgy* was possibly some kind of snapper or hussar, similar to the Spanish sea bream (*Pagrus vulgaris* or *Sparus pagrus* of authors). Unfortunately, it is not known exactly what species of fish Quiroz encountered, so no picture can be given here. Perhaps the same kind of fish was responsible for poisoning Cook's men on the "Resolution".



Red Bass (*Lutjanus coatesi*); a specimen from the Townsville area, Queensland.

George Coates, del.

Cook (1779) relates that two or three reddish fish were hooked in Port Sandwich, Mallicolo I., New Hebrides, on 24th July, 1774. The following night, all who had eaten of them were seized with violent pains in the head and bones, attended with a scorching heat all over the skin, and numbness in the joints. The pigs and dogs were also affected and two died. It was a week or ten days before all the officers recovered. Symptoms were also described by Cook's shipmate, Sparrman (1944, p. 147).

William Anderson (1776), the assistant surgeon with Cook, wrote an account of the poisoning and said the [European sea bream] *Sparus pagrus* resembled the fish responsible. For the most troublesome symptom, heat on the surface of the body, the surgeon prescribed a "sudorific julep, whereof the active ingredients were the antimonial wine and *spiritus mindererii*".

The best account, however, was given by the learned Forster (1778). Discussing the *Sparus* of Mallicolo, he wrote:

"... about sixteen persons eat of these three fish, and found themselves affected with a prodigious numbness, which soon made them quite giddy, and incapable of standing; they had afterwards excruciating pains in all their bones, which did not go off till ten days afterwards, by the continual use of vomits, and sudorifics. A hog that eat part of the entrails, swelled prodigiously, and died a few hours after; several dogs also which eat of the offal, lay for a fortnight in the greatest agonies, howling and foaming at the mouth, utterly incapable of standing on their legs. A little favourite parroquet, which eat a bit of the fish, likewise died in consequence of it."

Forster also remarked:

"The fish had in its mangled state a similarity to the red gilthead (*Sparus Pagrus*, Linn.) which is the more probable, since Quiros observed that his whole ship's crew were poisoned at the same place by a fish, which he called Pargo."

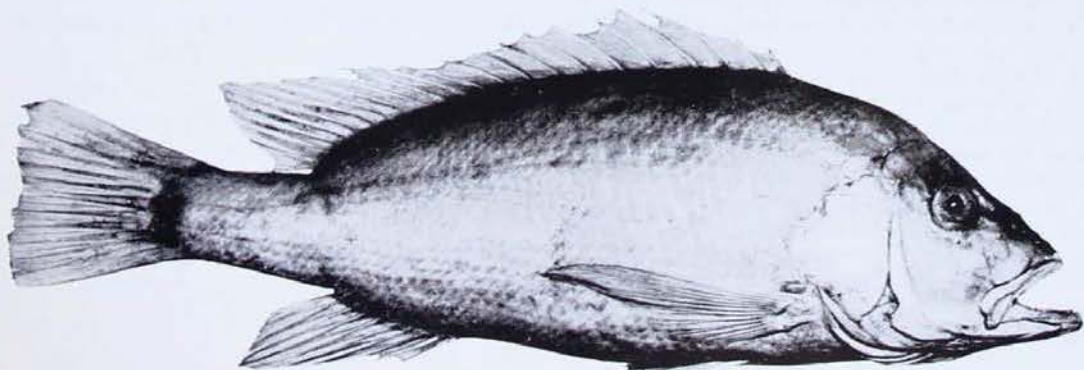
Bennett (1871) says of Cook's "red fish": "It was caught in the month of August, and was the beautiful *Holocentrus ruber*. In Ceylon this fish is in general estimation; its flesh is white and solid." Bennett was wrong about the date and probably his identification is unreliable. Forster, who examined the "Resolution" specimens, would not have confused so distinct a fish as a *Holocentrus* with a *Pagrus* or *Sparus*. The former is the nannegai-like squirrel fish, the latter are snapper or bream to Australians. Sparrman (1944) called them "*Sparus erythr. L.?*"

Pellegrin (1900) thought that Forster's *Pagrus* may have been a *Lethrinus*, i.e., the sort of fish known as sweetlips and emperors, often misnamed "morwongs" in Queensland. I feel, however, that the species may have been a hussar, similar to the red bass (*Lutjanus coatesi*) of Australia, or a Chinaman fish, and it is with those two that I shall now deal.

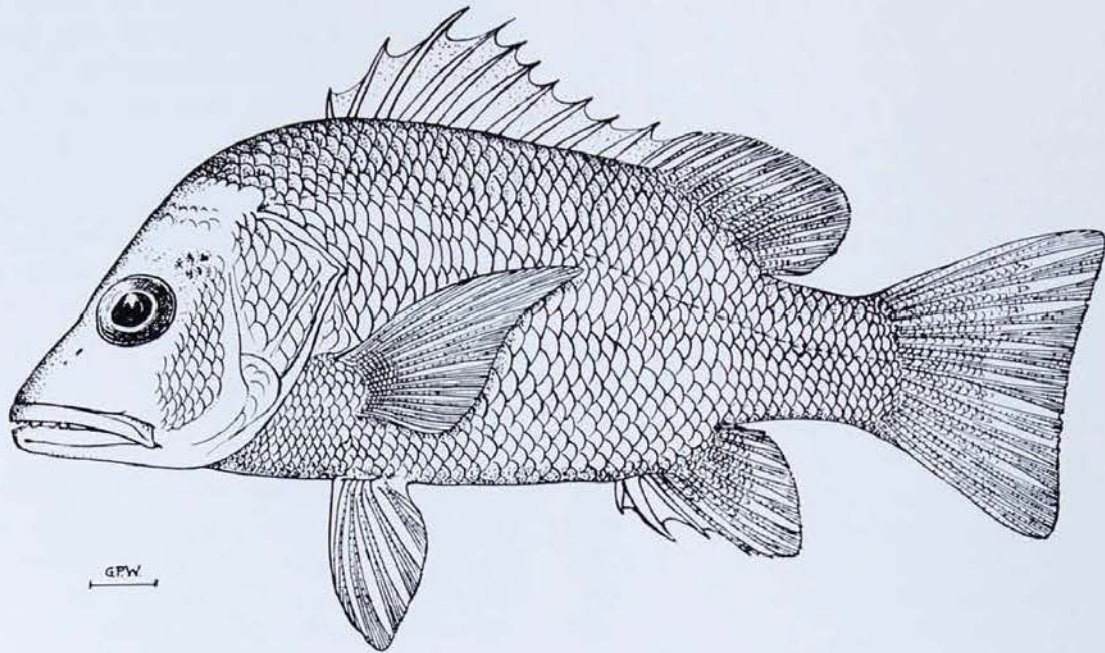
#### CHINAMAN FISH.

The shape, fins and colour-pattern of the Chinaman fish can best be appreciated from the figure on page 195. Coloured casts of it are exhibited in the museums of Brisbane and Sydney. The Chinaman fish (*Paradicichthys venenatus*) has prominent canine teeth, long rays in the dorsal fin in the young fish, and the tail is not markedly forked. It is known from Queensland, the Northern Territory and Indonesia.

When alive, the Chinaman fish is conspicuously barred and banded with red, of various shades, and white, forming a criss-cross pattern on the body. The belly is whitish. It grows up to 3 feet in length and about 34 lb. in weight.



Macleay's Hussar, or sea perch (*Lutjanus macleayanus*); from an exhibit in the Australian Museum.



A freshwater hussar or River Roman (*Lutjanus argentimaculatus*), from Rockingham Bay, Queensland. In life this fish is nearly four times as large.

G. P. Whitley, *del.*

The late Dr. P. S. Clarke has given a good account (in MS.) of the Chinaman fish from the medical standpoint. His account was partially quoted by Whitley<sup>1</sup> (1932) and Cleland (1942), but additional quotations are given here to complete the story:

"There appears to be a seasonal variation in the poisonous qualities of this fish. The Chinaman fish caught during the months of June, July and August appear to be more poisonous than those caught during the other months of the year. The poisonous effects are not the result of bacterial decomposition; I have known the fish when cooked shortly after being caught to have poisonous effects. Of two fish caught in the same locality, one Chinaman fish was found by dire experience to be poisonous and the other to be harmless . . . There is diffuse tenderness in the skeletal muscles and muscular cramps are apt to occur. Numerous semi-fluid motions are passed . . . There are often to be observed profuse attacks of perspiration and the urine is concentrated with deposits of urates. I have not observed albuminuria to be present in any of the cases treated by me . . . Erythema of a mild type occasionally occurs. With the persistence of symptoms in a severe attack the skeletal muscles become soft and flabby, but the reflex arcs remain unaffected. The liver function appears to be unimpaired; I have not observed signs of jaundice in any of my patients. Loss of weight continues during the course of the complaint . . ."

<sup>1</sup> This MAGAZINE, iv, 11, 1932, p. 395.

The distinguished North Queensland medico and naturalist, Dr. H. Flecker (1946), considered the symptoms given by Dr. P. S. Clarke were those of an acute gastro-enteritis, and stated that there is no reliable or satisfactory evidence that the Chinaman fish under ordinary circumstances is poisonous when eaten. He considered it unjust and uneconomic to condemn this fish as poisonous food unless and until more satisfactory evidence is forthcoming.

#### THE RED BASS.

This fish (*Lutjanus coatesi*) is allied to the Chinaman fish but differs as follows:

(a) Soft dorsal fin much higher than spinous dorsal fin and with lengthened rays in younger fish. Pectoral fin short, not reaching anal fin. Tail fin not strongly forked. Scales smaller, about fifty-six along lateral line. Upper profile of head more convex. No notch on preoperculum. No teeth on vomer . . . Chinaman fish (*Paradicichthys venenatus*).

(b) Soft dorsal fin with none of the rays as long as the longest dorsal spine, none of them elongated. Pectoral fin long, reaching level of origin of anal fin. Tail fin forked. Scales larger, about fifty or fifty-two along lateral line. Upper profile of

head sloping, almost straight. A notch, embracing a boss, on edge of preoperculum. A V-shaped patch of teeth on vomer . . . red bass (*Lutjanus coatesi*).

The red bass is also smaller, generally little more than 2 feet in length, but it grows to a length of about 3 feet and may exceed 30 lb. It is reputed to be poisonous as food but no precise medical data are available on this point.

In colour, the red bass is generally rosy or burgundy red; dark along the back and gradating to pink along the belly. Operculum yellowish. Head with several small wavy lines and blotches of dark lavender. Each body-scale with a boomerang-shaped lighter patch. Eye peach red encircled with narrow border of cadmium orange. Inside of mouth creamy white. Dorsal fins maroon to scarlet. Other fins rosy, outer edges of tail, ventral and anal fins blackish.

The coloration may be variable or may change when the fish dies. Preserved specimens turn greyish.

Mr. George Coates, of Townsville, to whom I am indebted for the accompanying fine drawing of this fish, informs me in a letter dated 12th September, 1942:

"This fish apparently varies in colour according to locality. They do not appear to have any darker colours than the picture [Whitley, 1943, Plate iii, Fig. B]. When caught at night on the reef in shallow water, they are a terra verte green in colour, which changes to the familiar red after death."

Both Chinaman fish and red bass are caught on all kinds of fish bait, including small whole fish, pieces of large fish and shark, also octopus and squid. Both fight well when hooked.

The red bass was discovered in North Queensland. I obtained it at Elizabeth Reef in the South Pacific Ocean, and it is common in north Western Australia,<sup>5</sup> and may occur over a much wider range. It soon took the hook over reefs in the Timor Sea, Northern Territory, for in September and October, 1949, when aboard the C.S.I.R.O. vessel "Stanley Fowler", I examined forty-five specimens from Sahul and Lynedoch Banks, Evans Shoal and Flinders Reef. These were 15 to 28 inches long, 4½ to 10½ lb. in weight. Most were mature males but all the females were immature and one fish was hermaphrodite. Their stomachs were mostly empty but some contained digested remains of fish or crustaceans. I would not let the crew eat them, although a little that I tasted was wholesome and very nice; but my colleagues aboard the "Warreen" in Western Australia feasted upon *Lutjanus coatesi* and enjoyed it very much, with no ill effects, and I was taken to task, in a good-natured way, for casting aspersions upon a noble food-fish.

And the question posed by the title of this article? I think it can be answered, "Yes, if you beware of the ruddy coloured hussars". Remember, however, that, as Halstead and Lively (1954) state, "One cannot detect a poisonous fish by its appearance. Moreover, there is no known simple chemical test to determine the edibility of a fish. The most reliable methods involve the preparation of tissue extracts which are injected intraperitoneally into mice, or feeding samples of the viscera and flesh to cats or dogs."

<sup>5</sup> Some recent American and Japanese records of poisoning by "*Lutjanus vaigiensis*" were almost certainly due to *L. coatesi*.



The young of the tiger cat (*Dasyurops maculatus*) approaching the weaning stage at five months. The body is covered with immature fur, and the tail-spots, which distinguish adults from the native cats, are seen as pigmented marks on the skin.

## The Marsupial "Tiger Cat"

### Birth and Growth in Captivity

By ELLIS TROUGHTON.

**A**N article in the last issue of the MAGAZINE described the appearance and habits of a captive pair of the marsupial "tiger cat", in comparison with its smaller cousin, the native cat.<sup>1</sup> The adult tiger cats were kept in captivity by Mr. H. H. Grant, retired sergeant of police, with the approval of the State Fauna Protection Panel. They were captured during weasel-like raids on a poultry yard in the Berry district, south of Sydney. After their capture last winter five young were born, as illustrated in the preceding issue, and their captor has now supplied the following interesting details of the birth and growth of the young.

Although inclined to bite fiercely at first, the adults proved remarkably responsive to feeding and a gentle approach, so that Mr. Grant was able to establish that the first

two infants were born on 1st July, the pouch being vacant on the previous day. Another three were attached to teats on 2nd July, although all five were probably born on the first day. There are six teats, to which the newly-born instinctively attach themselves, and it has been recorded that the smaller native cat, like the true American opossum, frequently gives birth to about twice the number of young that can be accommodated. The scramble through the fur into the pouch may therefore be a matter of survival of the fittest, under the limitation which provides a natural form of birth control in a predatory marsupial.

An excess of births, however, appears less likely in the larger and more powerful tiger cat, adults of which attain a length of 4 ft. from tip to tip. There was no lack of fitness in the five pouch-captives, but in

<sup>1</sup> See Troughton, AUSTRALIAN MUSEUM MAGAZINE, xi (3), 1953.



The predatory instincts and climbing ability of this marsupial are well-shown in the tapered snout with its long sensitive whisker-hairs, and the prehensile widely separable fingers and toes. The powerful jaws have long canine teeth, which enabled this half-grown female to kill an adult rabbit.



The remarkable success of Mr. H. H. Grant in quickly winning the confidence of the poultry-raiding parents of this young tiger cat was shown by the way it sought his protection while being photographed.



spite of their lusty growth, the introduction of a parasitic mite with grass clippings provided for the mother's comfort, caused the death of four. Fortunately, the fifth survived to become a most interesting and engaging subject for observation, according to its devoted captor.

Detachment of the baby from the teat was observed at eight weeks, the eyes opened a week later, and weaning took place at five months. When the youngster first left the pouch, the mother took protec-

tive action in trying to pick it up in her hands, then by her mouth, and finally with her hands to hold it while manoeuvring her body so that it would re-enter the pouch. For some time, the youngster would cling to the mother's back though frequently it was dislodged by her efforts at jumping on to objects upwards of 3ft. 6 in. from the floor.

At about eight months the young female, "Tibby", appeared about half-grown, measuring 2 ft. from tip to tip. Like its



The extent to which the confidence of predatory wild creatures is won by kindness and much patience with their sensitive tantrums is indicated by the young tiger cat submitting to harness while on walkabouts with its human friend. Similar experiences are reported with the supposedly much fiercer Tasmanian "Devil".

mother, it became very playful with pieces of clothing and other objects, like a kitten, without being friendly in the cat-like sense of wanting to be petted. At this stage, Tibby ate raw mince and steak, but showed a special liking for rabbit meat. To her captor's surprise, she also proved a most efficient killer by pouncing in a flash and killing an adult rabbit with a bite behind its ears. When hungry it would eat all the rabbit flesh, leaving only torn pieces of skin. It also killed a large lizard by the same method but ate the tail only, and would doubtless be an efficient killer of snakes. Like its mother "Tessie", the young female was a most efficient rat-catcher, so that not a mouse or rat was left where there had been numbers before. Another useful habit is that the tiger cats proved to be highly insectivorous, eating all kinds of hard-shelled beetles, other insects, and the larger larvae.

Although both adults had attempted to bite fiercely at first, the young one grew up with complete confidence in their captor, but it retained its acute sensitivity to unusual sounds, however slight. It seemed to be very sensitive to changes of colour in Mr. Grant's clothing, showing great

timidity until scenting his hands. As shown in an accompanying photo, it would then be completely at home sheltering in his arms and climbing around his shoulders. The tiger cats proved to be extremely cleanly, like all marsupials, and the nesting instinct was shown at about the end of April by the making of nests of fibre-wool in boxes. The adult male had died months before, apparently from an infestation of worms. Unfortunately, the call of the wild later proved Tessie's undoing as she was not discovered until too late wedged in an inaccessible place.

However, the pair may have met a harsher fate in being trapped or shot on one of their poultry raids, instead of having lived to prove the responsive nature of the "fiercest" of marsupials to man's companionship. The observations made also show that the most successful results are achieved with animals reared in captivity or caught when very young. The adults rarely lose the wild urge to go "walk-about", even when seemingly devoted to their captors. Perhaps a young mate may be found to share the contented existence of Tibby and continue the life story of the remarkable creatures.



Fledgling Stone Curlew in a self-hypnotic state on nest site, Double Cone Islands, Queensland.

Photo. by Author.

## A Shy Nocturnal Prowler

By FRANK McNEILL.

ON many of the islands along Queensland's tropical coast there lives one of the shyest of birds—the Stone Curlew. Many a drowsing visitor has been startled by the plaintive cries of this night prowler of the strands. Investigation is rewarded by little more than a fleeting glimpse of a wraith-like form melting swiftly into the gloom. The adult bird is about two feet six inches tall, with wide heavy bill and a slender body raised high on strong lanky legs. A dingy grey and brownish plumage is admirably suited to a nocturnal habit, making its wearer hard to distinguish unless quite close at hand.

On some islands the stone curlew is very plentiful. This is the case even at those places where busy tourist resorts have become established. The fact that the birds have not been driven from their haunts is a further tribute to their elusiveness and their effective camouflage. Another extraordinary fact is the way they can efface themselves during the hours of daylight.

A favourite habitat is a wide flat shoreline backed by crowded vegetation; any shallow and comparatively dry mangrove-filled depression is a particularly fancied

hideout. During daylight only the most diligent searcher, versed in bird lore, could hope to find his quarry among the baffling array of light and shadow in dense leafy places. More often than not a hiding bird is blundered upon by some fossicker off the beaten track and the surprise of discovery is mutually shared. In such circumstances the bird stands immobile on the ground with head and long neck erect, as though influenced by some hypnotic spell. It will rarely move until an intruder is almost at touching distance. The same spellbound sort of condition is evident to an even greater degree in the partly fledged young. A young bird will lie inert in a virtually open spot among fallen leaves on a strand of sun-bleached and stained coral shingle. Such a place on more isolated islands, rarely trod by human intruders, is a normal nesting site—a mere depression where the parent bird deposits its single egg, coloured greyish-white with faint lilac spots. It seems that only the merest chance will lead to the finding of this perfectly camouflaged egg—an item far more elusive than the bird that lays it.

Ornithologist Tom Iredale tells of coming upon a rare island curlew's egg by mere

chance early in the century on the strand of one of the islands in Port Curtis, near Gladstone. He claims that his eyes had become conditioned beforehand to the smaller and somewhat similarly elusive cast up shells he was searching for in the dry sands of the foreshore. That particular egg was brought south to Sydney before its real identity was revealed. It created quite a stir among local bird students, who were viewing a specimen for the first time. Finally the egg was deposited in the collection of the late Mr. A. F. Basset Hull, as a great rarity. In this connexion it is interesting to note that there is no similar example housed in the Australian Museum.

The accompanying photograph of a young partly-fledged bird was taken at the top of the strand on Double Cone Islands, in the Whitsunday Passage, south of Bowen. After a wide inquiry it has been established that only a rare few pictures of the subject have ever been published. Although the bird was wide-eyed and seemingly tensely alert for a full ten minutes while camera tripod and focus were

### Lunch-hour

### Film Programmes . . .

☉ Films will be screened at 1.15 p.m. on the dates given below, in the Lecture Hall of the Australian Museum. Admission is free and the screening time for each programme is approximately thirty minutes. Many of the films are in colour.

July, 7, 21; Aug., 4, 18; Sept., 1, 15; Oct., 6, 20.

adjusted, its self hypnosis rendered it immobile. Afterwards, ministering hands raised the body several times on bent legs from its bed of coral shingle and dead leaves. On each occasion the bird dropped back inert into its prone position. It was not until rougher handling was resorted to, combined with some vigorous massaging, that the fledgling became fully alert and, with surprising vitality darted with great speed into the undergrowth.

## Book Review

A BIRD BOOK FOR THE POCKET. By Major Edmund Sandars (fourth and revised edition, 18th February, 1954); first published 1933, 20s. 9d.

Since the original production the author died, in 1942, but he had assembled a number of corrections, and brought later names up to date, so that this edition could be published at comparatively short notice.

Throughout Britain there has been great demand for this book in field work, but it is one that should also be on the shelves of Australian ornithologists for accurate and easy identification of British birds in the field.

The illustrations are not only carefully drawn to scale and colour, but are artistic and pleasing to the eye.

The author gives reasons for his arrangement and the brevity of information concerning each species, and it is pleasing to note that he gives essentials without confusing "padding". *A Bird Book for the Pocket* is an excellent reference book for home, garden or field, and would be a good guide for any writer contemplating a similar work concerning Australian birds.

—J. R. KINGHORN.

## Death of General Sir Charles Rosenthal

ALTHOUGH Major-General Sir Charles Rosenthal, who died at Green Point, near Gosford, on 11th May last, aged 79, was best known as a soldier and politician, his public duties also included a period of service to the Aus-

tralian Museum. He became an Elective Trustee in 1924, was President of the Board of Trustees from 1926 to 1930, and during these years his drive and enthusiasm did much to stimulate interest in Museum activities.