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Price—TWO SHILLINGS



The Tiger Cat.

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THE AUSTRALIAN MUSEUM MAGAZINE

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

● OUR FRONT COVER. The Tiger Cat (*Dasyurops maculatus*) of eastern Australia and Tasmania, largest of the flesh-eating marsupials known as "native cats", which, in habits and appearance, more nearly resemble the foreign non-marsupial weasels. Turn to page 168 for a descriptive article and additional photographs.



Brittle Sea-stars are relatives of the conventional sea-stars and the sea-urchins. They occur plentifully between tide marks on the reefs of open coasts in temperate and tropical seas. It is usual for them to remain hidden from sight beneath boulders or in the crevices and undermined surfaces of coral reefs. All have extremely delicate ornate arms and most will throw these off when handled. Thread-like tubes terminating in tiny suckers spring from numerous pores on the undersides of the arms, which move in serpent-like motion when the creatures are crawling or reaching out in quest of food. The form illustrated is named *Macrophiothrix longipeda*, occurring along the Great Barrier Reef, Queensland. It possesses the longest limbs of its kind, often measuring as much as 24 inches from the central disk-like body to their tips. Rarely is a specimen collected and preserved so intact.

F. MCN.

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March 15, 1954

Princess Elizabeth Land

By H. O. FLETCHER.

FOR the first time in the history of the Commonwealth of Australia a Reigning Monarch has visited its shores. Her Majesty Queen Elizabeth II and His Royal Highness the Duke of Edinburgh arrived in Sydney on the 3rd February to be greeted with such a tumultuous welcome that Her Majesty can have little concern regarding the loyalty and allegiance to the Sovereignty of her people in Australia.

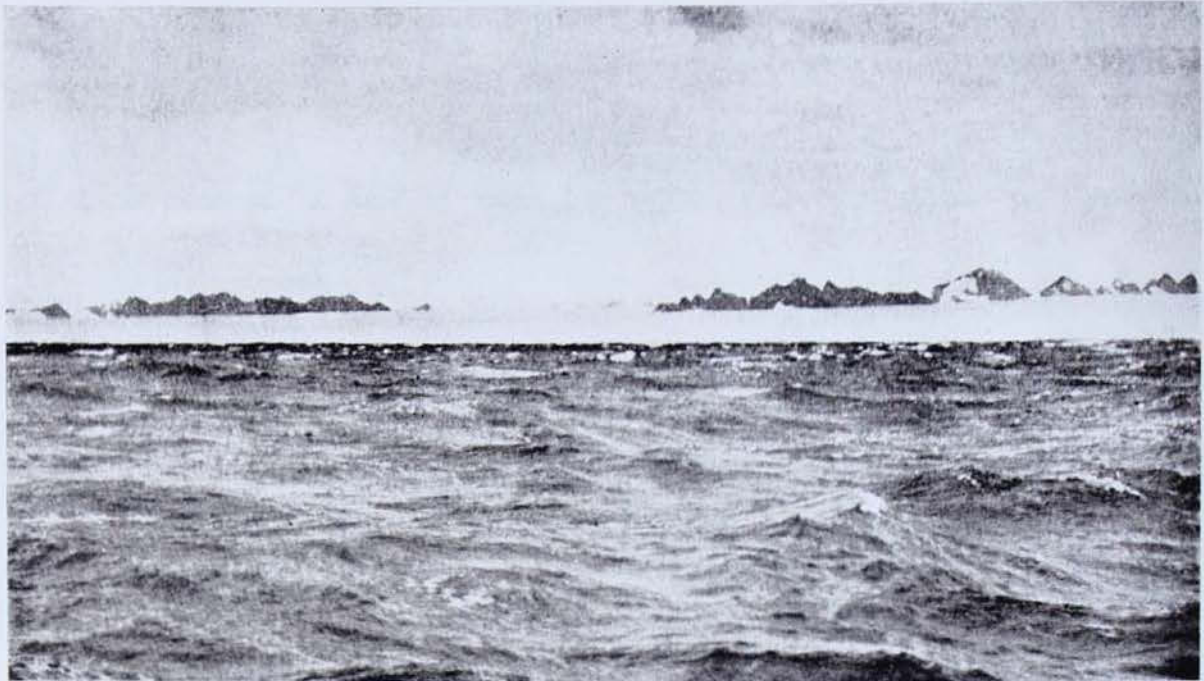
The visit of Her Majesty to Australia, one of her most southern possessions, must remind many people that far away in the great southern continent of Antarctica is Princess Elizabeth Land, discovered and named by Sir Douglas Mawson in 1931.

Princess Elizabeth Land extends on the ice-cliff fronted coast-line of Antarctica from 86 degrees east to 73 degrees east longitude. The land extends south from the coast-line to the position of the South Pole, 13,000 feet above sea-level and is, therefore, in the form of a gigantic slice of cake.

The land was first sighted by the British, Australian, New Zealand Antarctic Research Expedition on the 9th February, 1931. On this date the weather was favourable for an aerial reconnaissance and

the aeroplane was lowered overboard and took off from a large pool of water in the lee of a large tabular iceberg. Flight Lieutenant Campbell was the pilot and Sir Douglas Mawson, observer.

At a height of 5,700 feet they clearly observed a great jumble of icebergs to the south and south-east where there was also a definite appearance of elevated ice-covered land. Away to the south-west the pack-ice was not particularly heavy and some open water was leading up to a line of ice-coast. Later, on this section of coast, two snow-capped mountains were observed and named Monro Kerr Mountains. They have an altitude of 4,000 feet. Southward from the aeroplane at this time was a great expanse of dense pack-ice, but on the southern horizon there appeared to be a narrow belt of water and a low line of ice-coast beyond it. This appearance of land extended from the south-west (Monro Kerr Mountains) to the higher land in the south-east. Sir Douglas Mawson named this territory Princess Elizabeth Land and later close contact was made with it when the MacRobertson Land coast was traced from the west to join with Princess Elizabeth Land in the east.



Above—The MacRobertson Land coast-line within the Australian Sector of Antarctica. The Masson Range (left) and the David Range (right) consist of bold headlands and rocky mountains protruding through the continental ice-cap.

After Geographical Journal, London.

Below—Members of the Australian National Antarctic Research Expedition establishing a base camp on Heard Island in December, 1947. The base is now a flourishing one and is in its sixth year of operation.

Photo. by courtesy of the Department of External Affairs, Antarctic Division.

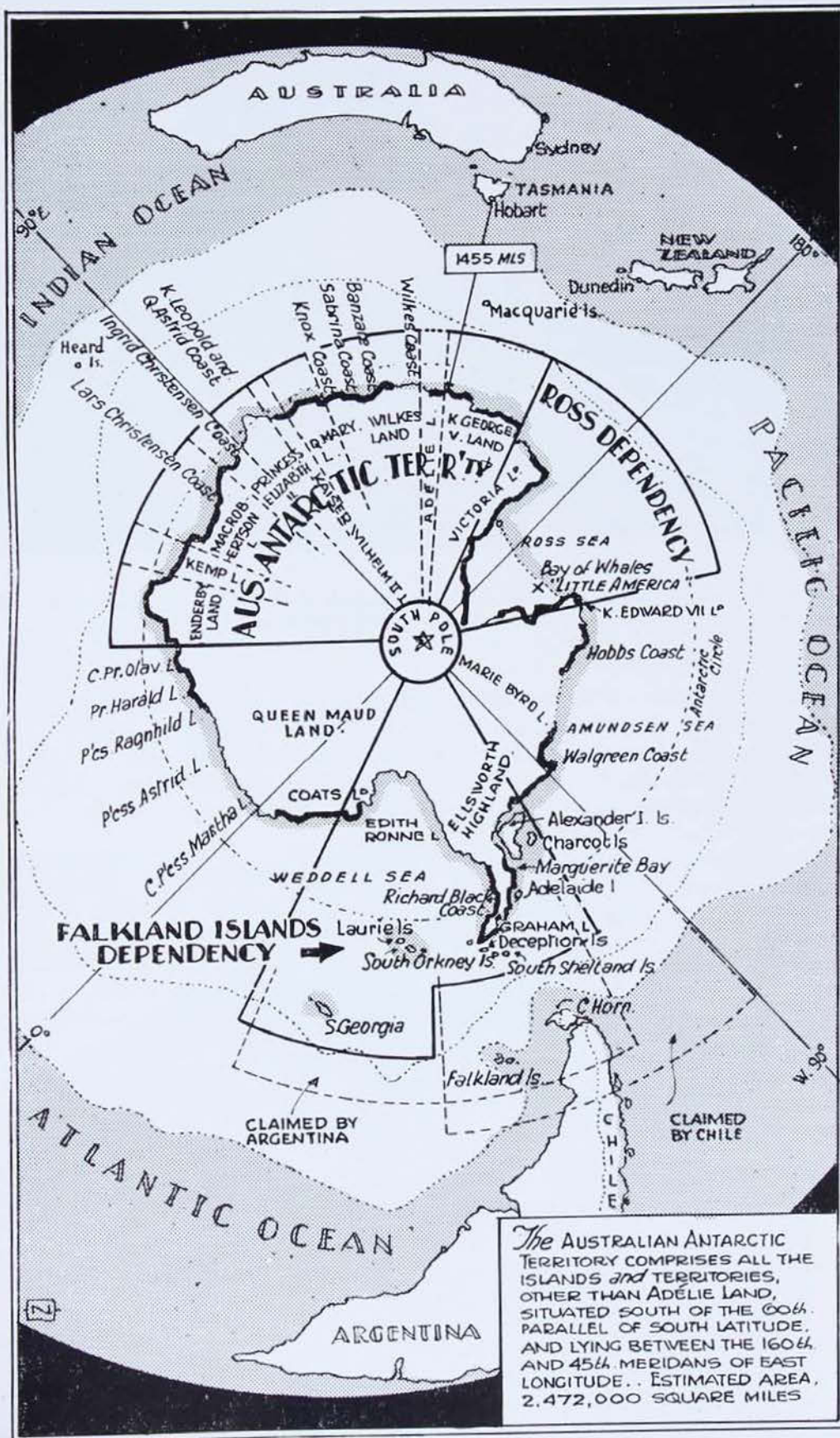


Princess Elizabeth Land is part of the Australian Sector of Antarctica and has an area of almost 2,500,000 square miles. This territory lying to the south of Australia consists of at least one-third of the entire continent.

As an outcome of explorations chiefly conducted by Australians, but also dating back to the discoveries of Biscoe and Kemp, the administration of a broad sweep of Antarctica lying adjacent to Australia was given to the Commonwealth of Australia.

The following appears in a British Order - in - Council dated 7th February, 1933:—

“That part of His Majesty’s dominions in the Antarctic seas which comprises all the islands and territories, other than Adelie Land, which are situated south of the 60th degree of south latitude and lying between the 160th degree of east longitude and the 45th degree of east longitude is hereby placed under the authority of the Commonwealth of Australia.”



Block by courtesy of the Tutorial Classes Department, University of Sydney.



The Scullin Monolith in MacRobertson Land, Antarctica. At this point a flag was raised by the B.A.N.Z.A. Expedition and formal possession of the area claimed for Great Britain.

After Geographical Journal, London.

Adelie Land is a thin slice of land within the limits of the Australian Sector of Antarctica and extends on the coast-line from 136 to 142 degrees of east longitude. France has frequently reiterated her claim to this territory which was discovered by the French navigator Dumont D'Urville on January 19th, 1840. A landing was made on the continent and the territory was named Terra Adelie.

Some time ago, however, the French Government agreed to move back their eastern frontier so that Cape Denison would be included in Australian territory. A memorial had been erected on it to Lieutenant Nimis and Dr. Mertz who had lost their lives during the Mawson Expedition of 1911-14. France recognized that Cape Denison has sentimental and historical associations with Australia.

The French Adelie Land Expedition which visited Adelie Land within the last few years carried out a great deal of work in their Antarctic possession and their claim to the area has been more than consolidated. Mr. Bob Dovers accompanied the expedition as an Australian observer.

Australia's interest in her southern ice-capped territory is a natural consequence of her close proximity to it, the nearest point being only 1,455 miles south of Hobart.

The Governments of many countries are exhibiting an increasing concern and interest in their frozen assets in Antarctica at the present time. This interest is not confined to scientific problems or to any possible commercial potentialities but is more to a justification or consolidation of their territorial claims.

Formal territorial claim to every part of the Antarctic Continent has been made by different Nations. No part of the Continent remains unclaimed and the Nations interested are the United Kingdom, Australia, New Zealand, Norway, France, Russia, America, Argentine and Chile. Some claims are recognized, others are disputed.

The Australian Government, since it took over the administration of its southern lands, has not been idle and plans have long been in operation for the establishment of bases from which a long term programme of surveying and scientific research can be carried out.

For the past six years meteorological stations have been established on the sub-antarctic islands Heard and Macquarie. These bases are an outcome of the Australian National Antarctic Research Expedition (A.N.A.R.E.) which was formed in 1947 with the object of establishing three permanent stations, one on the coast of the Australian Antarctic Territory, one at Heard Island and one at Macquarie Island.

Heard Island is about 900 miles north of the western sector of the Antarctic Territory while Macquarie Island is about 800 miles north of the eastern sector. Each station on these sub-antarctic islands has been manned by a party of about fourteen men and they are relieved annually. The stations are excellent training centres for men who will in the future be selected to accompany expeditions to the Antarctic Continent itself.

In 1947 the Australian National Antarctic Research Expedition, set up under the control of the Antarctic Division of the Department of External Affairs, was very keen to establish a base as soon as possible on the Antarctic Continent. A particularly fine job has been carried out on the

sub-antarctic islands but unfortunately a suitable ship was not available to make the hazardous journeys through thick pack-ice to the actual continent itself.

Early in 1948 the polar ship "Wyatt Earp" of 400 tons, which had been refitted, steamed south with Group Captain Campbell as leader and Commander K. Oom as Captain. Both men had been members of the Mawson Expedition of 1929-31. This Antarctic cruise which finally, after many adventures, reached the Balleny Islands, proved the vessel to be entirely unsuited for the work proposed in Antarctica.

It was then decided to obtain a ship of much greater capacity than the "Wyatt Earp" and one specially adapted for the ice conditions encountered in Antarctica.

Plans for the new expedition which left Melbourne last January were prepared by Mr. P. G. Law, Director of the Antarctic Division, Department of External Affairs.

Latest information is that the vessel has reached the Antarctic Continent after being subjected to extremely severe weather conditions. Slight damage was caused, but a base was established which in future will be known as "Mawson". The exact location is not known, but it will almost cer-

The remarkable Big Ben Range, approximately 8,000 feet, which covers most of the area of Heard Island. The culminating point on the plateau surface is Mt. Mawson, 9,005 feet above sea-level.

Photo. by courtesy of the Department of External Affairs Antarctic Division



tainly be in the sector of MacRobertson Land where a rocky coast-line lends itself to a good landing and protection for the building of a research and meteorological station.

During its first year the expedition, under the leadership of Mr. Bob Dovers, will consist of only a small party. The members will erect living quarters, an engine room, radio and meteorological huts in readiness for the long dark winter months. The expedition's vessel, the "Kista Dan", will return to Melbourne with the organiser, Mr. P. G. Law, as soon as the equipment is safely landed.

The programme of work of the continental party is an extensive one as, besides the meteorological work, a good deal of geological and biological research will be carried out. The area will be thoroughly surveyed and weather information when secured will be sent to Australia.

It is hoped that this station will be one of several in the near future and that the Australian Sector of Antarctica will be an area from which continual weather reports and information will enable long range forecasting of weather to be made for the Australian Continent.

As the years go by the Antarctic base will increase in its efficiency as more and more elaborate apparatus and equipment will be sent south with more personnel to carry out additional researches in all branches of science.

Expedition members will very soon realize that Antarctic weather is the most severe in the world with record low temperatures in the winter months and almost unbelievable wind velocities.

At the present time it is interesting to conjecture exactly what are the possibilities of obtaining uranium in the Antarctic. From time to time the press have published the hopeful possibilities of great uranium deposits and a wealth of other rare and precious minerals in the far south. Antarctic activity in this regard is very easily discounted when it is realized that only one-fifth of one per cent. of the country rock of Antarctica is exposed, the rest being buried beneath an immense ice-sheet which in places may be several thousand feet in thickness. Under conditions such as these it will be a long time, if ever, before mining is even a possibility while even more to the point is the fact that no traces of uranium or other radio-active minerals have been recorded in rocks brought back from Antarctica. Other rare minerals are represented by traces infrequently.

There can be no doubt, however, that in the immense but hidden rock deposits of Antarctica there must be great ore bodies but these are effectively sealed from human interference by the ice-cap.

It is gratifying to know that Australia is doing and has planned so much to unravel the secrets of her territory in Antarctica and to learn something of how this "giant refrigerator" may affect the weather not only in Australia but in the other great southern continents. At the same time Australia is overcoming one of the main points of international law which states that "effective" occupation must follow any initial act of territorial control within a reasonable time.

While Her Majesty Queen Elizabeth is seeing for the first time her many southern possessions a small party of Australians are preparing to winter on Her most southern possession and not very far from the land named after her as Princess Royal, Princess Elizabeth Land.

Tiers of sculptured stone figures beside a temple.



Bali: Emerald Gem of the Indies, II

By FREDERICK D. McCARTHY.*

THE encouragement of self-expression among all classes has enabled the Balinese to become one of the genuinely artistic people in the world. Moreover, the diffusion of highly skilled techniques from Asia, and the introduction of the spectacular arts and dramas of the Hindu-Javanese religion, have made possible a full development of their aesthetic life. Skilful craftsmanship, musical and dramatic talent in individuals are developed to the full by the village society because of the prestige derived from the work of renowned artists. There is keen rivalry between the carvers, orchestras, dancers, and stage performers of the different villages, many of which specialize in one of these arts for generations. In this manner, a

village acquires a reputation for its fine orchestra or talented troupe of dancers, its actors, poets, choreographers or composers.

The performers or craftsmen are not paid in money, but they are entertained lavishly, and receive gifts. The whole village contributes towards the expense of maintaining the artists and their paraphernalia.

RELIGION.

It is necessary to understand the religious changes that have taken place in Bali to appreciate its arts fully. Originally the people practised ancestor-worship. When they adopted Hinduism with its high aesthetic and intellectual ideals, it had already been modified for a decade by the

* Photographs by the author.

Javanese. The Balinese then blended this Hindu-Javanese religion with their own, which to-day is thus a mixture of concepts.

Shiva is the highest god of the Hindu Triumvirate in Bali, Brahma and Vishnu being his divine manifestations. Shiva, creator and destroyer, reigns on the great volcano, Gunung Agung, where he is identified with the sun-god, Suria. There are separate gods and goddesses, many of whom have contradictory attributes and who must be propitiated and pleased, reigning over every aspect of the people's life. The gods live on the mountains and volcano peaks, which form the sacred world of the Balinese. The nobility are of divine origin and are the representatives of the gods among the people. There are three castes among the upper classes: the Brah-

manas are the priests, the Satrias the secular leaders, and the Wesias the military caste.

The Balinese have to contend with evil giants, witches, and other fantastic creatures, whose favours must be won so that a healthy balance can be maintained between life and death, good and evil. To effect a harmonious understanding with nature and the supernatural world, the Balinese perform magical and religious rites, constantly re-enact the epics, and make offerings in their numerous temples. There is a close alliance between their everyday life and religious beliefs. Catastrophes such as incest, the birth of twins, suicide, epidemics, and the loss of crops are believed to be due to the temporary triumph of evil forces. The house or village must then be purified of the evil elements.

Both the gods and demons have supernatural powers, against which only the high priests are immune in carrying out the higher ritual. The evasion of the evil spirits and winning the goodwill of the gods, are thus part of the daily life. A constant danger are the *butas* and *kalas*, ever-present evil spirits who persecute human beings. Equally dangerous are the *leyaks*, witches who appear as flames in cemeteries and as weird animals, dead men, female temptresses, and in other forms.



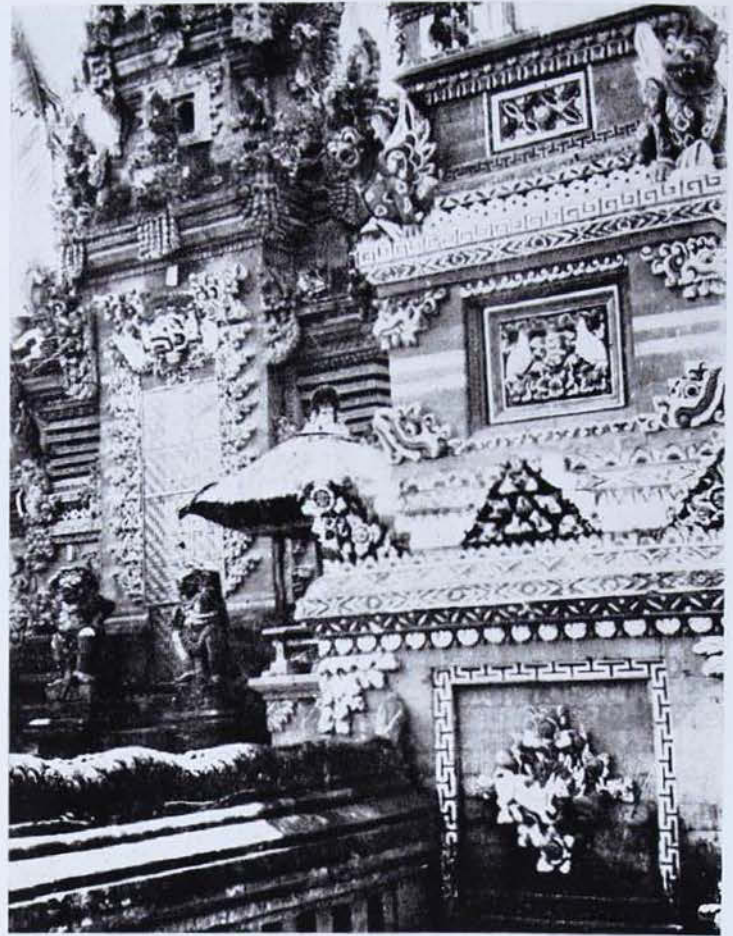
A fine example of the open gate of a temple. The opening symbolises the unhindered access of the people to their gods and places of worship.

The magnificent displays of carvings on the temples include representations of the Garuda bird of Vishnu, the bull Nandi of Shiva, the goose of Brahma, the bird Wilmana of Ravana, the lion, cock, snake and tortoise. Some of the figures represent demons and mythical animals who are the guardians of the temples.

TEMPLES.

Bali well deserves the title of the island of temples. Every house has its shrine for offerings. There are temples in the banyan trees and rice fields, in the cemeteries and markets. Every village and palace has a temple, and there are important ones on the beaches and lake shores. There are six holy temples, the greatest of which is situated on the slopes of Gunung Agung, where the highest priests officiate, and where every principality is represented by a shrine.

The layout of the temples varies in detail, but the basic type has two courtyards. In the outer court the people assemble for the ceremonies, and it has platforms for the orchestra, for resting and cooking; the alarm drums hang in one corner, and fragrant frangipanni trees grow within its walls. The entrance is through a gate split asunder by a god, and its two carved sections constitute one design. Steps lead up to the inner and sacred court, the gate of which is in one piece and is a replica of the outer gate. Statues and carvings of giants guard this entrance against the evil demons. In the courtyard are the shrines for the village deities, for the great volcanoes, one or more turreted *meru* for the supreme Hindu trio of Siva, Brahma and Vishnu, and a central assembly platform for the gods when they visit the earth. Shrines for other purposes, such as the lingam fertility cult, may also be present. The gods use these shrines on their visits, and the ceremonies and offerings are an attempt to prolong their visit



as long as possible. A local priest, a *pemangku* who may be a commoner, looks after the temple, and his life is devoted to meditation and the performance of ritual. At Besakih, all of the shrines are of the *meru* type and they form a most impressive assembly. The *stupa* type of temple, such as Borobodoer in Java, does not occur in Bali.

Local feasts are always being held because the Balinese are dependent upon the results of their rites and offerings for health, happiness and prosperity. If one god fails to respond, his temple may be abandoned and a new one built for a more promising member of the wide array of beneficent beings. The offerings consist of the choicest fruits, rice pastry, and lovely flowers artistically arranged by the women, who, dressed in black skirts and yellow bodices, carry them to the temple, where they are consecrated and offered by a white-robed priest. The people wear their finest clothes for the feasts and temple rites, and on these occasions many men wear their own sacred kris.

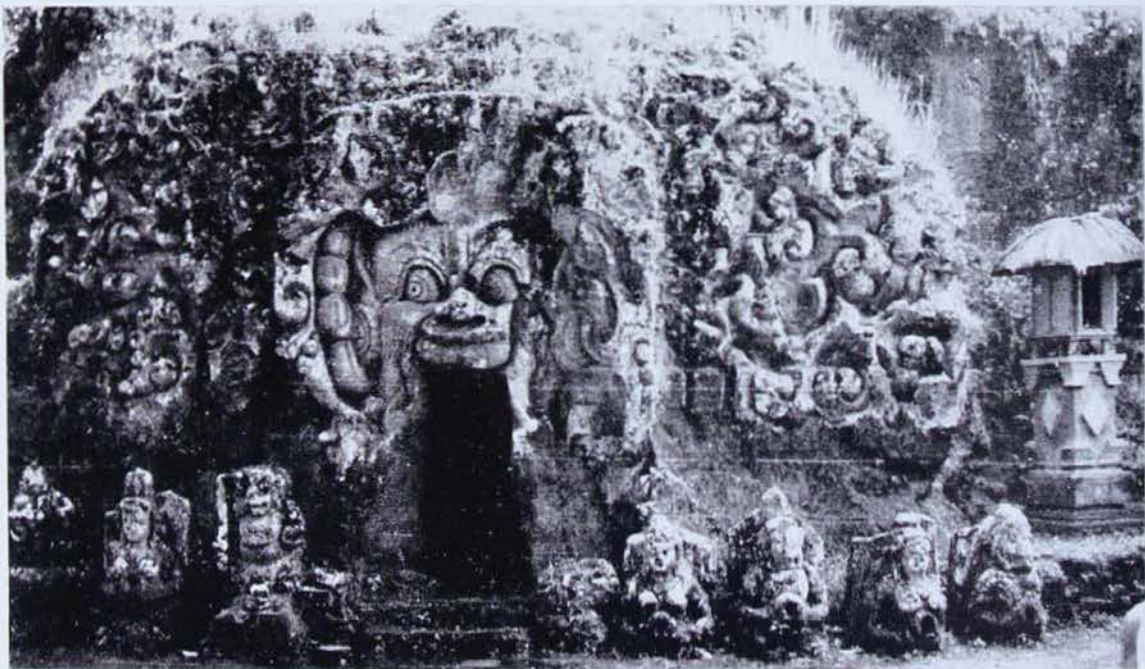


Tiered Meru towers are a feature of the great mother temple at Besakih, the abode of the highest deities in Hindu hierarchy in Bali.

Two great feasts are held each year. That of *Nyepi*, the New Year festival, is for the purpose of chasing away all the evil spirits. It is a happy and riotous gathering, lasting several days. The historical plays are performed, dancing troupes appear, and cock-fighting is permitted. The purpose of the other great festival, *Gulanggan*, is to entertain the ancestral spirits which visit the homes of their descendants for fifteen days. The roads

are decorated with lontar-palm manuscripts and tall towers, the mythical *Barong* appears, and violent dances are performed in which men in a trance stab and cut at themselves with a kris.

The religious and sacred background of the Balinese theatre may now be clear, but a full appreciation of its artistic and dramatic qualities may only be obtained by witnessing performances. There are several types of presentations.



The Elephant's cave, Gora Gadja, at Oedjoeng. The central carving is of a great monster with bulging eyes who tears the rock apart with his powerful hands, and the other carvings represent people running away from him in terror. Inside the cave is a statue of Ganessa in the form of an elephant's bust.

Offerings and decorations are placed on the temples on ritual occasions.



The classical drama is acted by princes, and the language used is the *Kawi*, a rich and melodic archaic Javanese. The themes are drawn from the highest historical stories of the sacred epics and local folklore. In the *Topeng* the wars between principalities and the exploits of great warriors are skilfully depicted by two or three men who impersonate all of the characters; they adopt different modes of speech, changes of voice, and wear many costumes. In the great *Ardja*, which is acted, and the *Wayang Kulit*, the shadow puppet version, the struggle between good and evil, in which neither triumphs, is the fundamental theme. Stories from the *Ramayana* and *Mahabharata*, the two principal Hindu epics, are depicted; a popular one is that of *Rama* rescuing *Sita* from the giant *Ravana* in which *Hanuman* and his legions of monkeys appear, while feuds between the virtuous *Pandawas* and the evil *Korawas*, and other episodes, are shown.

The *Wayang Kulit* is a highly developed art. It is believed that the ancestors came into the world as shadows to communicate

with their descendants, and the puppets represent these shadows. The puppets are made of thin sheets of buffalo-hide carved in filigree, and are carefully coloured. The operator, or *dalang*, manipulates these marionettes so that their shadow is cast upon the screen, meantime chanting the story in *Kawi*. He must be learned in the epics, and he performs a valuable educational service by his re-enactments of them. Shadow-plays take place at temple feasts, cremations, marriages, and on all festival occasions. The people, who know the stories intimately, keenly follow the drama the whole night through, but Europeans are soon wearied because it is not spectacular and the actions are difficult for them to understand.

Perhaps the finest dramatic production in Bali is that of *Tjalon Arang*, the feud between *Rangda*, leader of the *leyaks* (witches), a child-devouring mistress of black magic, and King *Erlangga*, upholder of good. Honours are always even because were a slur to be cast upon *Rangda* her wrath would wreak untold harm. The best orchestras play the finest music, the lovely *legong* is danced by its greatest exponents, while comedy and mystery add to the interest.

The most spectacular figure in Bali ritual is the representation of *Barong*, ruler of the jungle, who aids mankind in its

struggle against *Rangda* and her *leyaks*, and against other demons. *Barong* is a long-haired creature, with golden scales and tail, whose back is set with tiny mirrors; his head is a hideous bulging-eyed, snapping-jawed mask with a gilt crown, furnished with a long human-hair beard in which his magical power lies. Bells jingle at every movement of the two men who are trained to carry the figure and act its part. In one performance, *Barong* is killed by *Rangda*, who is then attacked by men with krisses; they have to evade the sweep of her death-dealing cloak, and, as the play proceeds, they work themselves into a trance and perform the kris dance.

Some Freshwater Gudgeons

Mainly from Tropical Australia

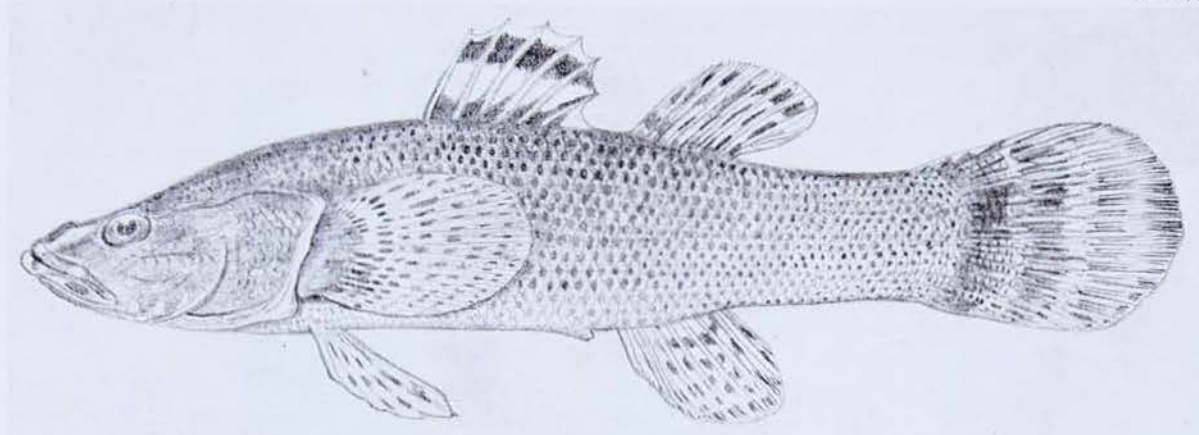
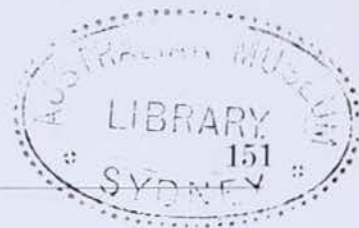
By GILBERT P. WHITLEY.

SOME groups of animals attract our attention more than others, by reason of their bright colours, their intelligence, or vivacity, or the way they take care of their young. Yet, however much a zoologist is interested in animals by and large, he generally recognises certain pet aversions or *bêtes noires*, certain animals he least likes to study because they are dull-coloured, too large or too small, difficult to classify, or otherwise (perhaps inexplicably) lacking in interest. For example, a conchologist has confessed¹ "Personally, as a group to work on, I dislike the land shells intensely . . ." and "I suffer a land-shell exhaustion". It is, I feel, my fault, not theirs, that I find the gudgeons a rather boring group of fishes after the bizarre sea-scorpions, the dazzling coral fishes, the fascinating flatfish, and indeed almost any other kind of fish that swims in sea or river. Gudgeons all seem to "look alike", and close study of their teeth, even

their pores, and counts of their fin-rays and scales are necessary to tell them apart. Sluggish in habits, modest in colouring, like their muddy surroundings, generally too small to be eaten—what feature can redeem them? Perhaps a more inspired writer about them can suggest possibilities. Let us read what my mentor, the late A. R. McCulloch, wrote of them in the *Australian Encyclopaedia*:

"*Gudgeons*, members of the family Eleotridae, and near relatives of the gobies. These small fish occur in the sea, estuaries and freshwater. Some even inhabit the streams and waterholes of the central Australian desert region; these have the power of aestivating during periods of drought—that is, by suspending animation while lying encased in dry mud, they survive until the return of wet weather revives them. One small species of the genus *Carassiops* is occasionally lifted from shallow pools by whirlwinds and, together with shrimps and water-snails, is carried alive for short distances, to be dropped as from the clouds; such an occurrence is sometimes noted in the press as a 'rain of fish'. Most of the numerous species occurring in Australia are but a few inches in length, but some are large enough to be useful as food-fish, and one (*Oxyeleotris lineolatus*) attains a length of 19 inches".

¹ Joyce Allan, *Australian Shells*, 1950, p. 370.



Tetard, *Cuius melanosoma*, from Buin, Solomon Islands.

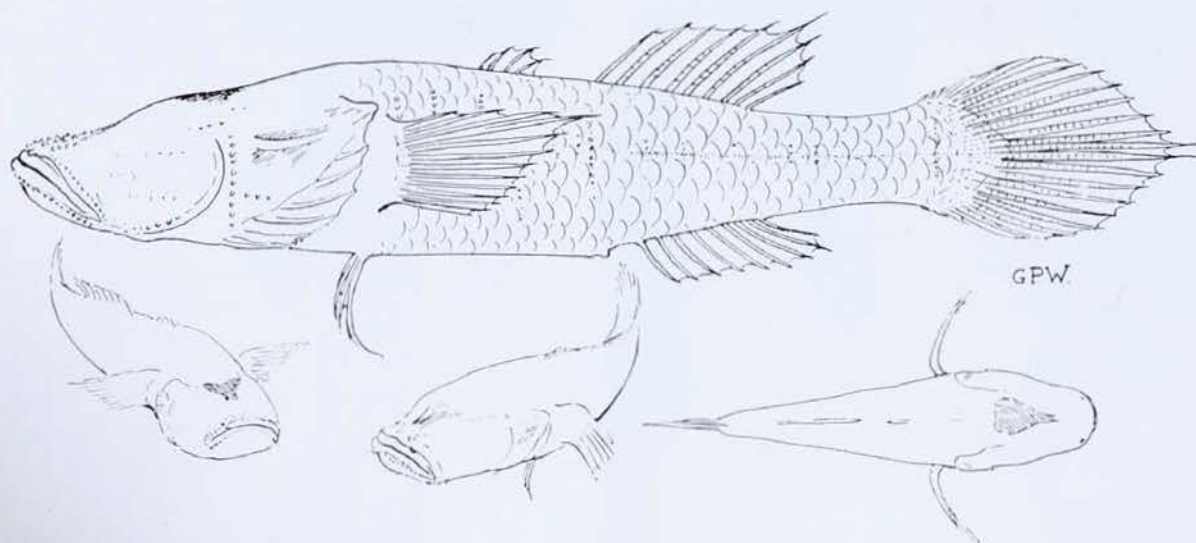
G. P. Whitley, del.

The common name Gudgeon has always been widely used for these little fishes in Australia, originally having doubtless been given by the colonists who remembered the superficially similar European Gudgeon, *Gobio gobio*, the *goujon* of the French. It is to the European fish, not to the Australian, that Gay's rather sour little verse alludes:

"What gudgeons are we men,
Every woman's easy prey!
Though we've felt the hook, again
We bite, and they betray".

But to return to our *goujons*. They are also known as Sleepers, because they lie quietly for long periods, and as guavinas, loters, and (yes, in Puerto Rico) as morons —also as tetards, and in German, grundeln. They differ from the Gobies in having the ventral fins separate instead of united into a sucking disc below the body.

The largest gudgeon (*Gigantogobius jordani*), which grows to a length of 26 inches, comes from the rivers of Borneo; the largest Australian one, as already

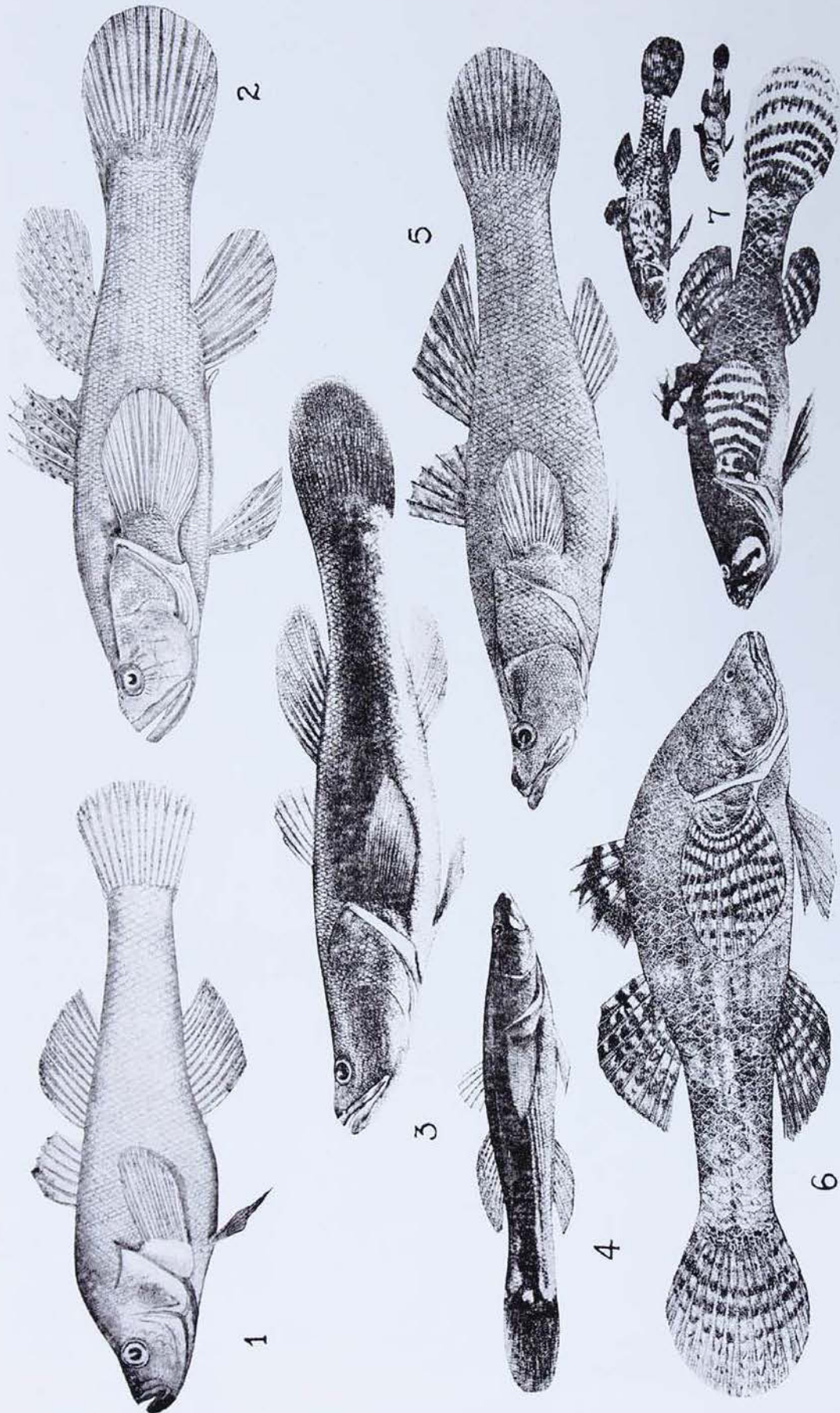


Blind Gudgeon, *Milyeringa veritas*, from north-western Australia.

The lower figures show its attitudes in life.

G. P. Whitley, del.

(Block by courtesy of the Royal Zoological Society of N.S.W.)



Tropical freshwater gudgeons whose species have been found in Australia.

- 1. Golden Gudgeon, *Shipwajia aurea*, from north-western Australia. After Shipway.
- 2. Brown Gudgeon, *Culius fuscus*, from Samoa.
- 3. Guavina, *Bunaka herwerdenii*, adult, New Guinea.
- 4. Guavina, *Bunaka herwerdenii*, young.
- 5. Lecter, *Oxyelcoliris lincolatatus*.
- 6. Small-eyed Sleeper, *Prionobutis microps*.
- 7. Small-eyed Sleeper, *Prionobutis microps*, 3 young stages. Nos. 3 to 7 after Weber.

G. P. Whitley, del.

noticed, attains 19 inches. Our smallest is the Tittle or "Bumblebee" (*Lindemanella iota*), less than one inch long.

As there are about two dozen genera of gudgeons in Australia with many species, I propose to deal here only with those which have entered freshwater, more particularly those north of the Tropic of Capricorn, as they are least known.

Our river gudgeons are sometimes mistaken for the young of Murray Cod and other larger fishes, but the front dorsal fin has soft spines in gudgeons and hard spikes in Murray Cod, perch, and other large food-fishes. The Carp Gudgeons are mid-water swimmers but others prefer to lurk about weeds and stones near the bottom. During long periods of drought, they can almost dry up in the mud without losing life. D. G. Stead (Fishes of Australia, 1906, p. 185) related: "A parcel of fish specimens had been brought to me, for identification of species, from Wagga Wagga. . . . They had . . . been brought down in the train—a journey of 314 miles; no special care being taken of them. . . . I opened the parcel . . . nearly 24 hours after and as the fins and skins were rather dry, threw all of the fishes into a basin of water to 'soak them out' prior to preserving them in formalin. About 10 minutes afterwards, upon going to examine them, my astonishment can be better imagined than described, when I found the two Gudgeons swimming round and round, one of them quite serenely and the other just a little 'lamely', as though it had been bruised a little on one side".

In spite of their hardiness, our native gudgeons, hardyheads, and other charming little denizens of our rivers are being ousted by those tougher guys from Texas, the Gambusias. Though valuable as eaters of mosquito wrigglers, Gudgeons are of no commercial value in Australia, being only used as bait for other fishes, or being eaten by trout, but in the Orient, notably in the Philippines, the ascent of streams by the fry (*ipon*) of various gobies and gudgeons gives rise to important fisheries. Huge nets with fine meshes catch enormous quantities of the tiny fishes, which are of delicate flavour and are eaten either fried in oil or

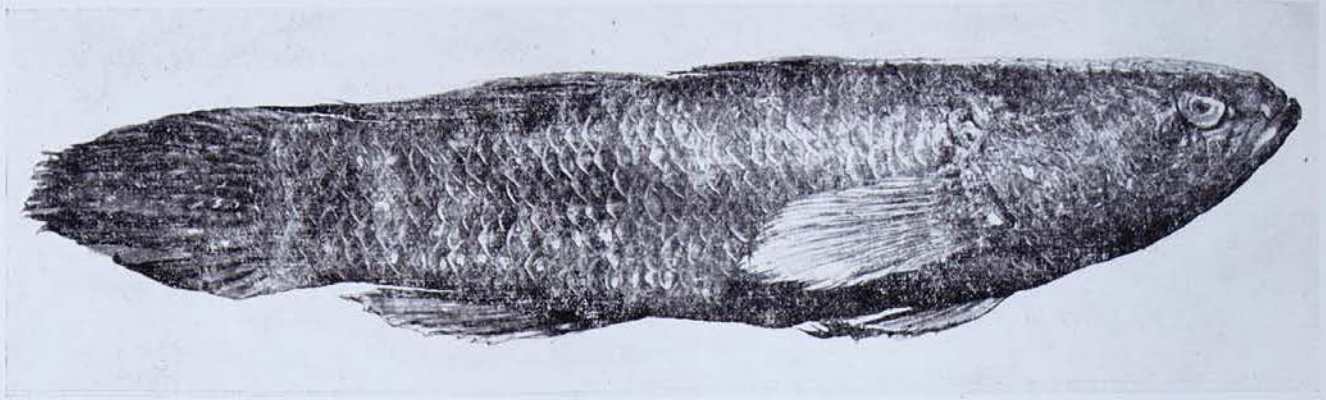
cooked in various other ways, or they are trapped by dams and barriers with great destruction of the species, so that the veteran ichthyologist, A. W. Herre, has rightly protested against the slaughter. Some natives invented the legend that a mass of foam forms in the sea and swells like a great bubble; within this the *ipon* are formed and when it rises to the top it bursts and releases them, so a campaign of elementary biological education was very necessary among the Ilocano people to offset the bad effects of this belief.²

Ipon and other small fishes and shrimps are salted in jars in layers to form an Oriental food known as *bagoong*.

A selection of species, mainly those recorded from tropical Australian rivers, is here illustrated to give some idea of the general appearance of gudgeons. The most aberrant type is the Blind Gudgeon (*Milyeringa veritas*) which has no eyes and lives in subterranean water in north-western Australia; it was named *veritas* after Truth, because it lies at the bottom of a well. Its scales are thin and papery; there are papillae on the head and body and delicate pointed fin-rays which doubtless serve as sense-organs in the darkness. The movements of these 2-inch fish are rather slow and tadpole-like and each swims its own way, rather than in a school. Only one other blind gudgeon is known, the genus *Typhleotris*, from a soak in Madagascar.

At least some of our gudgeons show sex and seasonal differences. Males may (like their human counterparts, you might say) have swollen heads at the courting season, the cheeks or nape being humped, their colours brighten and vary, their fin-rays may grow longer. The ovipositor of the female may be fringed or emarginate behind; in males there is a narrower genital papilla. They care for their brood, too. The male gudgeon may clear a space on a rock for the female to deposit her adhesive eggs, and the male mounts guard over them, and some days later when the young

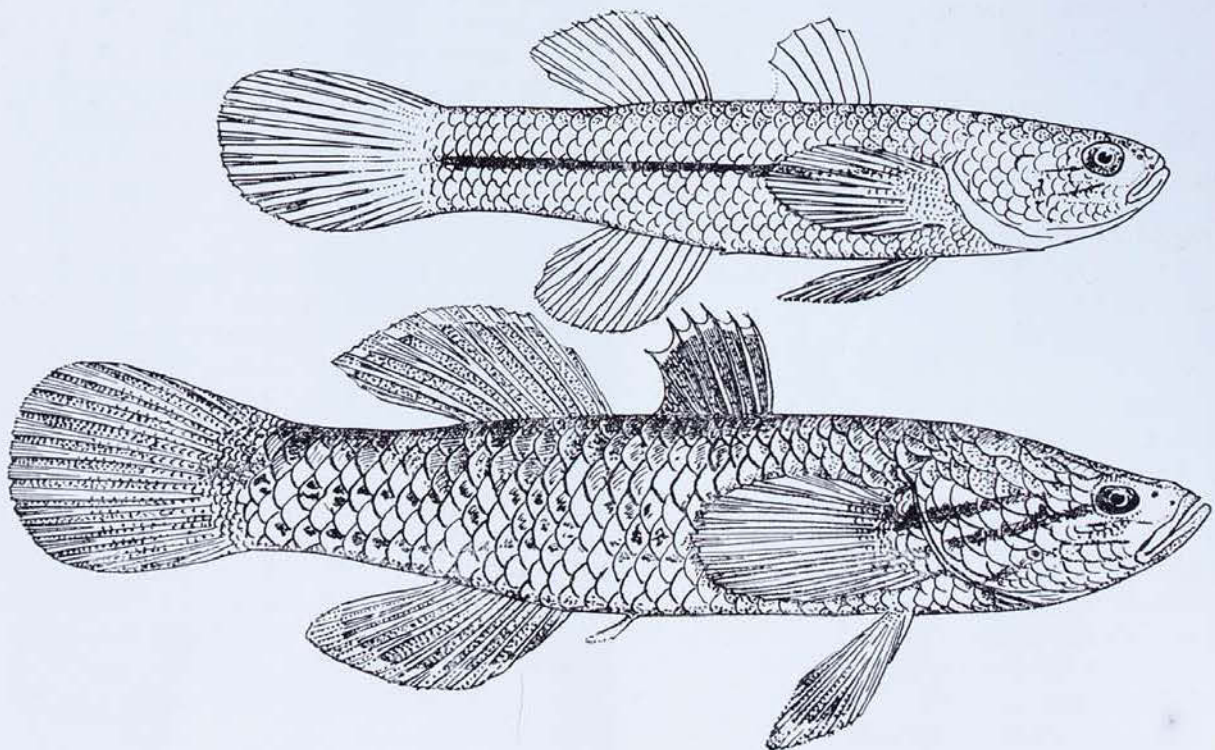
²A. W. Herre, Gobies of the Philippines and the China Sea, 1927, p. 17. For illustrations of the *ipon* fishery, see Montilla, *Philippine Journ. Science*, 45, 1931, p. 61, pls. i-vi and text-figs.



Spangled or Mullet Gudgeon, *Meuschenula darwiniensis*, from the Northern Territory.

hatch, he still refrains from food, otherwise much of the work of reproduction might be undone. Several species of gudgeons from the southern half of Australia have been observed in aquaria, but there is a great deal to be learnt about the ones in our northern half. Aquarists and others desiring to classify the freshwater gudgeons down to genera may find the key at

the end of this article helpful. The distribution of the species usually follows the river-systems, but gudgeons may appear in great numbers in tanks or hitherto fishless stretches. It seems that they or their eggs may be distributed by willy-willies or deluges and several "rains of fishes" involving gudgeons of different kinds have been reported, for example:



Snake-headed Gudgeon, *Ophieleotris aporos*, young from coastal Queensland and adult from Lillesmere Lagoon in the same State.

G. P. Whitley, del.

- Philypnodon grandiceps* located at Warwick, Q.³
- Carassiops compressus* and *C. galii* located at Killarney, Q., Mildura Farm, Cooper's Plains, Q.⁴
- Krefftius adpersus* [now = *Mogurnda pallida* (Cast., 1875)] located at Brisbane Q.⁵
- Carassiops klunzingeri* located at Gulargambone, N.S.W.⁶
- Mogurnda australis* located at Mullumbimby N.S.W.⁷
- Carassiops compressus* located at Native Dog Creek.

and probably a number of other cases of "small fish" from the rain. One little *Philypnodon* came through a tap at the Australian Museum (it must have come through the pipes at least from Potts Hill, Parramatta) and another one was found in a water-pipe at Concord Hospital. How hardy gudgeons are is further attested by Deraniyagala (*Ceylon Journ. Sci. B.*, xvii, 1932, p. 42) who recorded the Brown Gudgeon from mineral springs in Ceylon where the temperature of the water is about 36° C. In the colder waters of New Zealand, a gudgeon known as the Bulley or Toitoi (*Gobiomorphus gobioides*) was not eaten by the Maori who regarded them as tapu. Like other gudgeons, the Toitoi is a great destroyer of mosquito-larvae, thereby entitled to some respect and consideration.

In retrospection, I conclude that my apathy towards gudgeons must be due to my ignorance concerning them. Fishes which lie dormant for months in mud and clay yet which may be transported through the clouds surely cannot be dull save to the dull themselves.

³ Palmer, *Proc. Linn. Soc. N.S.W.*, xxvi, 1902, p. 515.

⁴ Ogilby, *Proc. Roy. Soc. Qld.*, xx, 1907, p. 28, and *Allgem. Fisch-Zeitung*, 1906.

⁵ Ogilby, *Proc. Roy. Soc. Qld.*, xxi, 1908, p. 12.

⁶ McCulloch, *AUSTR. MUS. MAG.* ii, 1925, p. 217. Specimen No. 1A.3773.

⁷ Austr. Mus. specimen No. 1A.239.

Key to the freshwater genera of Australian Gudgeons.

- A. Eyes present (Family Gobiomoridae, usually called Eleotridae).
 - B. About 60 to 70 scales in a longitudinal row from head to root of tail.
 - C. Preoperculum without a concealed spine at its angle.
 - D. Teeth fairly uniform in size *Bunaka*.
 - DD. Outer teeth enlarged *Oxyeleotris*.
 - CC. Preoperculum with a concealed spine at its angle *Culius*.
 - BB. Scales larger, less than 50.
 - E. Cheeks and opercles naked *Philypnodon*.
 - EE. Opercles scaly, cheeks more or less scaly.
 - F. Interorbital (region between eyes) scaly.
 - G. Snout broad, flat and depressed. Usually 6 rays in first (front) dorsal fin.
 - H. Scales above head very small. Scales 32 to 34 along body, with tiny auxiliary scales *Prionobutis*.
 - HH. Scales above head enlarged.
 - I. Preopercular margin hidden by scales; supraciliary scales present. Sc. c. 30 *Ophieleotris*.
 - II. Preopercular margin free; no supraciliary scales. Sc. c. 37 *Meuschenula*.
 - GG. Snout narrower, convex; scales above head not enlarged. 7 to 9 rays in first dorsal fin. *Mogurnda* (& subgen. *Krefftius*).
 - FF. Interorbital naked.
 - J. Body moderately elongate. Sc. 37 to 40 *Gobiomorphus*.
 - JJ. Body deeper, nape sometimes humped.
 - K. Sc. 45 to 50 *Shipwayia*, gen. nov.⁸.
 - KK. Sc. 27 to 35.
 - L. Scales cycloid. Body banded. Nine dorsal and anal rays. *Lindemanella*.
 - LL. Scales etenoid. Usually 10 or more dorsal and anal rays. *Carassiops* (& subgen. *Austrogobio*).
 - AA. No eyes (Family Milyeringidae) *Milyeringa*.

⁸ A new generic name, *Shipwayia*, is necessary for the Golden Gudgeon named *Eleotris aurea* by Bruce Shipway (*W. A. Naturalist*, ii, 1950, p. 75). The genus *Eleotris* Scopoli, 1777, is typified by *Gobius eleotris* Linne, a Chinese species in which, according to Osbeck, "the ventral fins have eight rays, and are joined together into one infundibuliform fin"—yet modern authors use "*Eleotris*" for gobies with separated ventral fins.



The stream flows along a course marked by low cliffs of Mootwingee sandstone. In the bottom right-hand corner it is about to flow into the steep gorge of the "Rockholes".

Photo.—J. F. Lovering.

The Mootwingee Range

By R. O. CHALMERS.

CONTRARY to popular belief the West Darling District is not an unbroken plain. Scattered on its surface are numerous ranges which though not very high do show considerable ruggedness in places. The most notable is the Barrier Range in which lies the great mining city of Broken Hill. Some sixty miles to the north-east of Broken Hill a chain of

isolated small ranges stretches north and south. First the Scope Range and the Dolo Hills are seen close to the Broken Hill-Wilcannia road. Then some 23 miles to the north where Scope Range abuts on the road, the southern end of the Mootwingee Range is first encountered. Its total length is about twenty miles and the greatest width is ten miles.

In 1844 Sturt and his party on their way to the Simpson Desert were travelling in a general northerly direction between where Broken Hill and Tibooburra now stand. In the Coko Range they saw another range some 50 or 60 miles distant which may have been the Mootwingee Range. The first recorded mention is in Wills' diary. The Burke and Wills Expedition left Menindie on the Darling in 1860 and proceeded past the Scope Range on their fateful expedition to the Gulf country. Wills wrote "Two places I may mention where the water is certainly permanent. Mutwongee, a gully midway between camps 39 and 40——". Wills was no doubt referring to the Mootwingee Rockholes and since the name was known to him one infers that pastoralists from Menindie might already have visited Mootwingee. They certainly had traversed considerable stretches of country in search of new grazing properties prior to the Burke and Wills expedition.

The rocks that form the Mootwingee Range are sandstone, conglomerate and shale. They bear a very close resemblance to rocks which form low ranges east of the Darling between Wilcannia and Cobar and on this score have been considered to be of Devonian Age. The late E. C. Andrews, considered that they were probably much older than Devonian. E. J. Kenny¹ gives an excellent summary of the views of the

earlier geological observers in the West Darling District on the geological age of the rocks in the Mootwingee and similar ranges as well as the results of his own extensive field work. He considers that the degree of tilting that the rocks have suffered due to earth movements offers evidence of considerable age but that apart from this they have suffered so little alteration that they might well be much younger than Devonian. It must be admitted that to the eyes of a geological observer from eastern New South Wales the sandstones of the Mootwingee Range bear a striking resemblance to our own Triassic Hawkesbury sandstones of the Sydney-Blue Mountains district.

Other outcrops of similar sandstones occur in the West Darling district. Some of these are adjacent to the Barrier Range itself. Other outcrops lie somewhat to the north-east of the Mootwingee Range while small areas are found in the vicinity of Wilcannia. All rocks of this type in the whole district are embraced under the geological name of Mootwingee Series. Interestingly enough two of the three peaks, Mounts Murchison and Lyell, seen and named by Mitchell to the west of the Darling when he made his famous trip down the river from Bourke in 1835, consist of these rocks thus indicating the resistant nature of the Mootwingee Series.

Our party's approach to the Mootwingee Range was from the north-east. Leaving the old opal field of White Cliffs in the morning we passed through The Peak,

¹ Kenny, E. J., West Darling District., Min. Res., No. 36, Dept. Mines N.S.W., 1934.

The last of the Rockholes at the foot of the gorge.
Photo.—R. O. Chalmers.



Nuntherungie, and Gnalta station. Climbing into the Mootwingee Range in the late afternoon on a steep rocky road we soon found ourselves descending again into a long, straight, narrow valley which runs right down the middle of the range and is flanked on each side by rocky sandstone cliffs. The reason for this is that the whole series is tilted, and unresistant thin shale beds alternate with the massive resistant sandstones. The erosion of these weak beds has given rise to the long narrow valleys. The vegetation in this valley is more abundant than one would have imagined in the this low rainfall area. The "Prickly Wattle" (*Acacia victoriae*) fringes the dry creek bed in the valley while the flat valley floor is sparsely studded with "Beefwood" (*Grevillea striata*). These are quite large for the western districts and reach a height of some 30 feet. They have a gnarled tough bark and long thin strap-like leaves. A series of small steep dry creekbeds with very rocky courses joins the main valley at intervals.

The steep rocky sides of these tributary creeks are timbered with attractive native pines (*Callitris robusta*). These are not so common in the West Darling district as in regions of higher rainfall much farther to the east of the Darling. The sandstones are massive and richly coloured in reds, browns and yellows due to the high iron-content. Indeed, as previously mentioned, they are very reminiscent of Hawkesbury sandstones except that the Hawkesbury sandstones are quite level bedded whereas the Mootwingee sandstones are steeply tilted due to the earth movements they have suffered.

Just before leaving the range at its southern end a diversion was made to inspect the well-known Mootwingee Rockholes. Here in addition to the sandstones, conglomerates are well developed. These consist of dense masses of quartzite boulders set in a hard sandy matrix. A very steep little gorge, no more than half a mile long has been cut in the sandstones and



A very coarse conglomerate forms vertical cliffs flanking the Mootwingee Rockholes.

Photo.—J. F. Lovering.



Weathering along horizontal joints in this massive Mootwingee sandstone has produced a shape curiously suggestive of the Sphinx.

Photo.—J. E. Lovering.

conglomerates and takes the form of a succession of more or less circular and elliptical pools. There are about nine in all and the three bottom pools contain quite sizeable volumes of water. Their natural capacities were enlarged many years ago by the installation of small retaining walls so that water could be piped to the Rockhole Hotel, only the ruins of which remain to-day. This was situated about a mile

away and was a stopping place on the main Broken Hill-White Cliffs coach route. Other observers have described the magnificent aboriginal engravings, stencilled hands and paintings in shelters in the vicinity of the Rockholes. Petroglyphs have also been noted. The unexpected bounty of water in this arid region permanently attracted the aborigines who must have spent much time in the execution of these works of art.





These children and their mother find much to interest them in the exhibition of school work at the Museum.

Exhibition of School Work at the Museum

By PATRICIA M. McDONALD, B.Sc., Dip.Ed.

ALL through the year, children come to the Museum to study the exhibits as part of their school work, making notes and sketches on all topics ranging from aborigines to eskimos and from kangaroos to gold mining. Because they showed such interest and produced such good results it was thought worth while to show their work to the general public. Accordingly, an exhibition was planned, to be on show in the galleries during the Christmas vacation.

As this was the first exhibition of its kind to be held here, it was decided to make it a small one by limiting the entries, so four classes from Woollahra and Hurstville schools were chosen to present material for the display. When the idea was

explained to the children, they were most enthusiastic and eager to begin. Even with the restricted number of classes, there were so many entries and the standard of the work was so high that the task of selection was a difficult one.

The work took the form of posters, as these were thought the most suitable for display purposes. They were chosen on the basis of originality, individual expression, accuracy, clearness of detail, and neatness. Altogether a total of 34 posters were exhibited, the topics illustrated including Australian mammals and birds, bird migration, marine animals, whaling, pearling, native races, Egypt and many others.

Most of the posters were done in poster paint and India ink on cardboard; some children added novel touches, such as gluing on matches to form a New Guinea house-on-stilts, others used sand to form a beach, and bark to form the trunk of a tree. One of the most popular topics was the Great Barrier Reef and these posters were all very colourful, one was even complete with small lumps of coral and a bent pin on a piece of cotton to catch a gaily col-

oured tropical fish. In all the posters, the quality of the drawing was particularly high and the sense of colour and design was also very good.

The success of this exhibition certainly warrants an attempt to hold a full scale exhibition next year. It is hoped that it will become an annual event at the Museum, and be expanded into a competition with different sections for age groups, topics, hand work, animal photography and so on.

The Kurrajong

Its History and Natural History, II

By A. MUSGRAVE.*

Louisa Atkinson. Reference to the Kurrajong District and its plants would not be complete without mention of Miss Louisa Atkinson, who was born at Oldbury, near Berrima, 25 February, 1834, and, as a delicate child, was taken by her mother to the Kurrajong. At her home, "Fernhurst", situated at an elevation of about 1,000 feet above sea-level, she was restored to health and later acquired local fame as an authoress and naturalist. Fiction stories and articles on natural history appeared from her pen in the pages of the *Sydney Morning Herald* and the *Sydney Mail* under the title of "A Voice from the Country", during 1861-1864. Articles on Kurrajong ferns were also published in the *Horticultural Magazine* (1864). Her articles were usually signed "L. A.—Fernhurst".

During her rambles she was often accompanied by Mrs. Selkirk, wife of Dr. Selkirk of Richmond. The plants she collected were sent to Dr. Woolls at Parramatta, or to Baron von Mueller in Melbourne, and many of these species are recorded in Mueller's *Fragmenta Phytologica Australica* or in Bentham's *Flora Australiensis*. Like earlier botanical collectors to the district she visited the Grose Valley and Mount Tomah and has mentioned their plants and scenic beauties. To botanists the genus *Atkinsonia* (Loranthaceae), *Ere-*

chites Atkinsonia (F. v. M.), and *Epacris Calvertiana* (F. v. M.), recall her. In 1870 she married James Snowden Calvert, who was, like herself, a keen student of botany. He had come out to Australia on the same ship as Dr. L. Leichhardt, and he later accompanied Dr. Leichhardt on his expedition to Port Essington and was wounded by the blacks. His wife died suddenly on 28 April, 1872, leaving a child 18 days old."

Of "Fernhurst", where Mrs. Calvert lived, it is interesting to record that Mr. John Tietkens, brother of Mrs. Daniels (wife of the present rector of St. Stephens, Kurrajong), and whose father was well known as an explorer with Giles in Central Australia, in 1921 built a house on the site of the old residence.

Dr. W. Woolls. A year after the death of the accomplished Mrs. Calvert, Dr. William Woolls became the incumbent of St. Peter's, Richmond. He is also entitled to be included amongst those whose lives have been bound up with the district. He had left England in 1831 and became a master at the King's School, Parramatta, and later at other schools. Through Baron von Mueller, Government

* Various biographical notes have appeared about this Kurrajong naturalist, perhaps the most comprehensive being that of Miss Margaret Swann in the *J. Proc. R. Austr. Hist. Soc.*, xv (1) 1929: 1-3, 14-29, portrait.

* Photographs by the author.

Botanist of Victoria, he acquired an interest in the study of plants and of which he made large collections. He collected widely in the Sydney district, also at Parramatta and Kurrajong.

In 1867 he published a small book, *A Contribution to the Flora of Australia*, which includes a chapter on a visit to Kurrajong and Mt. Tomah made in 1861, and in 1879 published another book entitled, *Lectures on the Vegetable Kingdom with Special Reference to the Flora of Australia*. In one of these lectures he outlines the Progress of Botanical Discovery in Australia. From the title-page we learn that he is "Rural Dean of Richmond and Patron of the Cumberland Mutual Improvement Society, &c.". He died on 14 March, 1893. In the porch of St. Peter's is a list of those who have served as rectors and we note that he was here from 1873-1883. His name is perpetuated in the genus *Woollsia*, now regarded as a synonym of the genus *Lysinema*; *Tylophora woollsi* Bentham; *Pterostylus woollsi* Fitzgerald; and *Prasophyllum woollsi* F. v. M., and the Yellow Caribeen Tree, *Sloanea woollsi*, F. v. M. For his thesis on the Plants of Parramatta the University of Göttingen conferred upon him the degree of Ph.D.

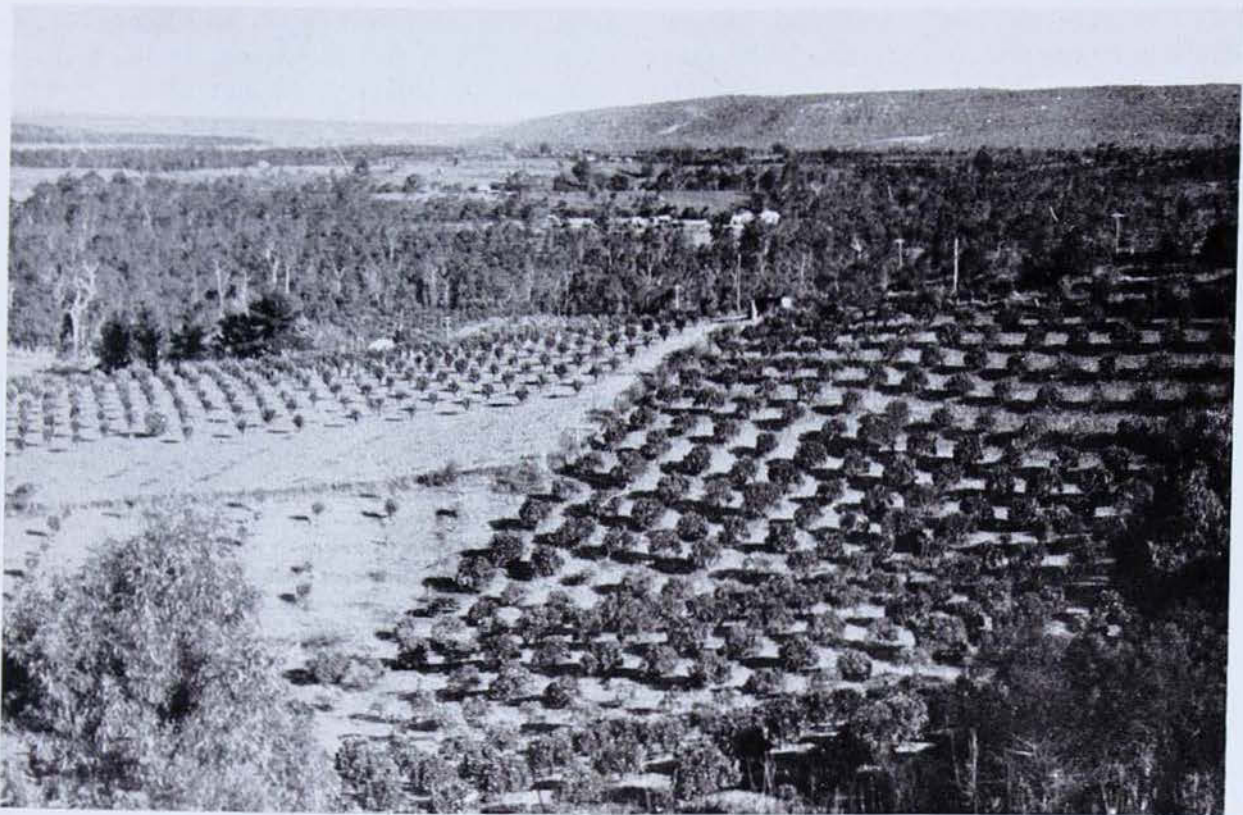
More Recent History. We have seen that in 1834 the Kurrajong was regarded as settled or established, but, two years later, the same annual publication, *N.S.W. Calendar and G.P.O. Directory*, 1836, Sydney, seemed a trifle vague about the postal addresses for residents near Richmond, for we read on p. 9, "Bell, Archibald, Belmont, Windsor", though there were two references to Richmond under "Douglass, Joseph, Joy Lodge, Richmond", and "Douglass, Thomas, Richmond". In 1866, however, the Kurrajong was becoming better known, for in Balliere's *N.S.W. Gazetteer and Road Guide, &c.*, p. 167, we learn that, "Currajong (Co. Cook) is a small hamlet in the Blue Mountains, lying a few miles to the W. of Richmond". Under Richmond, on the other hand, we read, on p. 476, "On the opposite bank of the river from the township rises the Blue Mountains, or rather that portion of them known as the Currajong. The scenery of this part of the country is magnificent and beautiful in the extreme, and,

from the romantic grandeur of the rocky chasms in the mountains, and the fine views of wood and water scenery, attracts numerous tourists, who usually avail themselves of the horses and conveyances to be hired in the township. The general geological formation is carbonaceous and ferruginous sandstone, with rich deep alluvial soil on the flats".

Though floods and fires have ravaged the farms along the Hawkesbury River since the earliest days of settlement, with grave loss in human lives, stock, and property, the blackest day in the history of Kurrajong, according to the local paper *The Hawkesbury Herald*, occurred on Sunday, 10 December, 1944. On that day, a devastating bushfire destroyed two churches, over twenty homes, and involved the deaths of three people.

Topographical Features: Some words on the main topographical features of the Kurrajong may not be out of place. The range, which forms a northern extension of the Blue Mountains, ascends rather gradually from the plains bordering the Hawkesbury, to a height of about 500 feet, and then dips to the stream called Little Wheeny Creek. Now commences the steep ascent to the Heights, higher by another 1,400-1,500 feet. Though only about 2,000 feet above sea level, nevertheless the panorama, seen from the eastern lookout on a clear day, is as satisfying as any to be met with in the Sydney district, vieing with the Bulli Pass Lookout in popularity.

The view embraced from this eastern lookout, includes points from as far north as Barrington Tops to as far south as the Gib at Bowral. At our feet lie the orchards and farms following the tops of the ridges and spurs of the Kurrajong, while away to the east are the towns of Richmond and Windsor and the elevated plateau of the Hornsby area away on the horizon. The town of Richmond, at the foot of the range on the east bank of the Hawkesbury was, before the completion of the branch railway from Richmond to Kurrajong, the main link with Sydney. It is 38 miles from Sydney and 61 feet above sea level. The river lies about a mile west of the town.



Looking south towards the Grose River from the lower slopes of the Kurrajong. Citrus orchards in foreground, "Glen Cuffe" on Thompson's Ridge in the distance.

Photo.—A. Musgrave.

Crossing over to the western side of the Kurrajong Heights near the eastern lookout, we are rewarded with the fine views first seen by Tench's party in 1791; these include the distant Blue Mountains, with glimpses of the Grose River gorge, Govett's Leap, Mount Hay near Blackheath, the country towards Bell and, along the western sky-line, Mts. King George, Tomah, Wilson and Irvine.

About a mile from this western lookout towards the northern end of the Range through a gap in the trees we see far below us the road, "Bell's Line of Road", winding to Bilpin, another fruit-growing centre, and beyond to Bell. When we look down on the country about Bilpin we realize that we are now in the presence of the famous *Kurrajong fault*. Here the plateau lies 423 feet below the main range, leaving as its eastern boundary a narrow ridge—the Kurrajong Heights.

The late Professor T. W. E. David wrote an account of the Kurrajong fault¹⁰ which tells us that in past geological ages the country here was warped up to form a fold—the monoclinical fold—crossing the

great fold of the Blue Mountains, from Lapstone Hill to Kurrajong, and, at the same time, there was a sinking of the coastal plain between Penrith and the sea. "The folding force", he points out, "came from a westerly direction, and it pushed the strata eastwards forming the steep easterly slopes of the Kurrajong and Lapstone Hill, a slight fold facing the west developing to the west of this eastern monocline. After the folding force had become less intense or had ceased, a fracture formed along this western fold, the plateau to the west subsiding over 400 feet as the result, while the development of the monocline at Mount Tomah depressed the western portion of the plateau by a vertical amount of about 250 feet".

Prof. David, and Messrs. Card and Pittman traced the subsidence in a westerly direction to the foot of Mount Tomah. The Wianamatta shales, which take their name from the aboriginal name for South Creek, and which overlie the Hawkesbury sandstones, were found to be almost continuous

¹⁰ *Journ. and Proc. Royal Soc., N.S.W.*, xxxvi, 1902: 368.

Movements of the earth's crust are sometimes felt at Kurrajong and are considered part of the movement which led to the great fold of the Blue Mountains.

The southern boundary of the Kurrajong is the Grose River which lies about six miles from "Glen Cuffe" farm. From the main Grose Vale Road there branches off the Vale of Avoca Road which leads out to the lookout on the hill overlooking the Grose River. Here a trig. station, Buralow T.S. has been recently erected on this hill, which, according to my aneroid barometer, is about 800 feet in height. In the autumn, winter, and spring months the walk out to this lookout is a pleasant jaunt and fine views are to be had looking down into the River, or up to the yellow sandstone cliffs on the southern bank and which are visible for many miles; the hills here rise to about 1,400 feet. Looking up the river we have glimpses of mountains away in the distance and nearby wooded hills. Peering down into the river we see large sandy pools alternating with rocky stretches. The early explorers found the river very difficult to negotiate. In the mid-distance a large rocky hill acts as a barrier between the waters of the Grose River and the Buralow Creek. The southern end of the Kurrajong which dominates the landscape here is very densely wooded, and its lower slopes are decked with cabbage tree palms. Cabbage Tree Creek joins the Buralow Creek near its junction with the Grose River. Louisa Atkinson in *The Sydney Morning Herald*, 7 January, 1861, has written about this part of the Kurrajong. The road to the lookout, after passing by farms and grazing land, runs for the last few miles through country very reminiscent of the Sydney district, the ground flora consisting of Burrawong palms and many similar coastal plants. Here we found the Wedding Bush growing, a familiar plant of the Sydney sandstone.

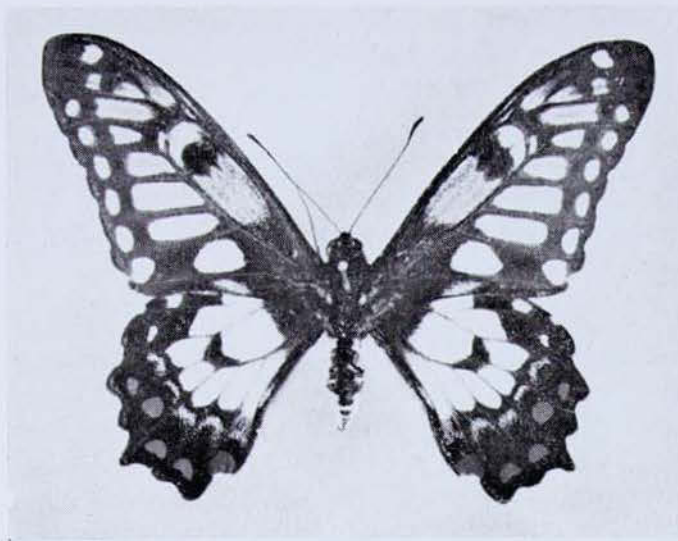
The northern boundary of the Kurrajong is the Colo River, and the country here is quite unlike that visited near the Grose River. There from the top of the lookout we look east to the plains about Richmond and Windsor, but here the district has passed from the rolling hills to wild sandstone gullies—their summits rising about 625 feet above sea-level. Wheeny Creek,

which rises in the mountains south of Kurrajong Heights Lookout, flows into the Colo River between Upper and Central Colo. If we proceed north along the Comleroy Road and turn off at the Blaxland Ridge junction we come eventually to the road which runs through Putty to Singleton.

As we near the valley of the Colo River, the road winds down the hillside affording fine views of the settlement of Central Colo and the valley of the Colo River. At Central Colo a white bridge crosses the River and, on the southern side, a road from Lower Portland coming in on the eastern side junctions with a road from Upper Colo on the western side. Plane trees growing near the bridge make an attractive picture during the autumn, on the right hand side of the bridge rocky sandstone cliffs tower above the river, while on the left, we look up the valley where farms and orchards take advantage of any arable land between the river and the sandstone spurs given off from the main range. Crossing the river and travelling along the new road for some miles we ascend a spur, which follows the course of the Colo, and from which we have views of the mountains in the west. Here at a height of about 500 feet we may see through the trees the little farms tucked away in the sandstone hills on the river flats below. These settlements hidden away in the ranges present a very different appearance to the usual wide open landscape one associates with the Kurrajong.

A tree which may be said to typify this area, and one which botanists would call a "dominant", is the Apple Tree, *Angophora bakeri*, which differs from its allies by its very narrow leaves. It occurs in various stages of growth all along the road in the vicinity of the Colo River.

While we have now considered the northern and southern limits of the Kurrajong and have noted something of the country lying between, it might be appropriate here to draw attention to a paper by Mr. W. H. Maze, Department of Geography, University of Sydney, which deals with the subject of "Land Utilization Survey in the



The Dingy Swallowtail, *Papilio anactus*, a pest of Citrus common in the Kurrajong.

Photo—A. Musgrave.

Parish of Kurrajong".¹¹ Maps prepared by students of the University show how land in the Kurrajong to Windsor districts is employed for four major uses: orcharding, cultivated land, pasture land, and woodland.

Orchards. The Kurrajong has long been noted for its citrus fruits which are the staple product of the district. In the early forties a man named Wilder, resident at Belmont Park, planted the first orange trees. Everywhere along the slopes we see rows of citrus trees—Jaffa, Valencia, Navel and Seville oranges, mandarins and lemon-trees, while a few grape-fruit trees are to be encountered. Other fruit trees such as apricots, plums, peaches, quinces, nectarines, apples and pears show that the dis-

¹¹ *Australian Geographer*, iv (6) Nov. 1943, 155-174, illustr.



The Dicky Rice Weevil, *Maleuterpes spinipes*, is a well-known pest of citrus in New South Wales.

Courtesy N.S.W. Department of Agriculture.

trict is not entirely given over to citrus. There are also large areas under passion fruit while grapes are also grown.

In 1923 the N.S.W. Country Promotion League issued a Pamphlet (No. 4) entitled "Facts about Kurrajong District. The Neglected Paradise", in which it was pointed out that at that time 3,646 acres were bearing and 1,189 non-bearing, fully 90% being citrus fruit. About that time 8,000 tons of fruit and vegetables, 6,000 tons of firewood, 2,000 tons of produce were annually sent to the Sydney market at a transportation cost of £7,000. In addition bee-keeping and poultry farming were carried on at many farms as side-lines. Many residents keep cows to supply them with milk, cream, and butter, but in the past dairying has not been a stable industry, despite the recent existence of the celebrated Navua Jersey herd at North Richmond.

Insects. The district has attracted insect collectors to it in the past, but with the growth of settlement, economic insects have demanded the attention of workers in entomology.

The orange trees have many insect pests as any grower will bitterly indicate. Beetle grubs tunnel in the trunk and roots, some of the adults eat the foliage, as also do the larvae of certain butterflies. Such scale insects as the Red Orange Scale, Pink Wax Scale, Mussel Scale, and White Louse occur on the trees. The Mediterranean Fruit Fly and the Queensland Fruit Fly lay their eggs in the rind and their larvae later destroy the fruit. In the orchard of my friend Mr. Gregg, I was shown orange trees banded with a black sticky substance, a proprietary mixture, placed in a band around the tree about 12-18" from the base. Such a band serves to trap all pests climbing up the trunk, but its main purpose is to catch the adult beetles of the Dicky Rice Weevil (*Maleuterpes spinipes*). It was first recorded from the Kurrajong in 1895 as a new species by A. S. Olliff, and as destructive to oranges. Since that year much has been written about it in *Agricultural Gazette of New South Wales*. It is only a tiny beetle of 1/12 of an inch in length with greyish-white markings. The forelegs of the male have a curved spine. The larvae feed on the roots of citrus and gnaw

channels in the bark, but their work of destruction is not so serious as that of the adult beetles. These damage the fruit by eating furrows in the rind. These furrows later turn black when the fruit ripens and so lower the market value of the fruit. A bad infestation may cause 70% of the fruit to be badly marked and another 20% slightly marked. The young trees may have the growth retarded by the adult beetles feeding on the leaves. The beetles have wings but do not use them so they are trapped when climbing up the trees by the sticky bands.

Other pests of the orange grower, but not very important, are the swallowtail butterflies of the genus *Papilio*, viz.: The Orchard Butterfly, *P. aegeus aegeus*, and the Dingy Swallowtail, *P. anactus*. The Orchard Butterfly is the larger of the two forms. The male, which measures about 3½" across the wings, is black with a white band across the top of the forewing, and a central white spot on the hindwing and a red spot at the anal angle. The female is rather differently coloured, the forewing with a black basal patch and the ends of the cells white, the hindwing has a central white patch beyond which are blue scalings and red lunules. It measures about 4" across the outspread wings. The larvae feed on wild and cultivated citrus. When fully grown the caterpillar is green in colour with diagonal brown bands edged with white. The pupa is also green in colour sometimes brown, and has horns on either side of the head. The time spent in the pupa varies from 14 to 22 days in the warm weather of February and March, but when they pupate in April they remain as pupae during the winter to emerge as butterflies in the spring.

The Dingy Swallowtail has a wide range from North Queensland to South Australia. It is black with a series of white spots, the hindwing has an outer series of dull red spots. The full-grown larva is black with short spines and three rows of yellowish spots arranged along the back and the sides. The larvae also feed on citrus and native plants such as the wild lime, wild orange and finger lime.



A wattle tree which has been attacked by borers and which now lies snapped off by the winds. The tunnels of the borer beetles are seen against the white shattered stem.

Photo.—A. Musgrave.

Wattle trees are common everywhere in the district particularly the black wattle, *Acacia decurrens*, whose bark is used for tanning.

The black wattle harbours a number of different kinds of insects, but it seems to be a favourite host plant of the silvery-brown longicorn beetle, *Pachydissus sericus*, which, in the larval state tunnels in the trunk. Eventually these burrows so riddle the stem that winds cause the weakened tree to snap off near the base. These fractured trees are an interesting feature of the Kurrajong paddocks. The adult beetle measures up to 1½ inches in length and is brownish in colour with a silvery sheen.

Conclusion. In the Mitchell Library, Sydney, is a bound volume of newspaper cuttings from the pen of the late Sam Boughton of the Waterworks, Richmond. These articles contain a great deal of information about the early history and development of the Richmond-Kurrajong district. Descendants of the writer still live in the district. In concluding this sketch of the Kurrajong district I would here gratefully acknowledge my indebtedness to the Staff of the Mitchell Library for much valued assistance in its compilation.

The Marsupial "Tiger Cat"

By ELLIS TROUGHTON.

The Tiger Cat differs from the smaller native cats in having the spots continuing down the tail instead of being restricted to the body. It is a fierce and furtive hunter of birds, rabbits and reptiles. The photograph shows the female of a pair caught raiding a poultry-yard. They soon became docile and quite affectionate captives.



THE pouched dasyures or native "cats", except for their uniquely spotted coats, in outward appearance and their flesh-eating habits most nearly resemble foreign carnivores of the weasel family. An Eastern Native Cat (*Dasyurus quoll*) which had been reared from infancy and showed an appealing attachment to its benefactors was the subject of a recent article.¹ About the same time excellent photographs were taken of a male and female of the much larger and generally fiercer Tiger Cat (*Dasyurops maculatus*) which had been caught in the act of raiding

poultry yards in the Berry district south of Sydney. With approval from the State Fauna Protection Panel their captor, Mr. H. Grant, a retired sergeant of police, not only tamed these habitual raiders of the bush but by devoted attention reduced them to a remarkable state of docile affection.

After their capture about six months ago, five young were discovered attached to teats within the shallow-edged pouch of the mother. Their lusty growth gave opportunity for most interesting observations in captivity, but an effort to increase the parent's comfort with green lawn-clippings unfortunately caused infestation by some

¹See Troughton, AUSTRALIAN MUSEUM MAGAZINE, xi (3), 1953, pp. 90-92.

kind of parasitic mite which attacked the naked skin of the pouch-young and resulted in the death of four of them. It is hoped that survival of the fifth youngster will provide some interesting notes on its growth and behaviour for future reference. The opportunity for observation had been remarkably favourable since the mother not only allowed her captor to handle the young but resignedly suffered close inspection by strangers, so long as he spoke soothingly and caressed her face and ears; even the hard-biting old male succumbed to the same almost mesmeric influence when Mr. Grant stroked its face and put a finger between its jaws.

The yellowish-brown tiger cat, which is the largest of the native cat group, attaining a length of 4 ft. from nose to tail-tip, is distinguished by having the creamy-white spots extending down the tail, instead of being restricted to the body as in all the



The five young, born after their mother's capture, are shown a few weeks after attachment to teats within her pouch. Note the superior development of the head and fore-limbs typical of infant marsupials. The pattern of body-spots showed in their naked skin. Detachment occurred at 8 weeks, the eyes opened a week later and weaning was at 5 months.



Climbing ability, which enables the sturdy Tiger Cat to capture birds in tree-tops, is shown in the hindfoot with its sharp curved nails, serrated pads and retention of a short but strong great-toe, which has disappeared in the terrestrial native cats.

smaller native cats. Its weasel-like habits and appearance were first recorded about Port Jackson by Governor Phillip who named it the "Spotted Marten" and described it as not only very ferocious but also exceedingly stubborn. Despite size, the tiger-cat is an expert climber with a well-developed great-toe which is lacking in the more terrestrial native cats. Not only a raider of poultry yards, it has been seen to leap from topmost branches to catch roosting fowls by the neck, killing them in the act of falling with the body to the ground. The tiger cat is able to kill large birds and small wallabies, but its naturally shy and secretive habits hardly warrant comparison with any large feline tiger cats.

The powerful spotted-tailed dasyure is in greater danger of extermination than the small native cats because of its weasel-like habit of returning to decimate poultry-yards, when it may become so intent on the kill as to ignore human approach. But

despite the bloodthirsty robbing of hen-roosts, there is no doubt that as a consumer of young rabbits, rats, mice, grasshoppers and other insects, the tiger cat and its smaller dasyure relatives have played an age-old part in maintaining the balance of nature. The tiger cat is plentiful in Tasmania which has become the last refuge of the largest known marsupial carnivore, the pouched "wolf" or "tiger". It inhabits eastern Australia from the southern border

of South Australia to the Cairns region of Queensland, where a smaller geographical race (*gracilis*) is known to occur. These recent examples of the taming of native and tiger cats stresses the natural affinity for human association shared by marsupials, and even the lowlier platypus and spiny ant-eater, and serves to emphasize that in them Australia has fostered the gentlest mammalian fauna the world can ever know.

Popular Science Lectures at The Australian Museum

A new series of popular science lectures will commence on the 6th May, 1954. They are held in the Lecture Hall at the Aus-

tralian Museum and admission is free. Full details of the series will be available from the Museum within a few weeks.

REVIEW

CHARLES DARWIN AND HIS PROBLEMS. By Evelyn Cheesman. Illustrated by Geoffrey Whittam. 166 pages. G. Bell & Sons, Ltd., London, 1953. 15s. 9d.

Miss Cheesman, whose writings have been reviewed in this MAGAZINE over the years, is eminently qualified to write about this great naturalist, for not only is she *persona grata* at the British Museum (Natural History) where she has carried out research work, but she herself has travelled and collected extensively in New Guinea and the Pacific region and so is able fully to understand Charles Darwin and his problems. This, her latest book, is a delightful biography of the great naturalist, written for boys and girls of 12 upwards. The publishers express the opinion that it is "the only recent biography specially written for them". Be that as it may, into the 166 pages Miss Cheesman has packed a great deal of information which can be read and enjoyed by adults as well as children.

Thus we read of the early family life and school-days of Darwin, while no less than four chapters of the book are devoted to the historic *Voyage round the world on H.M.S. Beagle*. The *Beagle*, under the leadership of Captain Fitzroy, it will be remembered, visited Australia and Tasmania in 1836. The vessel returned to England that same year and Darwin took up his residence in London to sort his collections and meet the scientific folk,

In 1839 he married. For more than 20 years he devoted himself to scientific research which culminated in the publication in 1859 of his work, *On the Origin of Species by means of Natural Selection*. His theory he shares with Alfred R. Wallace who had arrived independently at the same conclusion while collecting in the East Indies. The problem of seeing that Wallace received all the recognition due to him as a co-discoverer was one that Darwin had to solve, though Darwin had 20 years earlier submitted his theory of evolution and natural selection to his friends Sir Charles Lyell and Sir William Hooker. It was through these friends that Darwin was able to present his paper at the Linnean Society at the same time as that of Wallace. Actually both "evolutionists" had been influenced by the work written by the Rev. Thomas Malthus, *An Essay on the Principle of Population*, etc., and their travels abroad had proved to them how the general idea of the struggle for existence underlying the views of Malthus could be applied to all nature.

The chapter dealing with this most important and at the same time most controversial episode in Darwin's life is simply told, yet recalls for many of us an event which made a tremendous impact on life during the Victorian era. Charles Darwin's problems would seem to have become problems for all mankind.

A. MUSGRAVE.