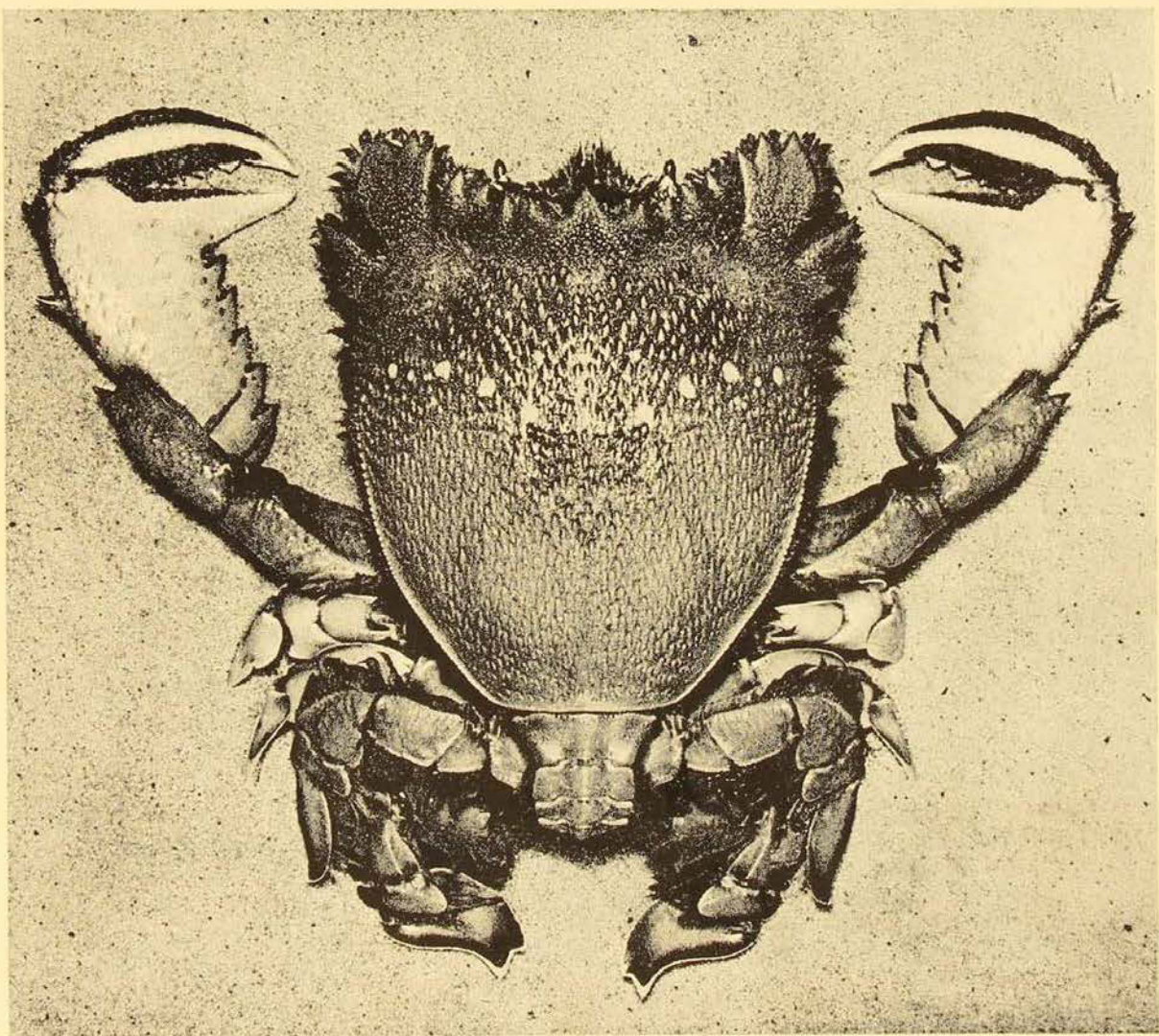


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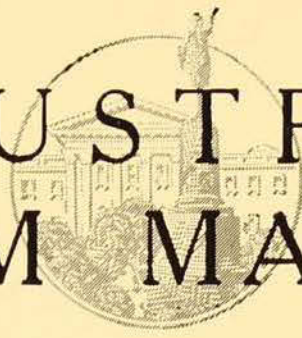


The Frog Crab.



"Tiger", the former native leader, examines one of the characteristic hook spears of the north. (See article on page 47.)

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With the Australian Museum Expedition to the Northern Territory

1. FROM ALICE SPRINGS TO THE GRANITES*

By H. O. FLETCHER

ON the return of the expedition to Alice Springs from Ayer's Rock preparations were immediately started for the next stage of the overland journey to Wyndham, via The Granites, Tanami and Hall's Creek.

It was planned to spend some time at The Granites and carry out an investigation of the fauna as well-authenticated reports had indicated the presence of some of the small and rare desert types of furred mammals. It had been reported that the interesting and almost forgotten Orange-backed Bandicoot, *Perameles eremiana*, described by Baldwin Spencer in 1897 from specimens collected near Charlotte Waters and the Burt Plain, was there in numbers. In fact, it was said that this creature, not scientifically recorded since it was described, had served as a food supply for the early miners when their provisions began to give out.

There are two methods of approach from Alice Springs to The Granites. The original track established about 1927 leads from the Stuart Highway about 75 miles

north of Alice Springs. It then proceeds in a north-westerly direction passing through the Coniston cattle station in the Reynolds Range, past Brook's Soak at 15 miles and at a point 43 miles from The Granites the remarkable Thomson's Rockhole. This rockhole in granite can contain hundreds of gallons of water but cannot always be depended upon. The section of track from Ryan's Well to The Granites, a distance of 295 miles, is an arduous and hazardous trail and any sort of hold-up could result in serious consequences.

It was decided, however, that we would travel to The Granites by the fairly new graded track which branches from the bitumen surfaced Stuart Highway immediately north of the Macdonnell Ranges. This track is possibly one of the straightest in Australia. Extending away to the north-west it rarely turns in any direction over the whole of its course to The Granites, a distance of about 336 miles. The few twists and turns which do occur appear to have been caused more by boredom of the grader driver than for any other reason.

For the first 30 miles or so the track passes over well-grassed and good country. From its appearance it is an area which

*Photographs for this article by Allen Keast, M.Sc.



Mining operations in progress at Mt. Doreen where the tungsten minerals scheelite and wolframite are being mined.

receives more than its fair share of rain. This may be due to the influence of the MacDonnell Ranges, which away to the south rise sharply from the plain with a rugged and imposing topography amply justifying its claim as one of the scenic attractions of Australia.

The whole of this area over which we were passing is part of a huge peneplain covering most of the southern and central portion of the Northern Territory. It has been subjected to peneplanation for so long a period that elevations of any sort above the general level are very few and scattered.

This vast and waterless plain is covered with spinifex and a sparse to fairly thick vegetation. Dry sandy creeks with which the country is occasionally grooved are lined with various types of gums and other trees of considerable size providing a welcome contrast to the more stunted trees of the plain.

One frequently wonders why this country does not create an impression of drabness and monotony which could be very easily expected. For hundreds of miles the scenery is unchanging and as far as the eye can see ahead the track continues on through a grey-green ocean of vegetation. On the other hand, however, the country possesses a strange beauty and a vividness difficult to describe. This attraction possibly lies in the vastness and the

feeling of living on top of the world. The open plain unfolding to all points of the horizon is a scene of quietness and tranquillity rather than loneliness.

After travelling about 200 miles from Alice Springs the buildings of the Yuendumu Mission come into sight and these are the first signs of habitation since leaving The Alice. The grounds are beautifully kept and the quality of the vegetables grown by the natives indicates what this country could produce were water available.

From Yuendumu a short run of 34 miles brought the expedition to Mt. Doreen. On this section of the journey we were surprised at the number of natives on "walk-about". At the approach of our vehicles the younger ones of the tribe, with their hordes of attendant dogs of all breeds, set off at a fast jog-trot away from the track and soon disappeared from sight in the scrub. The older gins weighed down with cans of water, fire-sticks and other odds and ends stayed alongside the track but rarely waved a greeting as we passed by in a swirl of dust.

The Mt. Doreen cattle station is one of the most westerly holdings in the central part of the Northern Territory and has an area of 2,000 square miles. Close to the homestead an extensive outcrop of Pre-Cambrian mica schist is being mined for the tungsten minerals, wolfram and schee-

Old mud dwellings on Chapman's Hill. These were built by the early pioneers of the Granites goldfields.



lite. Mining operations which are meeting with considerable success are carried out by Mr. Bob Bowes and native labour. The minerals are secured mainly by a process of open cuts and gouging. During the night Mr. E. Rayner, the expedition's geologist, visited the mine and by means of an ultra-violet lamp was able to prove the presence of considerable quantities of scheelite. Previous to our visit the occurrence of this mineral had only been suspected.

A profitable pastime of the native women and children at Mt. Doreen is searching the area for small pieces of tungsten minerals. Sand and soil are thoroughly sifted with great patience as time means nothing to these people and the results of their labours exchanged for extra tucker are well worth while.

That night we were the guests of Mr. Brailton, the owner of Mt. Doreen. Strangely enough another visitor had dropped in, Mr. Sneddon, the Mining Inspector from Alice Springs, who was returning from a visit to Tanami. During the evening we were regaled with numerous stories of mining in the Territory and particularly activities in the mica fields at Harts Range, about 80 miles north-east of Alice Springs. It was interesting to learn that at the last mica sales at Alice Springs the total sale of three grades of mica, clear, stained and spotted, realised £32,000.

The following morning the expedition set out for The Granites goldfield, a distance of 124 miles to the north-west. After passing Chilla Well, 40 miles out, the track passed through a narrow strip of country which had recently received good rain. The green foliage of the trees and shrubs was in marked contrast to the drought-affected vegetation we had been seeing since entering the Territory. Bird life was plentiful and their many calls indicated a variety of species not previously noticed.

This more verdant country was soon left behind and the track now became increasingly difficult to negotiate because of deep loose sand. This was actually due to large areas of the country having been fired by natives in their search for food. The sand, freed from the holding influence of spinifex and other small vegetation, is blown across the track and builds up to considerable heights. We had been on the lookout for a large group of natives making their way to The Granites country but although their progress could be easily followed by the fired patches we did not sight them at any time.

Our progress was slow and at nightfall our two vehicles were still being persuaded to keep moving across a great open, sandy plain. The surface was rough and the resultant slow speed of the trucks caused them to sink frequently into the soft and deep sand. By the judicious use of long

lengths of coir matting and a great deal of digging we were able to keep them on the move.

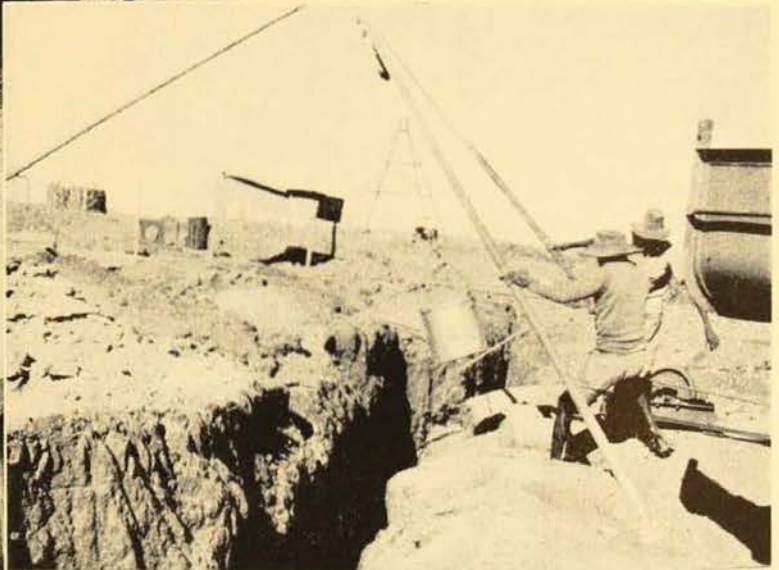
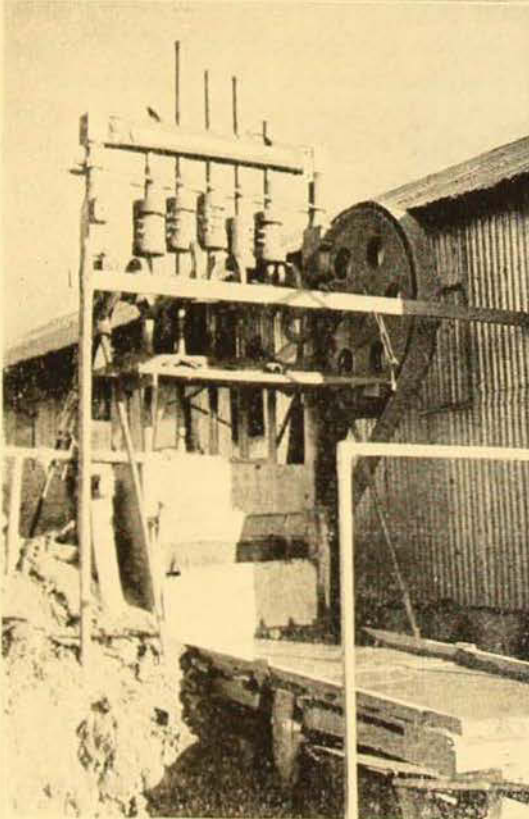
We had been noticing that the sky was rapidly becoming overcast with thick black clouds and it looked as if rain would fall at any minute. We were not greatly alarmed, however, as storm threats during the winter

months do not usually come to anything. Rain in the Territory is unpredictable and capricious and on this occasion heavy rain did fall but not in sufficient quantities to halt our progress.

Later on in the night we saw away in the distance several lights at The Granites but it was some time before we finally



Left—Most of the large boulders at The Granites reveal signs of native drawings. These are mainly conventional designs and their meanings are apparently not known by the present-day natives.



Lower left—A five head stamp battery in use at the Granites.

Upper right—An open-cut on the Bullagitchie Lease. Rich ore is in the process of being mined by the natives.

Lower right—A general view of the Granites from Chapman's Hill showing some of the mine buildings and one of the low rounded granite hills.

reached there and were welcomed by Mr. Gordon Chapman, son of the original pioneer of the field, Mr. C. H. Chapman.

The main mine buildings and residences are built on Chapman's Hill and these are a mixture of the old and the new. Comfortable homes have been erected in the shadow of the old original mud-walled buildings now in varying stages of disintegration.

The early history of The Granites, like that of most goldfields, is an interesting one. Gold was first found in payable quantities in the Northern Territory in 1872 while work was in progress on the overland telegraph line which, for the first time, linked Adelaide with Darwin. In 1902 a rich find was reported from Arltunga, about 60 miles north-east of Alice Springs, but this field did not come up to its early expectations and the actual gold yield was small.

At the beginning of the century the production of gold had moved to various parts of the Northern Territory. Prospectors ventured into little-known areas where distances are great and waterholes, if not absent altogether, are widely separated. Success, when it did come to the chosen few, was always well deserved.

In 1900 a prospecting party equipped by an English syndicate and under the leadership of Mr. Allan Davidson set out from the overland telegraph line to traverse the semi-desert and waterless country towards the Western Australian border. Three hundred miles west of the telegraph line the party came across a series of large granite boulders rising as prominent outcrops from the flat plain surface. The surrounding country for great distances is a flat plain covered with spinifex and a very sparse vegetation and outcrops with the exception of the granite hills are few and far between.

Traces of gold were found and Davidson named the locality Granite Hill. Later it became known as The Granites although it has since been established that the rock is not a true granite. It is, however, responsible for the mineralization of the area.

Davidson and his party continued with their exploratory work to the north and little further was heard of the field until 1910 when reports came through that one of a small party of prospectors at The Granites had been killed by natives. Shortly after this tragic incident the rest of the party left the field.

In 1926 it was reported that a number of applications were lodged for gold-mining leases at The Granites by a party who were working on the original find. Severe conditions and lack of water finally caused the death of one of the miners and once again the field was abandoned. Three prospectors in 1927 worked a patch of shallow alluvial ground only 40 yards long by 20 yards wide and obtained 22 oz. of coarse gold but the absence of water forced them to stop operations and retreat from the field.

In 1932 glowing reports of rich finds of gold at The Granites fired the public imagination and there was a rush to the field. Rich alluvial gold had again been found and subsequent mining on a lease known as the Burdekin Duck had produced excellent results. Parties of men including many with no experience of mining or any idea of the conditions under which they would have to work but all under the lure of gold made their way to The Granites in all types of vehicles. In no time the ground was pegged along the line of lode for nearly five miles and then the heartbreaking task of finding payable gold began. Poor results from most of the workings, an acute shortage of water and extremely trying working conditions soon saw the collapse of the boom and those who could get away from the field soon left. Geologists and mining engineers who visited the field to report on its potentialities condemned the area and it was not long before it was completely abandoned.

About this time the Chapman Gold Expedition passed through The Granites on its way to Tanami but soon returned and purchased the Burdekin Duck mine from three prospectors who claimed they had already mined 400 oz. of gold. Two small batteries were installed at the Government Well, three miles south of The Granites and in 1932 seventy tons of ore was crushed

for a yield of 130 oz. of gold bullion. Mr. C. H. Chapman finally acquired leases of most of the country between Chapman's Hill and the Ivy Lease and the continued development of the field is due entirely to his tireless energy and optimism. The water problem was soon overcome when two bores, one at Chapman's Hill and the other on the Golden Shoe, were successful and flowed with excellent freshwater.

The white population of The Granites now consists of Messrs. Gordon Chapman, Mick Costello, Frank Spencer and their wives and children. The remaining population consists of the natives who live on the surrounding plain in much the same manner as their ancestors did for centuries past. Many of the household duties are very ably carried out by certain of the gins while the native men assist generally in the mine workings.

The house gins, like most natives, are inveterate gamblers and every available opportunity is grasped to play a game somewhat similar to poker. The winning hand is never displayed and this possibly accounts for only a few of the gins ever winning. Gambling is frowned upon by Gordon Chapman but its prevention is no mean task because as soon as one pack of cards is confiscated another appears as if by magic from some hidden source.

The expedition's tent was erected near the mine buildings and a start was made on the investigation of the surrounding country. We were greatly indebted to Gordon Chapman and his wife for assistance and hospitality and it was due mainly to them that our visit proved a very profitable one. Natives were detailed off to hunt for the reptilian life of the area and before long a continual stream of specimens began to arrive at our tent. Unseasonal heat was being experienced at this time and the nights were just as trying as the days. The flies rose with the sun and were with us until it set, never faltering in their endeavours to harass and annoy us. It was no help either in the sweltering heat to see the natives, just issued with new heavy overcoats, proudly wearing them all through the day and removing them at night.

The smaller furred mammalian fauna of the Northern Territory is not well known and many of the species are still comparatively rare. Traps were set every evening in likely positions and baited with a very appetising mixture of oatmeal, peanut butter, finely chopped bacon and raisins. Our first catch was a specimen of the rare Orange-backed Bandicoot, *Perameles cremiana*, a small rather stout creature about eight and a half inches in length. This was the only specimen of its kind seen during the whole of the expedition.

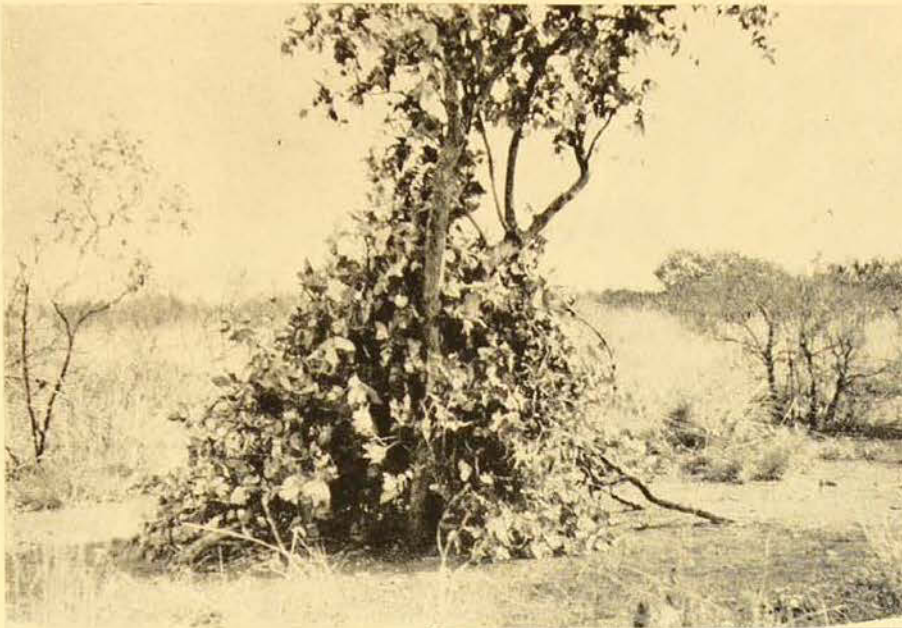
Other small furred mammals collected included the Fat-tailed Marsupial-Mouse, *Pseudantechinus macdonnellensis*, described by Baldwin Spencer in 1897 and, because of the remote nature of its habitat, also a rarity in Museum collections. This marsupial mouse has a remarkable fattening of the tail, a characteristic feature of certain desert living creatures which is associated with nutrition storage against seasonal changes and a resultant shortage of food.

Small delicately built indigenous mice caught in our traps were identified as the Sandy Inland Mouse, *Leggodina hermannsburgensis*, a little mouse with a big name and originally described from east of Alice Springs. It is slightly smaller than the introduced mouse and has a long tail.

The dry arid conditions at The Granites are not conducive to bird life, and during the heat of the day birds were rarely seen with the exception, of course, of crows and occasional Black Kites flying lazily overhead. Crows frequently flew into a large open cyanide tank at the mine for drinking water, and although they drank the poisonous mixture appeared to suffer no ill effects.

Other birds noted at The Granites included the Crested Bellbird, Rufous-crowned Emu Wrens, Tree Martins, Zebra Finches and the Barn Owl.

Many of the so-called granite boulders in this area were ornamented with native drawings but were not nearly as impressive as those seen at Ayer's Rock and later at the Forrest River Mission in north-west



Left—The burial place of an aged native who died during our stay at The Granites.

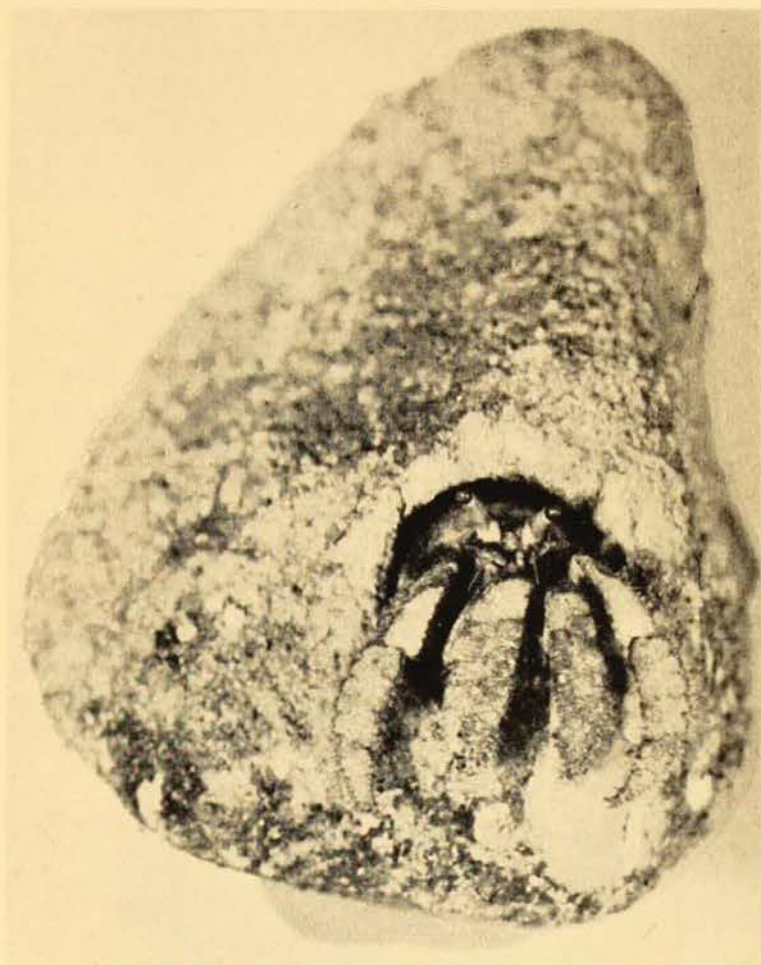


Right—A flashlight photograph of natives dancing during a night corroboree at The Granites.

Australia. They appeared to be of considerable age and were conventional designs which the natives professed to know little about.

While at The Granites one of the old men of the tribe died. We were not permitted to see the early ceremonial rites but later were guided to a spot in the bush where the body after it had been wrapped in bark was placed securely in the boughs of a tree and completely covered with foliage. The same evening a corroboree was held in the native camp and we were told we could attend. We joined the native audience and waited for the dancing to begin, but at least an hour passed before some sort of order emerged from what

could only be called chaos. Shouting, chattering and laughing natives did everything but organise a start until suddenly a few of them with fire-sticks ignited large heaps of spinifex and into the fire-light danced the younger men of the tribe. Six natives provided the music by clapping music sticks together with a perfect rhythm and at the same time chanting a wailing song, their voices rising to a high pitch then falling into a prolonged mumble. As the dancers advanced and retreated stamping their feet with terrific force they kept perfect time with the beat of the music sticks and the chanting voices. On this occasion one dance only was carried out and the entertainment was soon over.



Stones That Walk

By ELIZABETH C. POPE, M.Sc.

The hermit crab (*Cancellus typus*) peers cautiously out of its sandstone home. The hollow has been made in a coarse sandstone pebble and has been enlarged to keep pace with growth.

NORMALLY, if you see a pebble moving about in an animated way, without apparent external aids, it is time to visit the oculist or to mix more water with your drinks. Such an experience is not, however, unknown to the marine collector who is quite used to seeing sponges that walk about sedately or bivalve shells that scurry over the bottom of rock pools in a way no self-respecting bivalve should.

In all these cases the unwonted mobility is due to crustaceans of various kinds. In the mobile sponge and bivalve, crabs are responsible for the "walking" and the sponge or shell has been donned by way of camouflage. The walking stone is, however, quite different for here a hermit crab has actually hollowed a home for itself and uses this fine stone dwelling to protect its vulnerable, soft abdomen.

The local hermit crab, *Cancellus typus*, is one species which prefers a stone dwelling. In fact, this species has rarely been

found living in any other type of shelter and its body is so well adapted to this particular niche that it is almost inconceivable that it could live anywhere else.

It was first recorded in Australia by Zietz who described it to members of the Royal Society of South Australia in 1887. His specimens had been captured in St. Vincent Gulf in shallow water near low tide mark. They were recorded as living in self-made burrows in stones and it was noted that the stones chosen by *Cancellus* were generally coarse and granular in texture and somewhat loosely held together. Zietz was assured by the collector of these first specimens that the hermits did not drag their stones about as do other hermit crabs with shelly homes.

Since this early discovery, *Cancellus* has subsequently turned up in other parts of South Australia; in Western Port, Port Phillip and off Cape Everard in Victoria; and in Sydney Harbour in New South Wales. Sometimes it is taken in dredgings

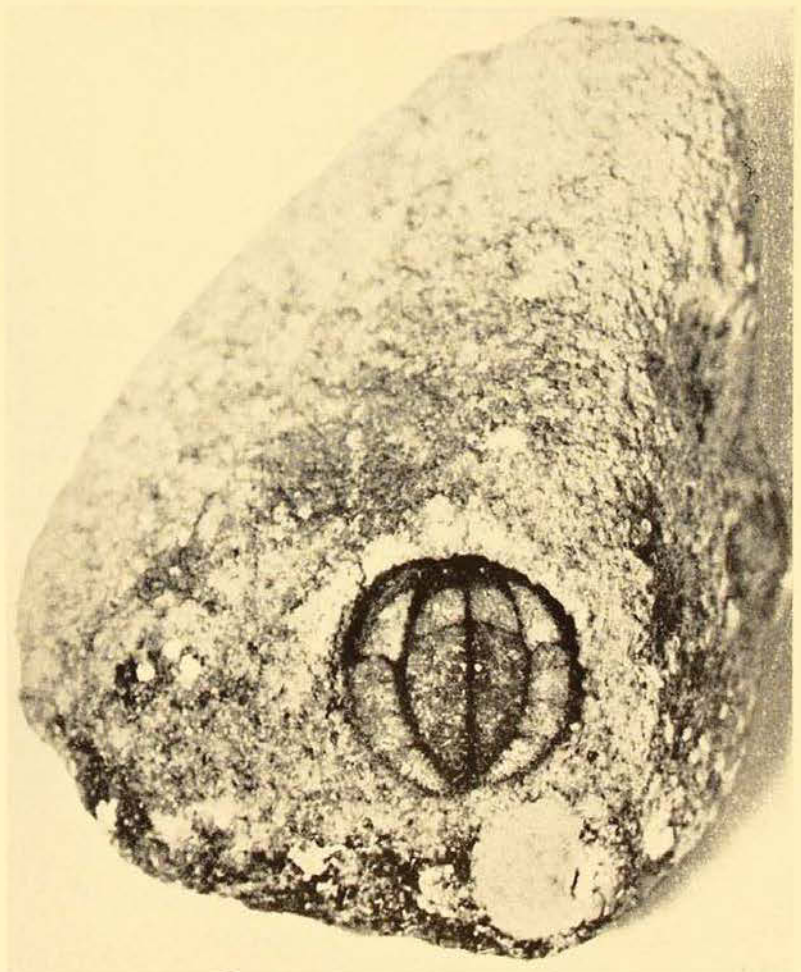
but more often is found just below the low-water mark of spring tides and the latest specimens to come in to the Museum's collections were taken by Mrs. L. Woolcott at Bradley's Head in Port Jackson at this shore level.

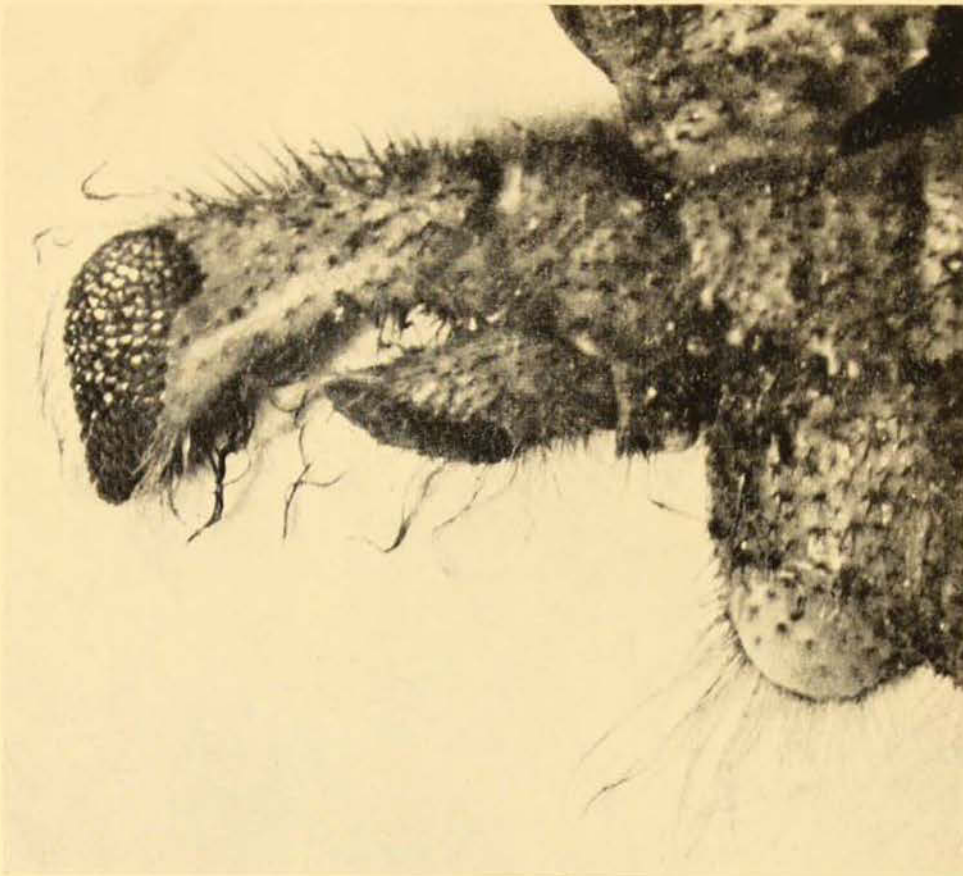
In view of the fact that Zietz stated that this hermit crab did not drag its stony home about, a note to the contrary made in the Museum's catalogues by F. A. McNeill is of more than passing interest, especially as we have just been able to verify McNeill's observation. Mrs. Woolcott's specimen was quite lively when brought in to the Museum and lived quite happily in a small dish of seawater for over a day. During that time it often extended well over half of its body from its stony protection and dragged the stone from one end of the dish to the other. Perhaps Zietz's observer did not keep his specimens of *Cancellus* in seawater and did not allow for the fact that it would be ever so much harder to drag the pebble around

in air than it would be in the denser, watery medium. While it is an easy matter, therefore, for a hermit crab with an empty molluscan home to traipse about in air it might be a physical impossibility for a small *Cancellus* to move a relatively large pebble in the same circumstances.

Museum records also state that one *Cancellus* that was collected had extended its burrow so far back into its pebble that the tunnel had just broken through on to the upper surface of the stone. The crustacean had discovered the mistake, however, and had begun to turn the end of the burrow slightly downwards, away from the surface. This would seem to support the theory that it is indeed the crab that makes the excavation and that it does not just appropriate a hollow stone left by some previous occupant. There are oval, horny, rasp-like structures on the tail appendages and the fourth legs which are possibly the chief digging organs but we were unable, on this occasion, to make observations on

The two front pairs of walking legs fit neatly together and close *Cancellus*' front door as effectively as an iron curtain. Note the space above where the watchful eyes peep forth.





The left side appendages of the tail of *Cancellus* bear small scaly pads which are possibly used for rasping and enlarging the home and definitely serve to grip the side walls. Similar pads appear on the fourth walking leg on each side.

digging habits for the hermit crab died prematurely.

At times, when extending the front, armoured-half of the body out of its stone residence, the crab reared up and assumed an erect, sort of praying attitude but since the aquarium was very small it may have been trying to reach the surface of the water in search of oxygen. When scared by a sudden movement from us, the *Cancellus* would retreat into its burrow and close the entrance in a most efficient way with its two front pairs of limbs. The outer (second) pair of legs form a kind of horse-shoe shaped frame that fits exactly into the entrance of the burrow and the large, nipped chelipeds fill in the remainder of the space. The whole thus forms a most efficient operculum, reminiscent of those of certain Serpulid worms, and only the antennae and bright, stalked eyes poke out in front.

While *Cancellus typus* is found only rarely by collectors, the reason is probably

not that it is a rare animal but that its cryptic habit of retreating into its stone when disturbed makes it hard to find. Also it occurs in that shore area, below low tide mark, about which we know very little for it generally lies beyond the reach of collectors working between tide marks and is not far enough offshore to come into areas which are regularly dredged. With the more thorough exploration of the sub-tidal zone which must follow now that so many spearfishermen are working in this zone, it is expected that more of these quaint hermit crabs will be captured and their habits observed. There is, for instance, one lone record of a *Cancellus* boring into a stony polyzoan colony and this specimen, which was taken by the F.I.S. "Endeavour", came from off Devonport, Tasmania, but we would like to know much more about this species and its habits and so would welcome any further information or specimens of this species from our readers.

Port Keats

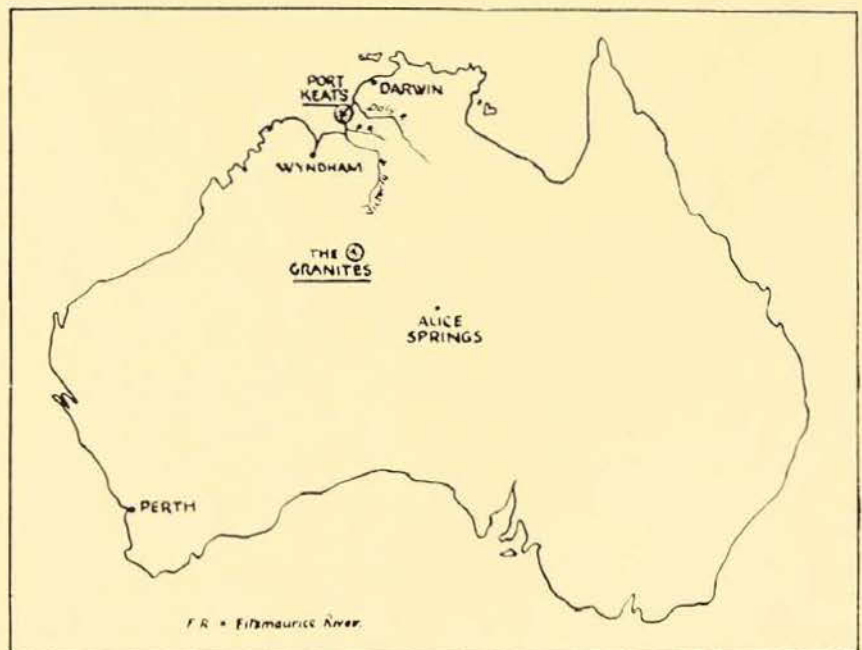
By ALLEN KEAST, M.Sc.*

PORT KEATS is an isolated inlet on the north-west coast of Australia, midway between Wyndham and Darwin. Nowadays it never finds mention in the press, but as recently as twenty years ago it was recognised by the administration as being particularly "wild country" so far as the natives were concerned. In the late 1920s three Japanese, whose lugger ventured into the port in search of fresh water, were killed. This marked the opening of a campaign by the resolute native chieftan, Namarluk, to drive the whites and Japanese from native territory. Timely police intervention, however, stopped the offensive before it really got under way and the instigators were removed to Darwin gaol. To-day the remnants of the Port Keats people are

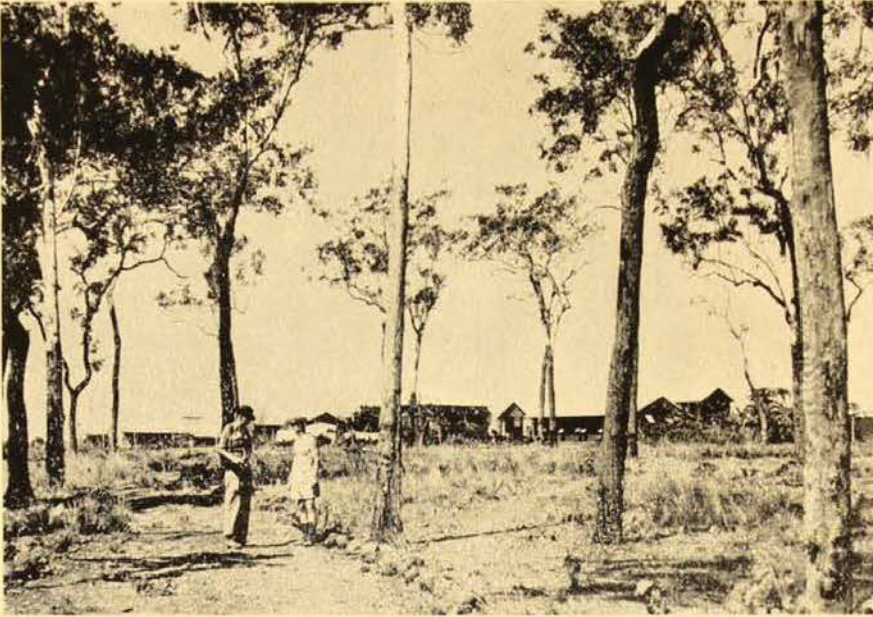
quite docile and being educated to a new mode of life, as sedentary farmers on a mission station.

In natural history circles, however, the name of Port Keats has not died. Shell enthusiasts think of it as the place where the majority of specimens of the rare and strikingly beautiful mollusc, *Voluta bednelli*, has been found. As much as £24 has been paid for a single specimen of this shell. But the area is of greater significance to the palaeontologist, for the rocks of Port Keats are of Permian age, rich in marine fossils, and were laid down approximately 250 million years ago. The Government Geologist, H. Y. L. Brown, travelling through the area in 1905, found Permian outcrops at four localities between

Map of Australia to show the position of Port Keats and The Granites.



* Photographs by the author.



The Port Keats Mission. It is situated on a low hill containing fine fossil outcrops.

the Daly and Fitzmaurice Rivers. Brown's collections, though small, contained very interesting material. It was with the primary objective of studying these fossils and comparing the material from this little understood area with that of Permian formations elsewhere that the 1952 Museum Expedition visited Port Keats. (Extensive animal collecting was also planned.)

The Department of Native Affairs in Darwin granted the party permission to work in the extensive native reserve between the Daly and Fitzmaurice Rivers. And when our objectives became known the Bishop of Darwin kindly invited us

to make the Mission station at Port Keats our headquarters. The area, we learnt, could only be entered in two ways, by boat or air. Since time was the prime consideration it was decided to charter an aircraft in Darwin and fly to the bush strip adjacent to the Mission.

We arrived in Darwin towards the end of June, the overland trip from Wyndham along bush tracks having meant a long detour by way of Victoria River Downs and Katherine. Hasty repacking followed for permissible weight limits for air travel dictated a much-abbreviated kit. Then on the second day we became airborne and headed to the south-west. The route to



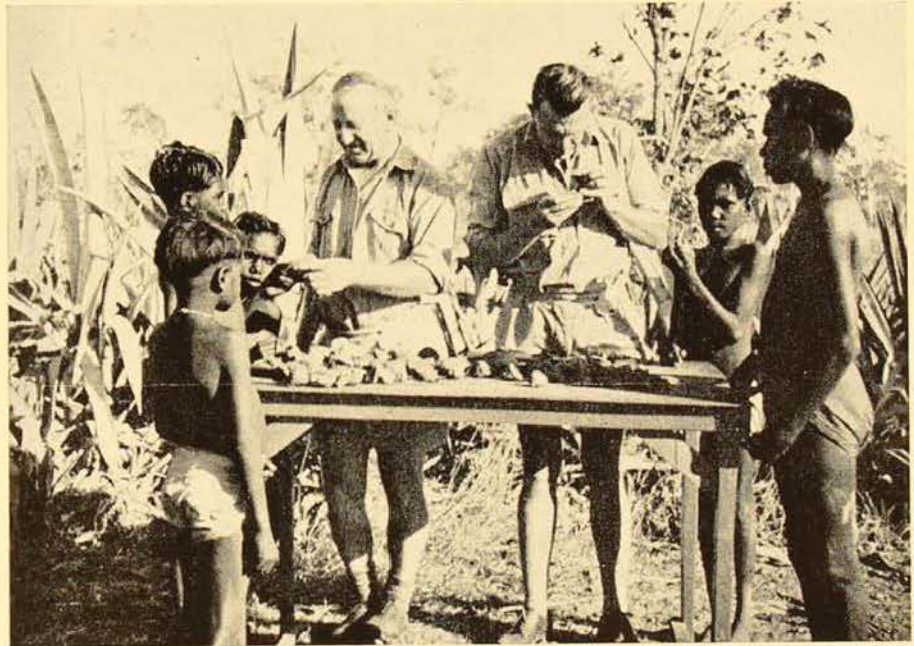
Head of the mangrove-fringed creek at the landing stage. The mission is about 8 miles from the mouth of Port Keats.

Port Keats was along the coastline, a succession of low headlands and long, white beaches. The Daly River was crossed half an hour after leaving Darwin, a broad, muddy stream whose waters discoloured the sea for several miles. It is mangrove-fringed about the mouth and contains several small islands. Then, as we were speculating as to the origin of several fires below, the aircraft turned inland and swept over flat plain-country and sparse forestlands. Presently there was a call of "Here we are" and the Mission huts were seen below. The pilot circled once to allow us to survey the area and note the Mission farm, the forest, mangroves, and the meandering creek that wound its way westward

Over morning tea we learned the history of the Mission. It had been formed at Government suggestion in 1935 and Fathers Dockerty and Quinn, together with anthropologist Dr. E. W. Stanner, had landed near the mouth of the Port and made contact with the natives. The first months had been very trying, the newcomers fearing that at any time the natives might emulate the killing of the Japanese. However, the curing of several bad cases of skin disease reinforced with periodic gifts of tobacco and flour, steadily gained the confidence of the natives and the Mission gained influence.

After the first few months it became apparent that the original site was unsuit-

The "fossil exchange", showing Harold Fletcher (left), Ted Rayner, and some of the Mission children.



to the shimmering mass of water on the horizon we knew must be Port Keats.

Captain Baker made a good job of landing on the rough ground and in no time natives were converging on the plane from all directions. And at their head was the Mission Superintendent, Father Dockerty, stout, jovial, and bearded, who was to prove himself the finest of hosts. Introductions were made all round and, with many willing hands to help with the baggage, we set off towards the buildings. It was then that I realized the bulk of the natives had collected around me. "They have never seen a redhead before," joked Father Dockerty.

able and it was decided to reconnoitre the hinterland for a better place. Over a period Father Dockerty and a group of natives explored the whole region, eventually deciding on the present site, at the head of a mangrove-fringed creek, some 12 miles from the sea. Construction of the new Mission had commenced at the outbreak of war but because of the danger of a Japanese invasion the newly-arrived sisters had to be sent south and expansion halted. Father Dockerty remained on the station throughout the war. To-day there are two priests, two brothers, and four sisters on the Mission and new buildings are steadily being added. There is a church, dormi-

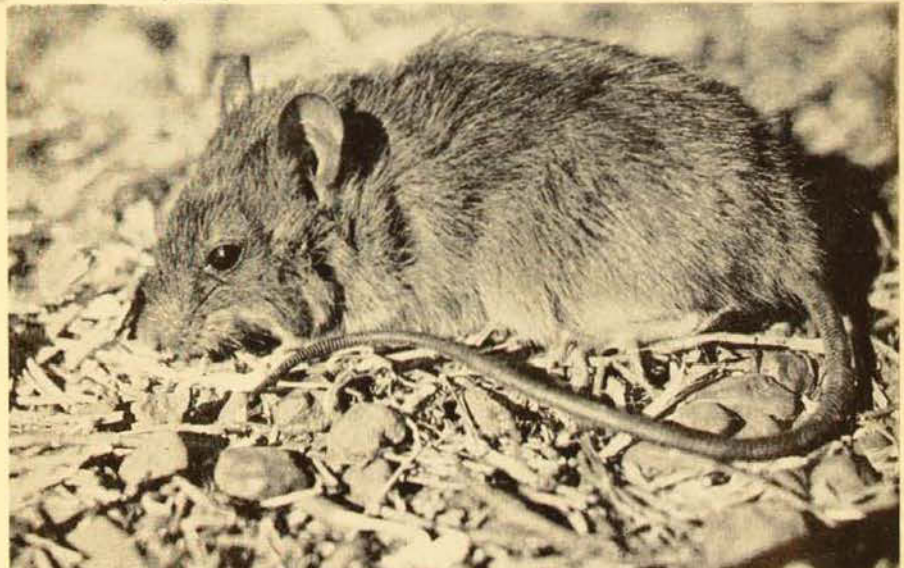
tories for boys and girls, a school, and several acres of cultivated land. And for the first time the fall in birthrate has been arrested.

The schoolboys were given a half-holiday on the afternoon of our arrival to help with fossil collecting for it had not taken our leader and palaeontologist, Harold Fletcher, long to find that the Mission was actually built on a fine outcrop. Many



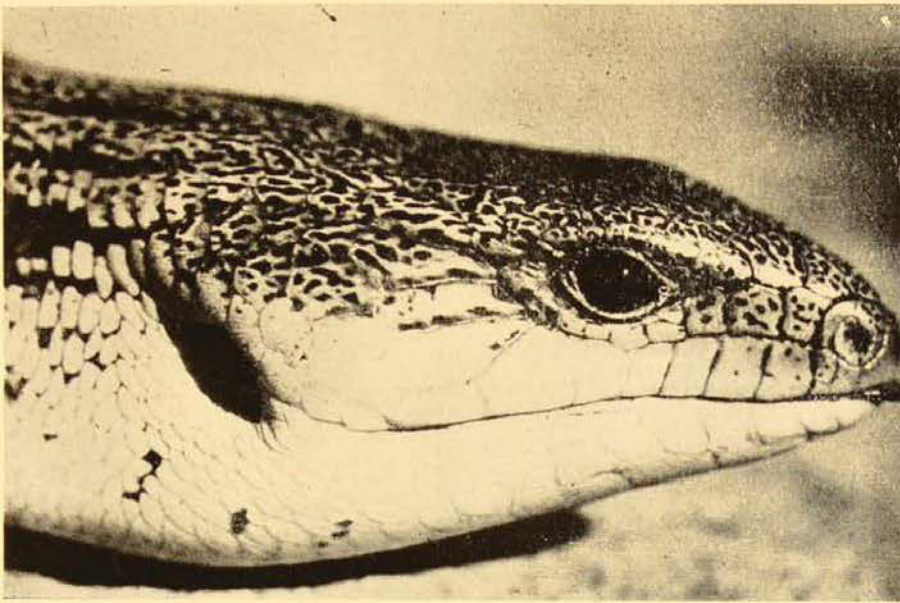
Above—A member of the Territory race of the widely-ranging "common" Grey Opossum (*Trichosurus vulpecula arnhemensis*). It is characterized by inferior size and reduction of the tail-brush to a mere crest.

Right—A species of naked-tailed rat (genus *Melomys*) inhabiting the coastal scrub and mangroves. The tail-scales are in a mosaic, instead of the usual rings, for prehensile action in climbing.



bivalve and brachiopod specimens could simply be picked up from the ground or prised from the loose rocky matrix and with the reward of a lolly or half a cigarette per specimen material was soon arriving in bulk. Mr. Fletcher and Ted Rayner (geologist) had a most busy afternoon. The better material was placed to one side for later sorting, the poorer specimens piled in an out-of-the-way portion of the building. When I returned from hunting towards the end of the afternoon it was to find Harold and Ted sitting beside a great heap of fossils and very happy with the afternoon's work. Already a couple of new species had been found and an excellent series of specimens obtained. Moreover, superficial inspection had revealed a great deal about the relationships of the area with other Permian basins in Australia and beyond.

In the meantime animal collecting had also got well under way. The landing stage at the head of the creek was made the focal point for an investigation of the mangrove life and much material obtained. The fact that the tide was out (there is a fall of 22 feet at Port Keats) had allowed deep penetration of the forests to be made although the heavy mud made going slow. A fine specimen of the Territory Brushtail, a small grey possum, was caught alive as it hid in the dense foliage. A number of crabs, most prominent of which was a striking black and red fiddler crab, found their way into the collecting bag. The pursuit, by the natives, of the goggle-eyed and air-



The Blue-tongue Lizard
(*Tiliqua occipitalis*) of the
north-west.

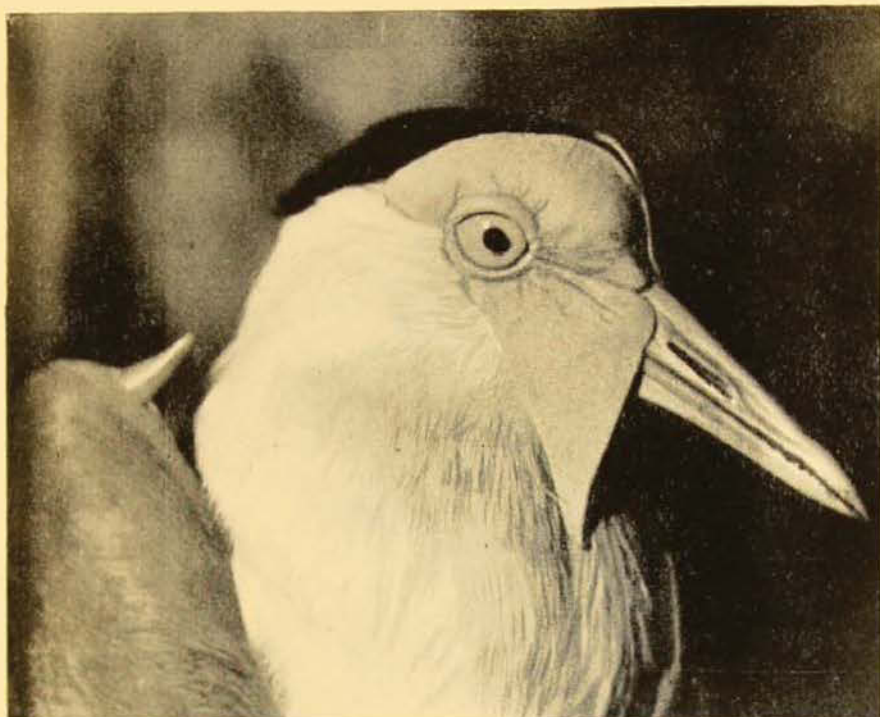
breathing mud-skipper fish caused them a great deal of amusement. These little fish climb out on to the trunks and limbs of the mangroves where, clear of the water, they rest until something approaches. Their speed, as by a series of irregular jumps they leap across the mud, is quite considerable. The mangroves also had quite a distinctive bird life. The Grey Whistler, a little-known species, was the first seen. Then the Northern Fantail fluttered into view, followed by the Yellow Silveryeye and Shining Flycatcher. Far ahead a pair of Burdekin Ducks scurried from a shallow pool and flew swiftly downstream. And then at the edge of the mangroves we came upon a clump of flowering tea-trees swarming with nectar-eating honeyeaters. Most conspicuous of them all was the little male Red-headed Honeyeater whose scarlet head and rump contrasted strikingly with his dark grey body. Brown and Black-capped Honeyeaters sang loudly and melodiously as they fed. And, one by one, four other forms, all ones confined to the north, were distinguished: the Dusky, Rufous-throated, Rufous-banded and White-breasted species. The last-named has the extraordinary habit for the group of building a domed nest.

At this stage a small boy appeared with a dead bird and upon being asked how he got it produced—a catapult. I was informed that small birds were shot to eat and that the champion marksman, who turned out to be an 11-year old lad, had

many birds. The opportunity was too good to miss and a few minutes later I came on the group of boys who had, between them, thirty small birds. I hastily went through their "bag" and found several I'd not yet seen: Lemon-breasted Flycatcher, White-winged Triller, and Black-headed Pardalote amongst them. Almost all were in good condition and I picked out twenty—there was an exchange of sweets for birds and both sides departed highly pleased with the arrangement, the boys moreover promising to bring in all the animals they caught for inspection.

I must confess that I have never had much respect for the catapult but now began to think that maybe it was little inferior to the shotgun where shooting birds was concerned. However, a walk with the boys showed them, with a couple of exceptions, to be no more accurate than I was at my peak. The two experts did, however, obtain quite a lot of "kills", some at extreme range. The pebbles were carried in what the boys called their "calico", a piece of triangular coloured cloth supplied by the Mission. This was worn around the lower part of the body and apart from being a garment it formed an excellent and readily accessible ammunition pouch.

On the succeeding days we were able to cover much of the surrounding countryside in search of animals. At the foot of the Mission hill was the farm. This was on a fertile flat through which a spring ran

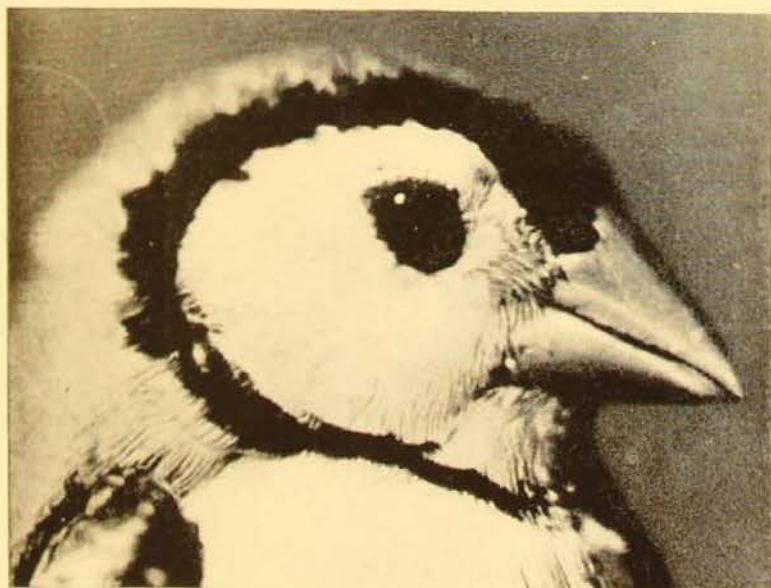


The Masked Plover (*Lobibyx miles*) has yellow flesh about the face and spur on the wing.

with such volume that much work went into keeping open the irrigation channels. Here was a large area of banana trees, a couple of rows of tapioca trees, and an extensive area of pineapples and sweet potatoes. The farm was found to be an interesting bird habitat, a number of forms concentrating there. A few White-breasted Wood-swallows, Rainbowbirds, Sacred Kingfishers, an odd Goshawk or two, and the Blue-winged Kookaburra, were always to be seen whilst Tree Martins fluttered overhead, catching the insects disturbed by the farm workers. Beyond the farm and adjacent to the mangroves was a small

clump of jungle trees, giant figs in which the flying foxes sported themselves at night and in whose gnarled trunks the little insectivorous bats found roosting places. Bush rats fed in the debris of the floor, several frogs were caught there, and a specimen of the water snake, *Forodonnia leucobalia*. In the mornings a magnificent chorus of birdsong was to be heard just here, for the breeding season of many species was beginning at this time.

The greater part of the Port Keats area was covered in forest which was of the dry sclerophyll type. Little undergrowth occurred in rocky places, but elsewhere



The Black-rumped Doublebar (*Steganopleura annulosa*) of the north-west.

This hunting party has obtained a fine lot of Magpie Geese (*Anseranas semi-palmata*) for the pot. The flesh is delicious.

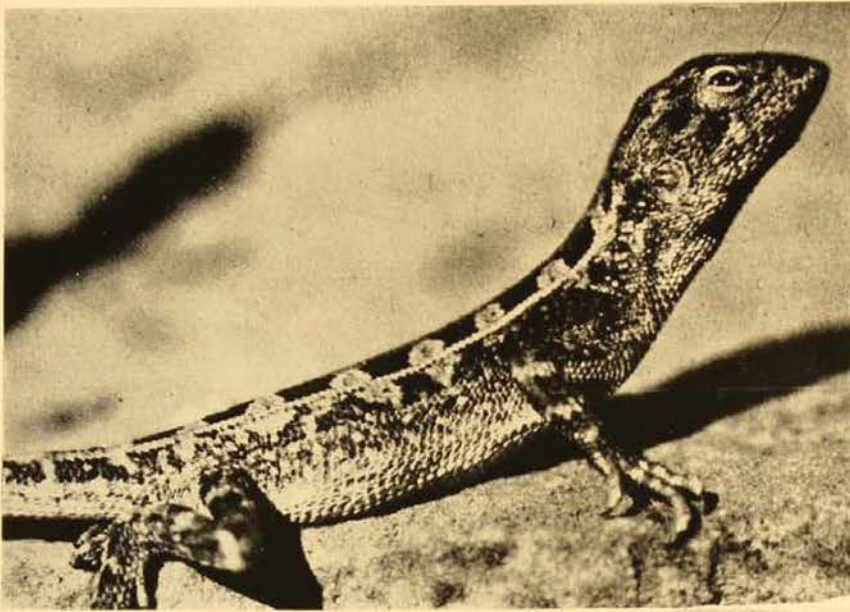


was dry and broken sorghum some five feet in height, reminding one of what the forest must be like in summer when the whole of the sixty inches of rain falls. Many large termite mounds occurred in the forest, the largest 15 feet in height and as much around the base. Here and there dense groves of vivid green *Macrozamia* stood out and vied with occasional palms for the honour of being the most elegant plants in the forest. Amongst the stones and dead grass of the forest floor reptiles were numerous. Little skink lizards of several kinds with highly polished scales basked on logs and tree-trunks and ran from one's path. Geckoes of several

genera were revealed when bark was pulled off trees or stones turned over—dazed and docile, their disproportionately large eyes identifying them as nocturnal forms. Into the soil large goannas had burrowed—like their smaller relatives these belonged to a species which has never been graced with a popular name. But there were two reptiles well-known in the south, Burton's Legless Lizard and the pretty little Red-naped Snake. Birds were also in abundance in the forest and included several forms that had arrived to feed on the flowering eucalypts: Varied and Red-collared Lorikeets, Little and Silver-crowned Friarbirds, in particular.



This Small-billed Crow (*Corvus bennetti*) has the white eye of the adult bird.

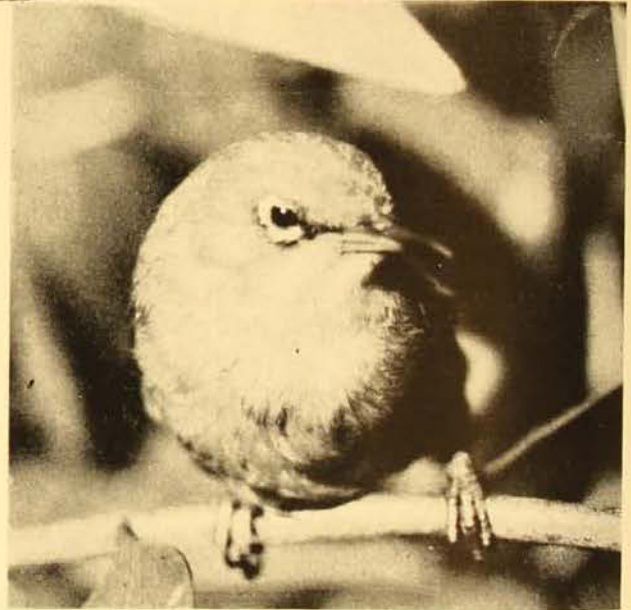


Left—The swift little Jacky Lizard (*Diporophora bilineata*).

Below—The Yellow Silver-eye (*Zosterops lutea*) of the mangroves.

The two longest trips made from the Mission were to an extensive plain some twenty miles to the south and by launch to the mouth of Port Keats. In the case of the former the objective was to reach Fossil Head, one of the places Brown had made collections, but the going proved too rough for the old Mission truck and we had to abandon the quest late in the afternoon. We did, however, cross the place where the Magpie Geese nest—a large plain which becomes swamp in the wet season and then holds a big breeding colony. There, too, we saw Brolgas, Ibis, and the Mission's cattle.

The water journey to the entrance of Port Keats was a notable one. We chose a day when highwater was shortly after daybreak, and, with two native boys as launch crew, set out down the meandering creek. Dense mangroves leant out over the water from both banks and interesting and varied bird life (and sandflies) were features of the journey. These mangrove streams are the home of kingfishers, particularly those tiny blue jewels known as the Azure and Little Kingfishers which dive after prey. And then there are the wading birds, the herons and curlews, that pursue the small crabs over the mud or dexterously withdraw them from their holes. Whereas the atmosphere along the creek was humid and oppressive, it suddenly became warm and dry with our emergence on to the openness of Port Keats. Now the water took on the vivid



blueness so typical of the tropics, and long sandy beaches began to alternate with the mangrove shoreline. We passed the place where the Japanese had been attacked on their lugger a quarter of a century ago, then an outjutting reef where migratory waders squabbled as they fed on the falling tide. A landing was made on a low sandy "island" on the southern side of the port. Here shells and coral were collected, mouse burrows unsuccessfully investigated for their owners, and the billy boiled in the meagre shade of a pandanus. Afternoon hunting followed, and as the tide became full again we turned back towards the mission. The return, in late afternoon and early evening, was a delight and that night we ate a most hearty meal.

Amongst the native inhabitants of Port Keats were some quite notable people. Foremost amongst these was "Tiger", whom Ion Idriess credits, in his book "Namarluk" as being one of the most wily and brave native leaders in the history of the north. He was the brother and contemporary of Namarluk and belonged to a small group of warriors who were not afraid, with their spears, to face the guns of the whites. Tiger, so tells Idriess, was alleged to have been responsible for the killing of two prospectors who ventured into the wild Fitzmaurice country some twenty years ago, and he was arrested on this charge. No proof was ever forthcoming, however, and he was subsequently released and Father Dockerty told us that

he believed Tiger's denials that he had been associated with the crime. To-day Tiger lives on the Mission and is a tower of strength in the community. But even in his daily chores one can observe a dignity of bearing in him. He was a fine companion when collecting was being done and most skilled in the hunt. Also on the Mission was the widow of Namarluk and several fine old men, white-headed and bearded, whose names I omitted to record. One cannot but feel a tinge of regret that these elders of the tribe, brave, dignified, and ecological masters of the most inhospitable terrain, belong to the past, their culture forsaken in favour of the more powerful one of the whites.

Cinema Screenings, 1953

Another series of half-hour cinema screenings has been arranged by the Australian Museum. The syllabus for 1953 is set out below. The screenings will take place in the Museum Lecture Hall at 1.15 p.m. on the first and third Wednesday of each month, admission free. This has been made possible through the courtesy of the film libraries of the Canadian Government, the N.S.W. Films Council and the National Film Library, Canberra.

Further information about the undermentioned and forthcoming programmes may be obtained at the Museum, or by telephoning number B 056, extension 2489.

July 1:

"Lost World." (A clever photographic description of prehistoric animal life.)

"Colour in Clay" (Colour). (Scenes of the English pottery industry.)

July 15:

"The Filter." (Water used for drinking is purified by filtering out various animals, e.g., amoeba, small crustacea, etc., and by the growth of algae.)

"The Australian Ballet" (Corroboree).

August 5:

"The Song of Ceylon." (Produced by John Grierson in 1935. Shows the traditional life of the people and contrasts their culture and primitive economy with the influence of modern commerce.)

August 19:

"Skeena River Trapline." (A Getikshan Indian of British Columbia operates the lifeline which brings him his food.)

"White Safari." (An account of a Canadian Army Expedition through the Arctic.)

"Dots" (Colour). (An experimental film created entirely by the artist drawing on celluloid without the use of camera or sound recording.)

September 2:

"Across the Arctic Ungava" (Colour). (A record of an expedition by four Canadian scientists and Indian guides into unmapped territory.)

"Time and Terrain" (Colour). (A cartoon study of Canadian geology.)

September 16:

"The River." (A documentary film of the Mississippi River and of the reckless cultivation of the land through which it flows.)

October 7:

"Daybreak in Udi." (Based on actual events which took place in Nigeria during the construction of a maternity hospital. Native superstitions are shown.)

October 21:

"The City." (An impressive documentary film showing the growth of a city from a small village.)



" We began to dig the
... shaft "

New South Wales Opal Fields

1. WHITE CLIFFS

By J. F. LOVERING, M.Sc.*

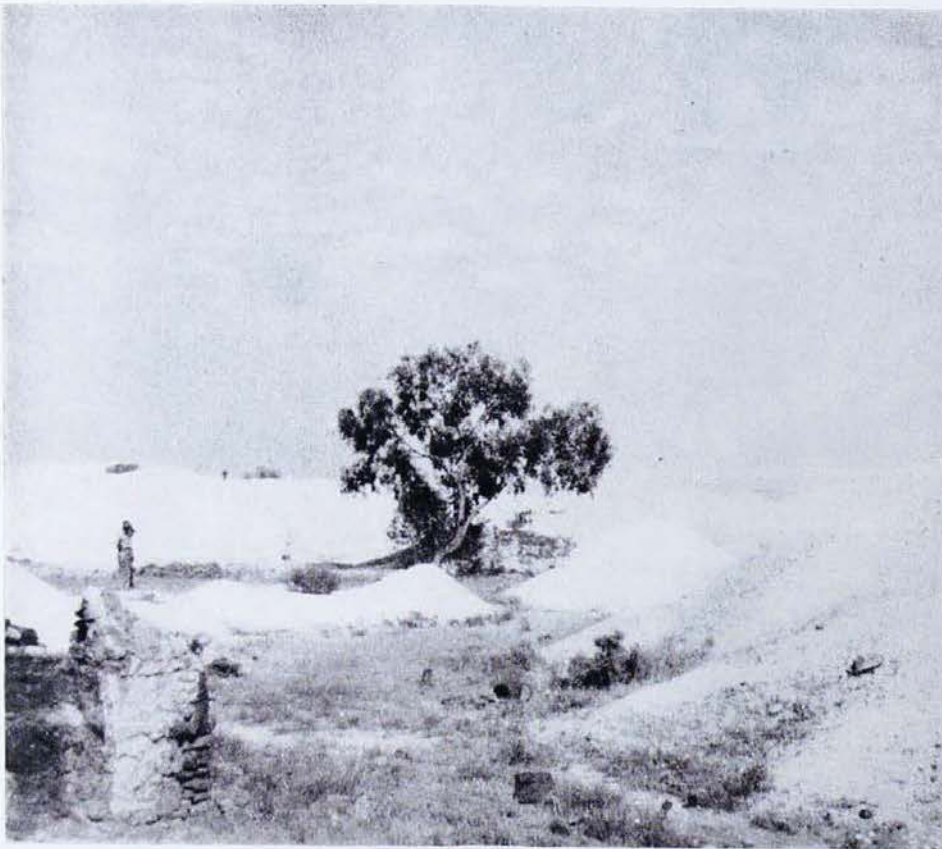
OPAL is the truly distinctive gemstone of Australia—its very origin is bound up with the vagaries of the climate of the country west of the Darling in the Geologic past. Despite a revival of interest in opal in America, no serious opal prospecting is being carried out in either White Cliffs or Lightning Ridge, the two principal opal fields of New South Wales. When I joined a party of keen amateur "opal gougers" in a visit to White Cliffs in March this year, we were the first to sink a hole in the district for some time.

The largest proportion of opal produced in this State has come from this field since it was discovered in 1884. By 1899 it was a vital town of 2,500 but to-day there are less than fifty people. A school, store, post office, hotel and a handful of scattered houses are all that remain of the original

town set in the gibber-covered plain about 60 miles by road north-north-west from Wilcannia. The only regular traveller is the mailman who, despite his long experience of the tracks, occasionally gets into trouble. We found him almost hopelessly bogged to the tray of his truck after a 40-point shower of rain the previous evening. Water, the old problem of the miners, is no problem at present. At least two large tanks provide adequate, if muddy, supplies as well as delightful camp sites under their fringe of river red gums. We chose our camp under three lone belahs on the gibber plain close to the No. 1 tank, about 2 miles out of the town and within easy reach of the diggings on Sullivan's Hill.

The first duty was to call on one of the most active of the local gougers, "Snowy" McCulloch. In his comfortable mud hut

*Photographs by the author.



*Left — Coolibah tree
"amongst the countless
blinding white dumps".*

*Right — Government Tank
with its "fringe of River
Red Gums".*





"the mailman . . . occasionally gets into trouble".

set amongst the countless blinding white dumps, he told us of the old days when men were so eager to sink new shafts after the rich prize that old shafts had to be filled in to get enough room for dumps from new shafts. "Snowy" picked a spot on the flanks of the hill where the opal horizon was reasonably close to the surface and we began to dig the conventional 5 feet by 3½ feet rectangular shaft—only the Chinese diggers made circular shafts, I was told. First, through the thin soil

and Tertiary "grey billy" cover and then into the Lower Cretaceous white clayey sandstone studded with gypsum crystal aggregates and then about 9 feet down we began to gouge into the soft clay after the opal seams but were unlucky. Our hopes were high after we struck a piece of silicified wood showing thin veins of precious opal about three feet down but it proved to be our only find. Despite this setback, another shaft was put down a little way up the hill but the result was the same—



Snowy McCulloch (centre) in front of his comfortable mud hut.



The open-cut with some of the old dugout homes.

no opal but a lot of experience in the back-breaking task of opal gouging.

The rest of our time was spent in visiting all the old diggings that are scattered over the low hills around the district. The old open cut, the result of a venture of an English company which held some of the best leases on the field, is still well preserved and contains some of the quaint dug-outs in the hillsides where the miners made their cool, fly-free homes. Two old miners still live comfortably in their dug-outs.

But the old bustling activity is gone and White Cliffs is all but a ghost town. Just a few picking over the dumps ("lousing") and occasional enthusiasts sinking a hole or two before they depart dejectedly. This was the field that gave the characteristic light-coloured stones of unequalled beauty and the interesting opal replacements of

wood and shells, the fossilized waste of the Lower Cretaceous sea. "Fossil pine-apples", the miners' very descriptive name for the radiating crystals of glauberite replaced by opal, were also typical of the field. White Cliffs will surely rise again when the lures of quick money from tank-sinking and fencing have gone. The Lower Cretaceous sandstone, host rock of the opal seams, has a considerable extent in the district and there is every possibility that, with systematic prospecting, new fields will be opened up.

The following articles on opals have been published previously in the MAGAZINE:—

"Opal, the Rainbow Gem", by C. Anderson (Volume I, No. 7, January, 1923, p. 200).

"Glendonites and other Fossil Crystals", by T. Hodge-Smith (Volume VI, No. 10, April-June, 1938, p. 337).



Toadfish Poisoning

By G. P. WHITLEY

"The Toadfish eaten, soon the body dies."
—J. A. Moore, Tasmanian Rhymings, 1844.

ON old maps of Western Australia one may see a "Baie des Tetrodons" at Dirk Hartog's Island, Shark's Bay. The name, given by Freycinet, means Toadfish Bay, *Tetrodon* (literally "four teeth") being the old standard name for these self-inflating fishes which have four large teeth forming a parrot-like beak. They are still common in the region: I have caught them there myself, recalling that, as far back as 1st April, 1772, a French explorer, Saint Allouarn, was at the same place when many of these sea toads were caught by the crew but were thrown away because they were known to be poisonous¹. Possibly Saint Allouarn had heard of or read the curious earliest (1690) account of toadfish poisoning in Kaempfer's History of Japan²:

"People that by some long and tedious sickness are grown weary of their lives, or are otherwise under miserable Circumstances, frequently chuse this poisonous Fish, instead of a knife or halter, to make away with themselves. A Neighbour of my servant at *Nangasaki* being so strongly infected with the Pox, that his nose was ready to drop off, resolv'd to take this Meal, in order to get rid at once, both of his life and distemper. Accordingly he bought a good quantity of this poisonous Fish, cut it into pieces, boil'd it, and in order as he thought, to make the poison still stronger, he took soot from the thatch'd roof of his house, and mix'd it with the rest. After dinner he laid himself down to die, and soon falling mortally sick, he brought up not only the poison he had taken, but a large quantity of viscid, sharp, nasty matter, probably not the least cause of his distemper, and by this means found life and health, in what he sought for death, for he recovered, and was well afterwards."

The renowned James Cook and his men were severely poisoned in 1774 after having had but a taste of a toadfish (*Pleuranacanthus sceleratus*) for supper when at New Caledonia. Cook³ recorded:

¹"Au jour peché beaucoup de crapeaux de mer que l'on a fait jeter tout de suite à l'eau ne voulant pas que l'Equipage en eut mangé dans la crainte qu'il ne leur eut fait mal comme l'on a eut beaucoup d'exemples."—Manuscript of Kerguelen's Voyage, 1771-2, vol. 2, Journal of St. Allouarn, folio 262, in the Mitchell Library copy of documents in the Hydrographic Department of France.

²E. Kaempfer, History of Japan (English ed.), 1727, vol. i, p. 134, pl. xi, figs. 1-2.

³J. Cook, A Voyage towards the South Pole, ed. 3, ii, 1779, pp. 39 and 112-113. See also W. Anderson, *Phil. Trans. Roy. Soc. London*, lxxvi, 1776, pp. 544 and 552-574; J. R. Forster, Observations made during a Voyage . . ., 1778, pp. 210-211, and Descriptiones Animalium, 1844, pp. 254 and 282.

The silver-cheeked toado, *Pleuranacanthus sceleratus*, found at the Baie des Tetrodons, named after this widely distributed and very poisonous fish.

G. P. Whitley, *del.*



"About three o'clock in the morning, we found ourselves seized with an extraordinary weakness and numbness all over our limbs. I had almost lost the sense of feeling; nor could I distinguish between light and heavy bodies, of such as I had strength to move; a quart pot full of water, and a feather, being the same in my hand . . . In the morning one of the pigs, which had eaten the entrails, was found dead."

The first truly Australian case occurred in the Newcastle district, New South Wales, 22nd June, 1801, as James Grant⁴ narrated:

"An object now presented itself to our view, which exhibited the completest picture of wretchedness I ever beheld. This was a man wrecked in a boat belonging to Sydney, with two other men, both of whom were dead; one of them by the hands of the natives, the other by eating greedily of the toad-fish, the prickly bones of which had choked him."

In his entertaining book, "True Patriots All", a collection of old broadsides, Lieut.-Commander G. C. Ingleton⁵ quotes from the *Sydney Gazette* of 21st April, 1821, a report of the coroner's inquest on the body of John Buff, a Crown servant:

"The unfortunate man had been fishing during the afternoon at Duck-river Bridge, about three miles from the town of Parramatta on the Sydney Road, and had caught a few toad-fish. On his return to Parramatta, the place of his residence, he broiled the fish for his supper, and eat them accordingly.

"In about ten minutes afterwards he expressed himself as being nearly insensible; his tongue became much swoln; he laid himself prostrate on the ground, and requested to have some water given him, complaining much of extreme thirst.

"As soon as he had drank the water, he begged to be turned on the other side, which last request of the poor man was scarcely complied with, before his soul took her flight into eternity. From the time he had eaten the fish to the time of his death, was about 20 minutes.

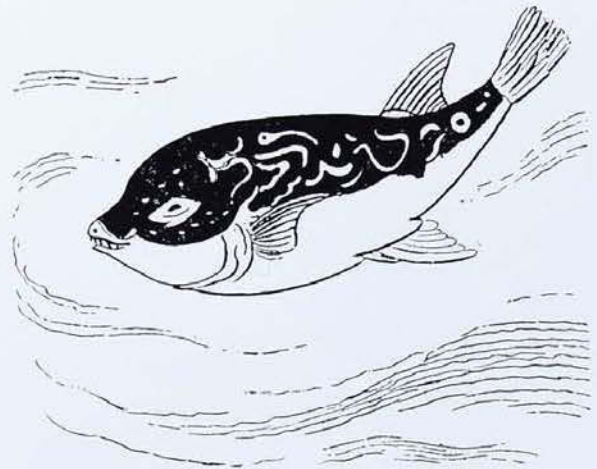
"The verdict on this occasion was—Died by eating the Toad-fish."

Exactly ten years later, Ingleton notices, the *Sydney Gazette* published the verdict on the wife of Captain Bell of Hobart and their two children as "accidental Death,

⁴ J. Grant, Narrative of a Voyage of Discovery, 1803, p. 156. See also Bladen, Hist. Rec. N.S.W. iv, 1896, p. 406; Huntington's History of Newcastle; and Ida Lee, Logbooks of the "Lady Nelson", 1915, p. 67.

⁵ G. C. Ingleton, True Patriots All, 1952, pp. 88 & 265, with extrapolated fig. and headlines. See also Australasian Pocket Almanack, 1822, p. 67.

河豚
Furube.



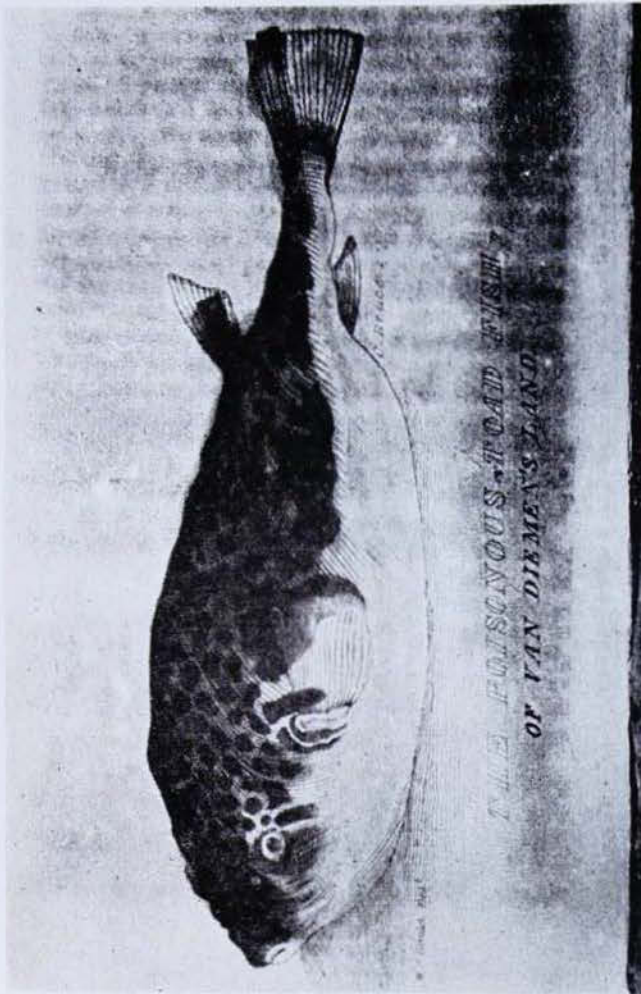
Kaempfer's figure of the furube or fugu (*Fugu rubripes rubripes*), a poisonous toadfish of Japan, first published in the 17th Century.

After W. H. Yudkin.

casually and by misfortunes, from eating of toad-fish, not knowing it to be poisonous".

The poisoning of Mrs. Bell and her two children, who died in a few hours at Hobart Town, in March, 1831, created a furore at the time. The species of fish responsible was *Sphaeroides glaber* and details of the inquest and the case generally and experiments on cats with the poisonous fish may be found in various publications⁶ of the period. Precautions to mariners visiting Australasia were issued in the *Nautical Magazine* because of the poisoning by the "*Rana piscatrix*" (the toadfish which was later named *liosomus* by Regan, but which equals Fréminville's *glaber*, named from Adventure Bay in 1813).

⁶ *Colonial Times* newspaper, Hobart, 29 March and 5 April, 1831, 3rd pages; *Sydney Herald*, i, April 18, 1831; Ross's Hobart Town Almanack, 1832, p. 89 & pl.; *Nautical Mag.*, ii, 1833, p. 545; Montgomery Martin, Hist. Brit. Colonies, iv, 1835, p. 437; Mrs. C. Meredith, Notes and Sketches of N.S.W., 1844, p. 155; Newman, *Zoologist*, iv, 1846, p. 1341; Lord & Scott, Synops. Vertebr. Anim. Tasm., 1924, p. 94; and Lea, Poisonous and Stinging Animals of Tasmania (ex *Tas. Mail*, Nov. 1903), folding sheet with 16 figures.



THE POISONOUS OR TOAD FISH

OF VAN DIEMEN'S LAND.

(Communicated by James Scott, Esq. R. N. Colonial Surgeon.)

The Fish, of which I send you a delineation, is found in the bays and on the shores of Van Diemen's land, and is supposed to be a species of the Toad Fish.

The melancholy and dreadful effect produced by eating it was lately instanced in the neighbourhood of Hobart town, on the lady of one of the most respectable merchants, and two children, who died in the course of three hours, without being able to give any notice of their danger, and several servants were only saved by the timely discovery of the death of their mistress and their fellow servant's children.

The poison is of a powerful sedative nature, producing stupor, loss of speech deglutition vision and the power of the voluntary muscles, and ultimately an entire deprivation of nervous power and death. At the inquest over the above bodies, the effect of the poison was satisfactorily proved by

The historic figure of the Poisonous or Toad Fish of Van Diemen's Land (*Sphaeroides glaber*). "The general size of the fish is about five inches . . . spotted like the tortoiseshell".

After J. Scott, *Ross's Hobart Town Almanack*, 1832, p. 89 and plate. By courtesy of the Mitchell Library, Sydney.

In spite of all the warnings, however, there was a fatality in Western Australia in August, 1834, when H. M. Ommaney, in the boat "Monkey," visited Shark's Bay and recorded⁷:

"On the night of the 16th one of the crew died and I have but little hesitation in saying that he was poisoned from partaking of a fish (*Tetrodon?*) of which we caught a great many; although the rest of the crew ridiculously attributed his death to the want of water, for we were all on short allowance."

Furthermore, an aborigine was poisoned at Rottneest Island, Western Australia, through eating a blowfish⁸.

⁷ Report in the *W. Austr. State Archives*, copied from the original in Public Records Office, London, and kindly supplied to me by Dr. D. L. Serventy.

⁸ According to G. F. Moore, Nov. 10, 1840, quoted by W. B. Alexander, *Proc. Roy. Soc. W. Austr.*, iii, 1918, p. 68. See also Moore, *Diary of Ten Years . . . in W. Austr.*, 1884, p. 418.

In January, 1871, two young boys, H. Gibson and A. Burrows, were killed through eating toadfish in the Coogee district near Sydney. *Sphaeroides hamiltoni* was the species responsible and the distressing details of the post-mortem examinations, the experiments of Dr. Pattison on himself and his pets, of interest to medical men, may be read about in the subjoined references⁹.

Rats, cats, pigs, fowls and other animals, as well as human beings, have been killed through eating toadoes. I do not know

⁹ *Illustr. Sydney News*, 18 February, 1871, p. 140 & fig.; E. S. Hill, *Sydney Mail*, 4 March, 1871, p. 22, and 3 June, 1871, p. 426; Krefft, *Sydney Mail*, 29 July, 1871, p. 697; *N.S.W. Medical Gazette*, i, 1871, pp. 176 & 305, pl., and ii, 1872, pp. 138 & 145; Tenison-Woods, *Fish & Fisher*, N.S.W., 1882, p. 90 (where "1874" should read 1871); Aflalo, *Sketch Nat. Hist. Austr.*, 1896, p. 247.

whether seagulls are immune. However, it is usually the visitor to our shores, the inland aboriginal who is new to the coast, or other strangers who fall victims to these poisonous fishes, of which there are some thirty Australian species, generally under eight inches in length (a few exceed two feet). They often have a peculiar and disagreeable smell and may grunt and inflate themselves when taken from the water. The bodies are oval or pear-shaped, smooth or prickly. Toadoes may be of almost any colour: plain, spotted, striped, banded or marbled. It is hoped that New Australians and overseas visitors, particularly children, will acquaint themselves with toadoes and porcupine fishes¹⁰, which are the only fishes poisonous to eat in New South Wales. Every so many years there grows up a generation which knows not toadfish, so continuous tradition and propaganda must be kept alive. A few more instances will show that even to this day, these little fishes are taking their toll. They are so easy to catch, and like most things easy to get, are not worth having.

Mr. George Coates, of Townsville, in a letter to me recently recalled a Queensland

case of toado poisoning which occurred "many years ago" as follows:

"A fisherman on Magnetic Island was cleaning his trap out and amongst the fish thrown out were a number of *Pleuranacanthus lunaris*. A new arrival in the country (Scandinavian, I think) picked some of these up and was told by the fisherman to throw them away and take a good fish to eat. The man however insisted they were good fish, took them to his camp, and had a good feed. He was very shortly attacked with great pains in his stomach and an effort was made to get him by boat to the hospital on the mainland four miles away. However, he died on the way, the whole business occupying only a few hours."

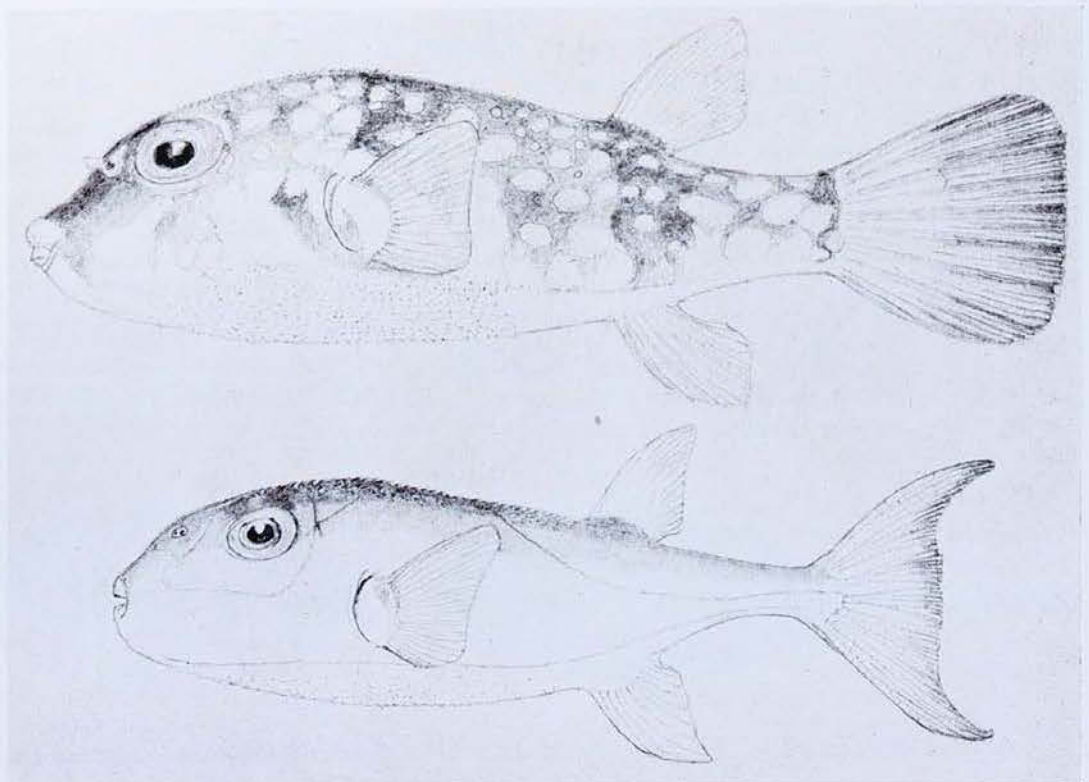
Another case of toado poisoning was reported from Thursday Island.

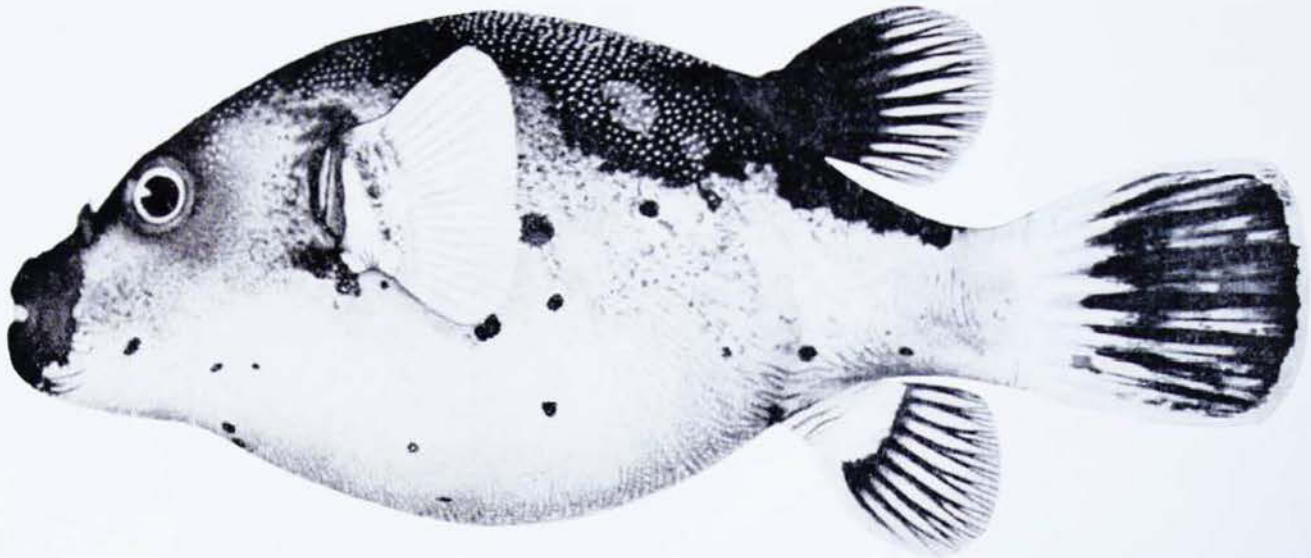
In 1940, the Medical Officer in Charge at Rabaul, New Guinea, sent to The Australian Museum a toado from Madang which I identified as *Ovoides nigropunctatus* which was said by the natives to be very poisonous and to have caused several deaths. That same species killed two out of eight poisoned natives¹¹ at the Lombadina Mission, 110 miles north-east of Broome, Western Australia, in August, 1950; they had eaten the liver and lye of what was called the *ngarlee*, *bingnarlingarl* or *ngarl* fish, thinking they had a fish called

¹⁰ Fully dealt with in THE AUSTRALIAN MUSEUM MAGAZINE, x, 11, 1952, pp. 353-360, 8 figs.

¹¹ *West Australian* (Perth), 11 August, 1950.

Two tropical Australian Toadoes. Above, the White-spotted Toado (*Chelonodon dapsilis*), and below, the Green Toado, (*Pleuranacanthus lunaris*). G. P. Whitley, del.





The black-spotted Toadfish, *Ovoides nigropunctatus*, the cause of many deaths in Indo-Pacific waters and even in Western Australia.

After D. S. Jordan and A. Searle.

ngaring, which is wholesome. Through the co-operation of the District Medical Officer, Broome; the Western Australian fisheries authorities; and the Rev. Father Francis I. Kelly, S.C.A., who sent a pastel drawing of the fish as well as a specimen (always welcome in such cases), identification as *O. nigropunctatus* was possible. This species has a black spot at the vent and usually black marks at the gill-opening and elsewhere.

In December, 1950, a boy and his cat¹², were killed by eating so-called "mountain trout" from Kermantie Creek, Castle Forbes Bay, Tasmania; but the fish was subsequently identified as a toado, *Sphaeroides liosomus*, now *glaber*.

Finally, a Sydney family was poisoned in March, 1951, and one of them died¹³. Remains of the fishes were submitted to me

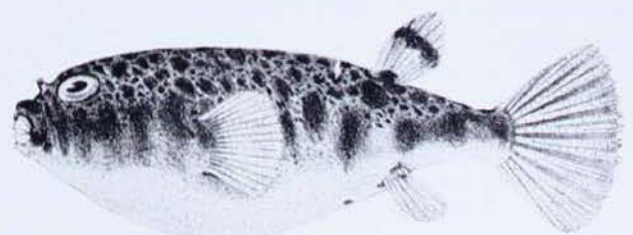
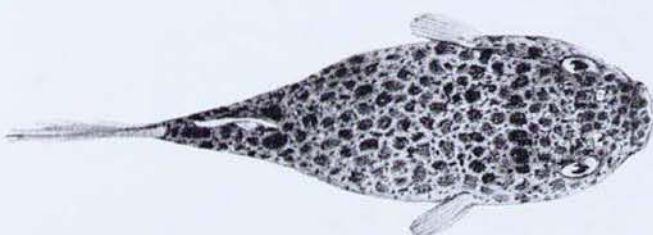
¹² *Daily Telegraph* (Sydney), 9, 11 and 12 December, 1950; H. G. Taylor, *Walkabout*, 1 November, 1951, pp. 46 and 48, and fig.; *Sun* (Sydney), 7 March, 1951, p. 14.

¹³ *Sydney Morning Herald*, 6 March, 1951.

for identification and I found fragments of at least three or four toadoes (*Sphaeroides hamiltoni* or *pleurogramma* or both), the head of a kelpfish and decomposed head and tail of other small fishes, which had originally been caught at Manly.

Probably doctors, or the records of hospitals, could add other cases of toado poisoning.

So never eat a toadfish. They are common, generally in shallow water, in all parts of Australia, and probably at all times of the year. Though some people have eaten of them with little or no effect (and indeed one species is marketed in America and the Japanese are said to have some secret way of preparing or cooking them) others, independent of season or the state of maturity of the fish, have died in a few hours. Poisonings, known also as ciguatera, have been recorded from various parts of the world. The poison has been named Tetrodotoxin and in *Fugu rubripes rubripes*, a Japanese toado, its formula is reported as $C_{12} H_{17} O_{10} N_2$.



A bold and bad little fish very common in New South Wales, the common Toado, *Sphaeroides hamiltoni*, responsible for several deaths.

After Richardson.

according to Yokoo¹⁴. I am grateful to Dr. Tokiharu Abe, of Tokyo, for identifying Kaempfer's 17th century illustration as of the same species. Thanks are also due to the Mitchell Library, Sydney, for access to rare newspapers, books and manuscripts, and for a copy of the Hobart Town Almanack, 1832, illustration reproduced here.

Species known to have been responsible for deaths or severe poisoning in Australia are: *Pleuranacanthus sceleratus* and *P. lunaris*, *Contusus richiei*, *Ovoides nigropunctatus*, *Sphaeroides hamiltoni*, *S. glaber* (syn. *liosomus*) and possibly *S. pleurogramma*.

TREATMENT.

In any case of toadfish poisoning, it is, of course, essential to obtain immediate

¹⁴ Yokoo, *Proc. Jap. Acad.*, xxviii, 4, 1952, p. 200.

medical aid. Dr. George Bennett, in 1871, remarked:

"The treatment I have invariably found successful has been the speedy administration of an emetic, followed by mild aperients—generally castor oil, and if much debility should supervene after the attack, aromatic spirits of ammonia, with the camphor mixture or vegetable tonics . . .

" . . . it may be recommended to those persons who may be poisoned by fish . . . to take emetics, followed by copious draughts of warm water, until the poisonous fish is rejected from the stomach, and then to take a mild saline aperient or castor oil, and if debility be felt, brandy or any other alcoholic stimulant may be taken."

A more modern treatment, as for bacterial fish poisoning, recommends:

"The patient should be put to bed and given a liquid diet and brandy—two hourly. Milk is probably best avoided. Hot applications should be made to the abdomen—and morphia may be indicated—in early cases emetics or gastric lavage may be of value. The bowel should be washed out if there is much diarrhoea. If the loss of fluid by vomiting or diarrhoea is great, saline should be given intravenously."

Review

POSSUMS. By Carl G. Hartman, Ph.D., former professor of zoology and physiology at the Universities of Texas and Illinois; now Associate Director of the Ortho Research Foundation at Raritan, New Jersey. 174 pp. with 100-odd illustrations, including earliest historical woodcuts, drawings covering the birth and growth of the American opossum and the kangaroo, and striking photographs of marsupials. University of Texas Press, Austin, U.S.A., 1952. \$6.00.

Contemplating the supposed mystery of marsupial birth which involves the kangaroo even to-day, it seems difficult to realize that it is four and a half centuries since the first pouch-bearer, the true opossum of America, became known to Western civilization. But as stated by Professor Hartman in his eventful history of this primitive marsupial, it was the explorer Vincente Pinzón, a captain associated with Columbus in his discovery of the New World, who in 1500 picked up a possum with pouch-young on the newly-discovered shore of Brazil. He brought it back to Spain and

presented the "incredible mother" at the court of Ferdinand and Isabella, who placed their royal fingers in the pouch and "marveled at so strange a contrivance of Nature".

The process of marsupial birth as a veritable embryo, and migration to the pouch, challenged imagination and evaded solution for about four centuries. The entire problem finally yielded to anatomical research and direct observation, in which Hartman was to take a leading part amongst embryologists, and as chief chronicler of possum lore both ancient and modern. Several translations of the original account by Peter Martyr, in his world-famous *De Orbe Novo Decades* (1493-1526), of the discovery of the "Monstrous beast with a snowte lyke a foxe—bearing her whelpes abowte with her in an outwarde bellye much like unto a greate bagge or purse", were reasonably factual, probably coming first hand from Pinzón and his crew. But for three centuries writings about opossums included the kind of exaggeration common to adventurers of those times.

After the conquest of Mexico by Cortez, much cultural material of the pagan Aztecs was destroyed by Spanish friars, but men like Fra Sahagún (1499-1590) preserved some of the nature lore of Montezuma's kingdom, including quite a complex materia medica. So impressed was Cortez that he warned King Philip II that Spanish physicians would be embarrassed by the superior knowledge of the Aztec medicine men. One of the least appealing of their herbals and nostrums extolled the virtues of a concoction brewed from possum tails as a wondrous remedy for inflammation of the kidneys and for expelling stones or calculi!

Subsequent writings made the civilized world well aware of this strange new mammal, but it was midway in 1800 before zoological science had advanced to a comprehension of the relationships and reproduction of just "another strange beast". The first attempt to bridge the hiatus between marsupial gestation and birth was made, as Hartman says, not by one "living where possums abound" but by Professor Selenka of Wurzburg, Germany, who published in 1887 an important treatise on some eggs and numerous embryos from possums imported from America. There was no marked advance on the subject until 1911 when Professor J. P. Hill, F.R.S., Emeritus of London University and previously at the University of Sydney, published his monograph on the embryology of the Australian pouched "cat" and bandicoot, demonstrating an unknown principle of marsupial parturition.

In 1913 Hartman, stimulated by these researches, began his comprehensive investigation of the breeding habits of the American opossum, confirming that basic reproductive principle which, he generously states, might have been overlooked but for Hill's work on the Australian marsupials. The results of Hartman's research upon some 2,000 eggs and embryos, covering every developmental stage, appeared in at least six important papers between 1920 and 1928. In his book, the results are summarized in popular style in chapters on Opossum Embryology and Birth, and depicted "painlessly" as he says by a number of drawings and photos. Such evidence must finally dispel any bizarre beliefs of community folklore such as an idea that the "seed" of the baby possum is blown into the pouch from the mother's nostrils.

The actual unaided migration of the embryonic babe to the pouch, as first recorded by Hartman, is reviewed in detail in chapters on: "Journey to the Pouch—Fancy", in "Fact", and "Birth of the Kangaroo". It is a fact that in 1806 Professor Barton of Philadelphia first postulated the unaided transference of the newly-born opossum. Doubtless based on his unrecorded observations because he wrote: "It is not true, as has been often asserted, that the mother, with her paws, puts the young ones into the pouch". Evidently, through some misinterpretation Hartman has misquoted Barton as saying the reverse, and attributes his suggestion of unaided transference to guesswork. "Surprisingly enough", Hartman writes, "an author in the popular British *Elements*

of Natural History (1801) also hit the nail on the head: 'The young are exceedingly small, blind, naked, but they immediately creep into the pouch' which was sheer clairvoyance for that day." Such contradictory passages as those on page 93, should be clarified in a future edition.

But unquestionably the credit must go to Professor Hartman and his wife for the first detailed observations of possum birth and migration to the pouch, as recorded in the *Anatomical Record* (U.S.A.) in 1920. Observation of a female, in a softly-lighted cage insulated against disturbing sounds, proved that: "Without any assistance on the mother's part . . . this twelve-and-three-quarter-day-old embryo, in appearance more like a worm than a mammal, is able, immediately upon its release from its liquid medium, to crawl a full three inches over difficult terrain. Indeed, it can do more; after it has arrived at the pouch, it is able to find the nipple amid a forest of hair. This it must find or perish."

Amongst confirmatory observations, Hartman says the best job must be credited to Harold C. Reynolds who, at the Museum of Vertebrate Zoology, University of California, witnessed the birth of four litters, and with a stop-watch even clocked the time required for the "perilous journey". The infant's main hazard is in getting started, in which there is a considerable percentage of failure. The mothers made no effort, apart from relaxing the pouch-flap in bending over, to assist the young, such as by licking the intervening fur, while occasional licking of the climbing young appeared to slow it down rather than help. Although the number in a litter averages not more than nine, and the maximum of the teats is fourteen, Reynolds observed one litter of twenty-five at least half of which must fail in the struggle for attachment.

As with the Australian pouched native "cat" and ring-tail phalanger, a frequent overplus of young for the functional teats provides elementary proof that marsupial young are not conceived within the pouch. Concerning the unaided transference of the newly-born it is interesting to note, as previously quoted¹, that the first observation of the unassisted passage of an infant kangaroo was communicated to the Zoological Society of London in 1830 from Surgeon Alexander Collie. This account, barely twenty-four years after that of Professor Barton on the American Opossum, concerned a wallaby from Garden Island, off present-day Fremantle. Unfortunately, Hartman has not quoted Collie's original account, but an abridged one by G. R. Waterhouse in Jardine's *Naturalist's Library*, which omitted the vital reference to the unaided journey to the pouch, and ended with a misleading footnote: "The mode by which the Kangaroo reaches the pouch immediately after birth is not yet known."

However, the question of unaided progression to the pouch in both opossum and kangaroo being finally settled there remained the problem: By what

¹ See Troughton, AUSTRALIAN MUSEUM MAGAZINE, viii (2), 1942, pp. 40-44.

senses is the newborn marsupial guided to the point of attachment within the pouch? According to Hartman "The word *instinct* has trapped many a naturalist into mental lethargy" or high-sounding but misleading expressions. He then propounds the simple theory that the clambering opossum, because of the far superior development of the fore-limbs, as in kangaroos, must of *necessity* move upward to the pouch. On the contrary, Reynolds gives an instance of a mother opossum lying partly on her side so that young crawling side by side would have by-passed the opening had they not turned at an angle of about 90° to enter the pouch. The young are therefore not anatomically incapable of crawling other than upwards and obviously there are other sensory factors such as that of smell for their guidance.

After so much controversy, extending from the year 1500, it is small wonder that at Cooktown in 1770 Captain Cook's naturalists gave the name "possum" to a female ring-tailed phalanger, on noting its pouch. Of the American Indian name "opossum", it was suggested that the initial "o" represented a preliminary grunt, but the use of "wabasim" in a related language group discounts the idea. In similar vein, Hartman ventures the suggestion that when Cook and his naturalists recorded the name "kangooroo" "Perhaps a native cleared his throat at the psychological moment" because "no native word sounding anything like that has since been heard in Queensland!" Actually, our Museum Anthropologist, F. D. McCarthy, cites references in *North Queensland Ethnography*, Bulletin 2, 1901, by Dr. W. E. Roth:

"It is noteworthy that this Koko-Yimidir language is the identical one of which Lieutenant Cook took a vocabulary when visiting the Endeavour River." Also "Under the date 14th June, 1770. Captain Cook states . . . the animal . . . called by the natives kangaroo. This animal is still spoken of as ganguru."

Apart from the above historical and controversial matters, there are intriguing chapters on the natural history of the primitive opossum in which the author "debunks" the amusingly illustrated legend of the litter of young being transported with their tails looped pot-hook fashion around that of the mother. Though the possum is a proverbial chicken thief, such food is far from first on the list, because rats, mice, and insects comprise a major percentage of diet. So that, as with Australian marsupials such as the native and tiger "cats", the American opossum "plays a role beneficial to man" in the balance of nature. Another chapter deals with the possum's quaint habit of feigning death when in danger, giving rise to the American expression "playing possum", now generally used to imply human shamming or pretence.

Written not only with a truly scientific concern for accuracy, but with rare humour and imagination as well, beautifully produced and illustrated, and with delightful chapters on the folklore of Br'er Possum, and his "Cousins Down Under", the book must provide fascinating reading for all who are interested in nature's ways, and the marsupials in particular.

—ELLIS TROUGHTON.

Notes and News

An investigation of a deposit of fossil bones at Weetaliba, New South Wales, was recently made by Mr. H. O. Fletcher, Curator of Palaeontology. The occurrence was reported by Mr. John Beasley of Binnaway.

It was found that the bones occur at varying depths up to 12 feet in an alluvium which forms the steep sides of a creek near the Weetaliba railway bridge. The fossil bones outcrop at various points from the railway bridge to near the Binnaway-Coolah road, a distance of about one mile. The main outcrop of bones was found in a deep erosion gully leading into the creek and near the road.

The exposed bones are plentiful but fragmentary and are usually encrusted with

a limy-clay matrix. It is almost certain that the bones are not *in situ* but have been washed out from an older deposit and re-distributed in their present position by comparatively recent flood waters.

The fossil bones are for the most part limb bones of extinct kangaroos which lived during Pleistocene times about 10,000 years ago.

Fossil bone deposits of Tertiary and Pleistocene age are of extreme interest and it is only by an investigation of them that material will be found which will add to our limited knowledge of the remarkable creatures which once roamed the Australian continent. The possibilities of finding rare vertebrate remains are endless.

Mineralogical Expedition

In March, a private trip to the far west of New South Wales was organized by Mr. O. le M. Knight, Honorary Correspondent of this Museum. Included in the party of seven were Messrs. R. O. Chalmers and J. F. Lovering of the Museum's Department of Minerals and Rocks, who attended in the capacity of "busmen on holiday". Many interesting minerals were collected at localities such as White Cliffs and in the

vicinity of Broken Hill, Euriowie, Thompson's Siding, Thackaringa, Egebek, Rockwell and a hitherto unrecorded locality on Huonville Station, where gem quality titanite occurs associated with adularia feldspar in a manner reminiscent of the Swiss occurrence. Commencing in this issue, from time to time, articles dealing with some of these localities will appear.
