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Emu Wren.

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THE AUSTRALIAN MUSEUM

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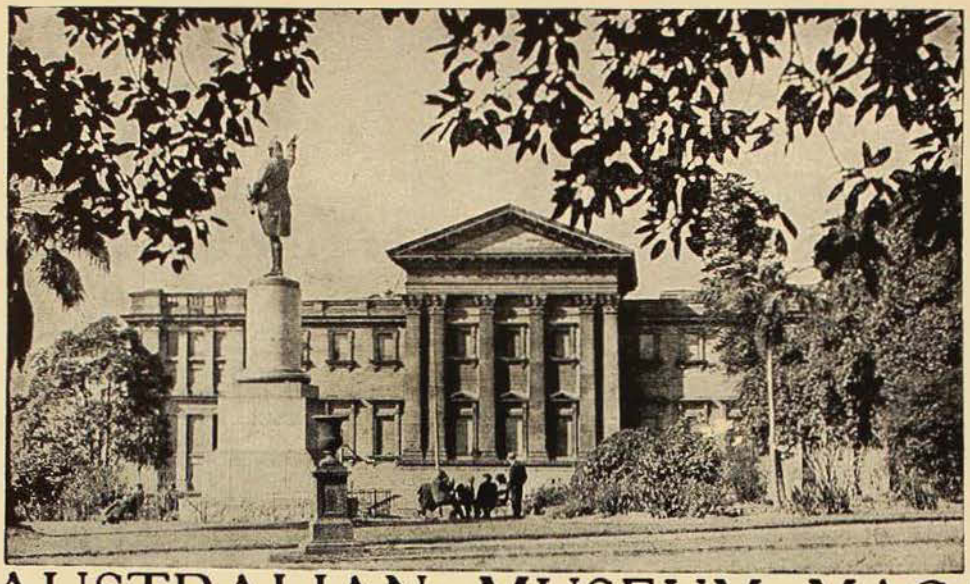

THE AUSTRALIAN MUSEUM MAGAZINE

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

● OUR FRONT COVER. The Emu Wren (*Stipiturus malachurus* Shaw), is by Lilian Medland. It is one of a series of postcards issued by the Australian Museum.

This quaint little Australian is known only to the initiated, since it is of shy and retiring disposition, and creeps mouse-like through the thick scrubby vegetation of open heath lands, where it is specially to be sought in swampy places. Its presence is usually indicated by its note, which resembles that of the Blue Wren, and is usually uttered from the top of a low bush, after which the bird drops down to the ground again. It is difficult to force it to take wing, and in a high wind its peculiar tail is so unmanageable that the bird may be run down and caught by hand.

The Emu Wren takes its name from the feathers of its tail, which are only six in number in place of the more customary ten or twelve, and are loosely barbed like those of the Emu. It is found throughout southern Australia, and is entirely insectivorous. The nest resembles that of the Blue Wren on a somewhat smaller scale, and three or four white eggs are laid, minutely freckled with brown.

VOLUME VIII, NUMBER 2. SEPTEMBER–NOVEMBER, 1942.

A Red-necked Wallaby (Wallabia rufogrisea) in a resting attitude common to all members of the kangaroo family. Authentic observations have proved that this is also the attitude assumed during the birth of young. The embryonic marsupial is born onto the base of the tail, while the crouched position of the parent lessens the distance for its instinctive upward journey and relaxes the opening of the pouch (see page 40).

THE AUSTRALIAN MUSEUM MAGAZINE

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A Notable Gift to the Nation

In many countries it has become somewhat traditional for some of those who have amassed considerable fortunes to return portion to the cultural institutions of their country. This is sometimes done by bequest of money, either for special purposes or for use at the discretion of governing bodies, at others by bequest of collections, which have been gathered as a result of the donor's enthusiasm for a particular hobby. Often they have been gathered at great expense to the collector, so that, in fact, they represent gifts which have considerable monetary value.

In a young and sparsely populated country such as ours fortunes are fewer than in the older countries, but nevertheless our cultural institutions—universities, art galleries, and museums among them—have received many notable bequests. Bequests to museums in Australia have generally been of collections, and a large proportion of the contents of our museums has been accumulated in this way.

In order to enrich their collections some of the larger museums in other countries are able to send special expeditions to almost any corner of the globe. This is mostly possible as a result of the provision of funds for museum purposes by generous donors who take an interest in the welfare of the institutions.

The Australian Museum has received no more valuable bequest than that recently made by the late Miss Amy Alfreda Vickery, of Strathfield, in the following terms:

> I BEQUEATH to the Trustees of the Australian Museum College Street Sydney, aforesaid that portion of my collection of stamps contained in my stamp albums or books now numbered 1 to 23 (both inclusive) and also any additional stamp albums or books numbered 24 or more which may be added by me thereto during my lifetime upon the express condition that such portion of my collection of stamps bequeathed as aforesaid shall after arrangement as hereinafter mentioned be kept intact and not split up or divided or parted with by the said Museum Trustees and for the purpose of arranging and housing such bequest I bequeath to the said Museum Trustees the sum of five hundred pounds (£500) to be expended by them in paying for the services of an expert philatelist to suitably arrange the bequest and also for cabinets for the convenient and permanent housing thereof AND I DECLARE that the receipt of the Treasurer or Secretary of the said Museum Trustees shall be a full discharge to my trustees for the payment of the said sum of five hundred pounds (£500) and my trustees shall not be bound or concerned to see to the due application of the same.

Miss Vickery had devoted a lifetime to the acquisition of this collection, and it was her desire that the valuable series of Australian stamps should be preserved in a national institution.

Though philately is somewhat removed from the scope of a museum that is essentially one of natural history, the Trustees gratefully accepted the bequest, realizing their responsibility as custodians of this magnificent collection for the State.

The Truth about Marsupial Birth

By ELLIS TROUGHTON, F.R.Z.S., C.M.Z.S.

AS marsupials are probably the most interesting of our Australian animals, it seems appropriate that the birth and infant nurture of baby kangaroos should provide human invaders of their stronghold with an everlasting subject of argument. By camp-fire and country bar the debate has gone on since earliest settlement, reviving as a trusty annual in the town and country papers. Despite endless repetition of scientific facts, many bush-naturalists still assert that the young kangaroo develops out of the teat, like an apple on a twig. They also refuse to credit that the tiny infant actually does make an instinctive journey to the pouch, following upon birth in the manner of all furred animals.

A young kangaroo eyes the intruder from the safety zone of its cosy retreat. Though fully furred and feeding upon grass, the pouch is sought at sign of danger. When hard pressed by pursuers the young may be thrown from the pouch, either in an attempt to save the young or to relieve the parent's distress.
Courtesy of Sydney "Sun".

The Museum constitutes a court of zoological appeal in such matters, and it can be stated definitely that not one of many hundreds of enquirers has departed unconvinced of the actual facts. In 1926 in a MAGAZINE article,[1] "The Mystery of Marsupial Birth and Transference to the Pouch", it was shown that there was actually no mystery at all. Also, that as early as 1806 the unaided journey of newly-born opossums to the pouch had been reliably recorded in America. From recent research, one is now able to draw public attention to the earliest Australian record of the similar unaided transference of an embryonic kangaroo. As this account was published in the *Zoological Journal* of London in 1830, fifty years in advance of previously quoted observations, the time seems opportune for reviewing the facts of marsupial birth.

Looking over one's collection of notes and news-cuttings, it is evident that pouch-birth theorists have been misled by lack of opportunity for continuous observation of living animals, besides a general lack of anatomical knowledge. Therefore, in yet another attempt to clarify the facts, it is most helpful firstly to explain the basic relationship of marsupials with all furred animals (mammals), not excluding the primitive egg-laying platypus and spiny ant-eaters. It must be kept in mind that all of the

[1] Troughton.—THE AUSTRALIAN MUSEUM MAGAZINE, Vol. ii, No. 11, July-September, 1926, p. 387.

mammalian class are air-breathing and warm-blooded animals, which suckle their young—the term "mammal" being derived from the Latin *mamma*, referring to the breast and teats, associated with the milk-glands.

EGG-LAYING MAMMALS AND MARSUPIALS.

While marvelling at the relatively minute size of newly-born marsupials, we must remember that the furred platypus is hatched from a very small egg a fortnight *after* it is laid. Also that the blind and naked nestling then instinctively sucks-up milk exuded from its mother's milk-glands, there being no teats. The ant-eating relative of the platypus, however, lays its egg directly into a pouch temporarily formed by muscular adaptation during the breeding season. In this teatless pouch, the newly-hatched ant-eater suckles at will until its spines outgrow the temporary home.

In the more advanced marsupials, embryos are not encased in a leathery shell and are able to absorb a certain amount of nutrition before they are born in an active though relatively unformed state. But in the "higher" or non-marsupial mammals there is prolonged sustenance of the unborn, by means of the placental or "navel-cord" connection with the parental blood-stream, so that birth is at a much more advanced stage. This pre-natal connection is either absent or rudimentary in most marsupials, only the bandicoot family having a fairly complete placental connection, while kangaroos have none. Embryonic kangaroos are therefore dependent upon the surrounding yolk-sac for pre-natal growth and are necessarily born at a remarkably early and comparatively unformed stage. And so, in the age-old combination of pouch and teats, Mother Nature evolved her unique cradle for the shelter and feeding of marsupial young.

BIRTH—AND TRANSFERENCE TO THE POUCH.

In spite of quaint Red Indian legends, it was discovered soon after settlement of America that the young of true opossums were born in the natural way of all mammals. Although the pouched mammals have achieved their utmost variety in Australian isolation, it is notable that the much smaller comparative size of newly-born kangaroos has concentrated discussion almost entirely upon the kangaroo family. Such disparity of size will doubtless mislead ardent advocates of the pouch-birth theory for all time.

Long after scientific knowledge of the anatomical facts of marsupial birth, there was prolonged disagreement concerning the actual method of transference of young to the pouch. It was generally supposed that the mother, by means of lips or paws, was entirely responsible, although as early as 1806 it was recorded that newly-born American opossums actually travelled unaided to the pouch, and attached themselves to the teats. This first account appeared in a pamphlet by Professor B. S. Barton, of Philadelphia, and included the following observation:

> The young opossums, unformed and perfectly sightless as they are at this period, find their ways to the teats by the power of an invariable, a determinate instinct, which may, surely, be considered as one of the most wonderful that is furnished to us by the science of natural history. It is not true, as has often been asserted, that the mother, with her paws, puts the young ones into the pouch.

This statement of fact was actually doubted by the great Professor Richard Owen, who, as late as 1867, favoured the idea that transference was effected by the lips of the mother rather than her paws as was generally supposed. The original opossum observation by Professor Barton was confirmed, however, more than a century later by Dr. Carl Hartman of the University of Texas, from whose detailed account, in the *Anatomical Record* for 1920, the following is abridged:

> The animal was placed just outside a window in a cage illuminated with a red electric light . . . insulated against noises from within the room. . . . Unerringly the embryo travelled by its own efforts; without any assistance on the mother's part . . . this ten-day old embryo, in appearance more like a worm than a mammal, is able . . . to crawl a full three inches over a difficult terrain. Indeed, it can do more: after it has arrived at the pouch it is able to find the nipple. . . . One detached young . . . crawled readily back into the pouch . . . and one wanderer, which lost out in the first scramble, found a vacated teat and attached itself even after twenty minutes' delay, show-

ing that the instinct to find the teat persists for some time. If the skin be tilted, the embryos can be made to travel upward and even away from the pouch. For locomotion the embryo employs a kind of 'overhand stroke', as if swimming. . . . With each turn of the head the snout is touched to the mother's skin as if to test it out, and if the teat is touched, the embryo stops and at once takes hold.

The mother was in a sitting position when the young were born, and subsequent examination of her pouch showed eighteen squirming embryos, of which twelve were attached and the remainder, of course, doomed to early starvation. Some of these unfortunates held on with their mouths to the tip of a minute tail or a flap of skin, while several continued to move about. Although the number of teats varies most in American opossums, it is notable that our Australian "native cats", which most nearly resemble them, have only six teats, but are known to give birth to as many as twenty-four young at the one time. Kangaroos and brush possums usually have one young, but ringtail possums give birth to as many as six for which only two teats are available, the dried remains of the others often being seen in the pouch. In such examples of the "survival of the fleetest" amongst an overplus of young, there is conclusive proof that they are not born upon the teats.

KANGAROO BIRTH—FIRST AUSTRALIAN OBSERVATION.

The first account of the birth and unaided transference of embryonic kangaroos was provided by Alexander Collie, Surgeon on H.M. Sloop *Sulphur*, in a letter to the Secretary of the Zoological Society of London, of which he was one of the earliest Corresponding Members. The letter of 26th January, 1830, published in the *Zoological Journal* of that year, refers to the Dama or Tammar Wallaby of Western Australia (*Thylogale eugenii*) taken from Garden Island, off the port now known as Fremantle, when Collie's ship was anchored in Cockburn Sound. Strangely enough, a coastal race of this wallaby was the first member of the kangaroo family, and possibly the first marsupial to be described by early navigators. In his observations, when wrecked on Houtman's Abrolhos off Geraldton in 1629, the enterprising Dutchman Pelsart, after comparing the contradictory creature with a hare, squirrel, civet-cat, and monkey, referred to the young attached to nipples within the pouch "which were only the size of a bean, though at the same time perfectly proportioned". It is interesting to note that this earliest observer, misled by the relatively minute proportions of the pouch-young, expressed the view that "it seems certain that they grow there out of the nipples of the mammae, from which they draw their food".

The trained anatomist, Surgeon Alexander Collie, however, was not sidetracked by such superficial observation, which has misled country observers to the present day. After expressing his delight at the capture of kangaroos with young at the teats within "the sac", Collie refers to having dissected "embryos" from the parent which were "at, or very near to, the termination of the period of gestation". One of these, he said, was "about the size of the smallest young already mentioned as being in the abdominal sac". His account also includes the following observation of the actual birth of a young wallaby:

An officer of H.M.S. *Success* at present here, observed a Kangaroo in the act of parturition. When the fœtus was expelled . . . the mother was lying partly on one side and partly on her back, resting against the side of the cage where she was confined . . . and the very diminutive young, when brought forth, crept among the fur of the mother towards her belly and towards the opening of the abdominal pouch; whilst she, with her head turned towards her tender offspring, seemed to watch its progress, which was about as expeditious as that of a snail. After it had made some advance, my informant, unconscious of the remarkable œconomy of generation in this class of Quadrupeds, removed the newly born animal before it had reached its destination, which must have been the mouth of the sac.

With reference to the supposed inactivity of very immature kangaroos, Collie gave several instances of the voluntary re-attachment of one, about one and a quarter inches in length, and described the general muscularity of its efforts in suckling. He actually succeeded, by gentle

pressure, in removing the young one, the teat stretching for more than an inch and having a small expansion at the tip, for retention by the closed-in lips of the infant. An hour after being left in the pouch it was unattached, but two hours later it had taken hold of the teat and was again actively suckling. These remarkable observations, published only 24 years after similar ones concerning the American opossum, and more than 50 years before other recorded observations of unaided transference of the embryonic kangaroo, must prove of great interest to any nature-loving Australian.

LATER OBSERVATIONS OF KANGAROO BIRTH.

Subsequent to Collie's observations of 1830, now brought to popular notice for the first time, the earliest quoted reference to the unaided journey of an immature kangaroo towards the pouch was that of the Hon. L. Hope, in the *Transactions of the Philosophical Society of Queensland* for 1882. As a result of his observations, Hope considered that transference to the pouch was effected by the embryo itself, and that any slight assistance from the mother would be almost unconsciously given. Having recently heard of similar observations by a kangaroo hunter, Hope expressed pleasure at confirming the hunter's story by his own experience "that the embryo was working its way through the fur straight towards the orifice of the pouch . . . actively with its fore legs—arms, in fact—which were considerably developed, with the claws apparent", the hindquarters and tail being relatively undeveloped—in reversal of the adult state.

The next observations of unaided transference were by Mr. A. Goerling, of Marloo Station, in the Murchison district of Western Australia, concerning the birth of a Red Kangaroo, published in the *Western Mail* of January 3, 1913. Noting the unusual behaviour of a female, which was sitting with her tail brought forward in the resting position common to kangaroos, Mr. Goerling was astonished, when she lifted her head, to see the embryonic kangaroo clinging to the long fur, about four inches below the opening of the pouch. Using its arms and continually moving the head to either side, it went upward through the fur. Nearly thirty minutes were required for the little wanderer to reach the top of the pouch, the mother taking no notice and leaving it entirely to its own exertions.

In the *Sydney Morning Herald* of May 20, 1926, an article by the late Professor Launcelot Harrison was published concerning the following letter which was placed in his hands by the Chairman of the Taronga Park Trust for publication.

April 22, 1926.

I hereby state that on the above date, about 10.30 a.m., having noticed the action of a wallaby (female of the species *Macropus thetidis*) to be peculiar, I watched carefully and noticed her to be sitting with the tail brought forward under the legs. The animal was vigorously licking the fur between the base of the tail and the pouch. I was then able to see the foetus clinging to the fur near the tail. At this juncture, I summoned to witness, L. McHugh, E. Harrison, and F. Stone. The foetus moved slowly up through the fur with an automatic kind of movement with the fore limbs, but was unable to find the pouch and moved on high and got lost near the chest. The female continued to lick the foetus, but made no attempt to render other aid, or remove it to the pouch. The female then became restless, and in hopping away, dislodged the foetus, which was recovered.

(Signed) J. S. Munro (keeper's assist.).

We the undermentioned did witness the movements as mentioned above, and swear that these statements are correct.

(Signed) L. McHugh (keeper),
E. Harrison (keeper's assist.),
F. Stone.

A newly-born Great Grey Kangaroo attached to a teat in its mother's pouch. Its fore limbs are abnormally long and are provided with claws which are wanting on the weaker hind limbs.

Subsequently, in the *Australian Zoologist* for 1936, David Fleay, B.Sc., then Curator of the Australian Section of the Melbourne Zoo, described the wanderings of a half-inch wallaby embryo which finally attached itself to a teat, within the closed pouch.

Authentic American observations of kangaroo-birth at the zoos of New York and Boston, published in the Melbourne *Pastoral Review* of July 16, 1923, are in agreement that kangaroos are born onto the base of the mother's tail, the crouching of her body lessening the distance to and relaxing the opening of the pouch.

In the natural and undisturbed state, maternal instinct may occasionally prompt some nudging of a vagrant infant onto its course, but the main assistance is apparently concerned with a licking of the fur to provide a central line of least resistance. There can be no question, however, of the facts of actual birth and unaided attachment to the teat.

ERRONEOUS BELIEFS—AND EXPLANATIONS.

Although the supposed helplessness of newly born marsupials has proved an absolute myth, this belief is still encouraged by statements that they are incapable of suckling, while the flow of milk is said to be regulated by a muscular pumping of the mother's milk glands. However, since the newly hatched platypus suckles at will, in the absence of any teats, surely there can be no reason for assuming some kind of forcible feeding for young marsupials. Actually, the newly born marsupial has its breathing apparatus modified to form a separate passage, so that milk may trickle freely to the gullet without flooding the lungs.

Two examples have appeared in this MAGAZINE[2] of the voluntary absorption of milk by tiny glider-possums, following their removal from the teats of dead parents. One youngster, which could be coiled up easily on a shilling, was fed through a fine straw placed in its tiny rounded mouth, and was quite bloated after two drops of sugared milk. The other wriggling "pouch-embryo", carefully removed from the nipple of its ice-cold parent, absorbed watered milk into which its tubular mouth was pressed, after which the lips soon formed. Both grew up into most engaging pets, one of them living for about ten years in the care of its devoted rescuer.

Exponents of the pouch-birth theory generally begin by telling you of a tiny bud "no bigger than a grain of tapioca" appearing on the end of the teat. But this apparent "budding-off" is merely a natural swelling of the nipple (caused by the impending flow of milk) around which the suckling's mouth soon becomes constricted. The bush observer, noting the swollen nipple and killing *another* parent with a hairless embryo held firmly to a teat, jumps to the conclusion—in a manner he would heartily condemn in any scientific worker—that the infant is born there. Should the restricted mouth of the suckling, or tender nipple, bleed upon forcible removal the case is considered as proven for all time!

It should now be accepted, however, that it is actually an *anatomical impossibility* for young marsupials to be conceived or formed through medium of the teats, which, as in all furred animals, are solely concerned with the milk supply. Strangely enough, many people, who readily accept facts of scientific research upon dead animals, show an odd reluctance to credit records of the habits of living creatures, no matter how highly qualified the observer, or journal publishing the record. But why contend that tiny marsupials could not possibly reach the pouch, or marvel at the instinct which urges them on, when the egg-born of far lowlier creatures are passing through complicated life-cycles to maturity? To those who remain unconvinced of the facts of marsupial birth, one might point out that they are not challenging the writer's individual opinion, but fundamental truths of natural law.

[2] Troughton: "Marsupial Gliders or 'Flying Possums'", THE AUSTRALIAN MUSEUM MAGAZINE, Vol. v, No. 8, Oct.-Dec., 1934, p. 257.

A Fall of Meteorites at Forest Vale, New South Wales

By T. HODGE-SMITH

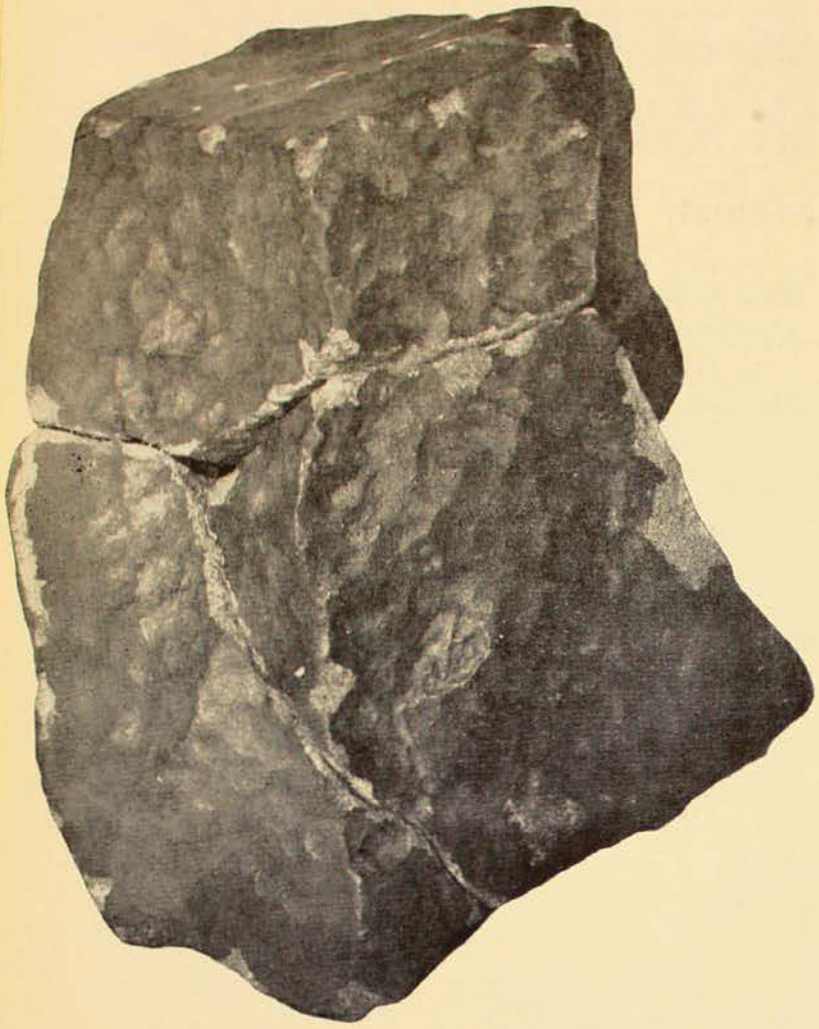
IN these days when anything drops from the skies one may be pardoned for imagining that enemy planes are in action, particularly when there have been so many proofs of the fallacy of that "it can't happen here".

We can well understand how the thoughts of Mr. H. D. Stokes, a veteran of the first World War, turned for a moment to enemy planes when on a peaceful afternoon he suddenly heard a noise resembling thunder followed by a sound like that of an aeroplane. Almost immediately after came the whizz, thump, and a little cloud of dust rose just nine and a half chains to his left, followed in quick succession by another about the same distance behind him, a third to his right, a fourth midway between the second and third and a little further away, a fifth back near where the second fell. Then peace reigned once more.

All this happened at about 3 p.m. on the seventh of August last at Forest Vale about twelve miles north-east of Tullibigeal, New South Wales. The day was fine with but a few scattered clouds, and Mr. Stokes, accompanied by his six and a half year old twin sons, was re-swinging a gate on his boundary fence.

It was very fortunate that Mr. Stokes did not panic, though he vows that he got a terrible fright. The fact is that he listened intently, noted the direction of each separate whizz, and fixed in his mind the position of each little cloud of dust. When all was quiet he continued with his work of re-swinging the gate. Only when his work was complete did he proceed to the position of the first cloud of dust to investigate what he now felt sure was a meteorite. To his surprise the meteorite was just visible, and the hole that it made was barely a foot deep. It proved to be only a fragment, weighing some twenty-two pounds, of a meteorite, and it fell in a cultivated paddock consisting of red deep sandy soil. That afternoon he recovered the five fragments that he had heard fall, but not before he was joined by two neighbours. They discovered that the five pieces fitted together to form an almost complete meteorite; only a very small portion was missing. Obviously it had exploded in the air, causing the noise of thunder. No one in the district saw any unusual light in the sky.

Mr. H. D. Stokes and his sons at the gate, near which the Forest Vale meteorite fragments fell. The group is looking towards the first fall, whilst X indicates where the second and last fragments fell.
Photo.—T. Hodge-Smith.



Three fragments of the Forest Vale meteoritic stone. These fitted together, but two fragments of the complete stone are missing.

The next day Mr. F. W. Bahr observed, on the road, about 12 chains north of Mr. Stokes' gate, a small hole, only about seven inches deep, with a black object lying beside it. Sure enough the object was a complete meteorite weighing about four and a quarter pounds. The roads in this district are just soft red earth roads.

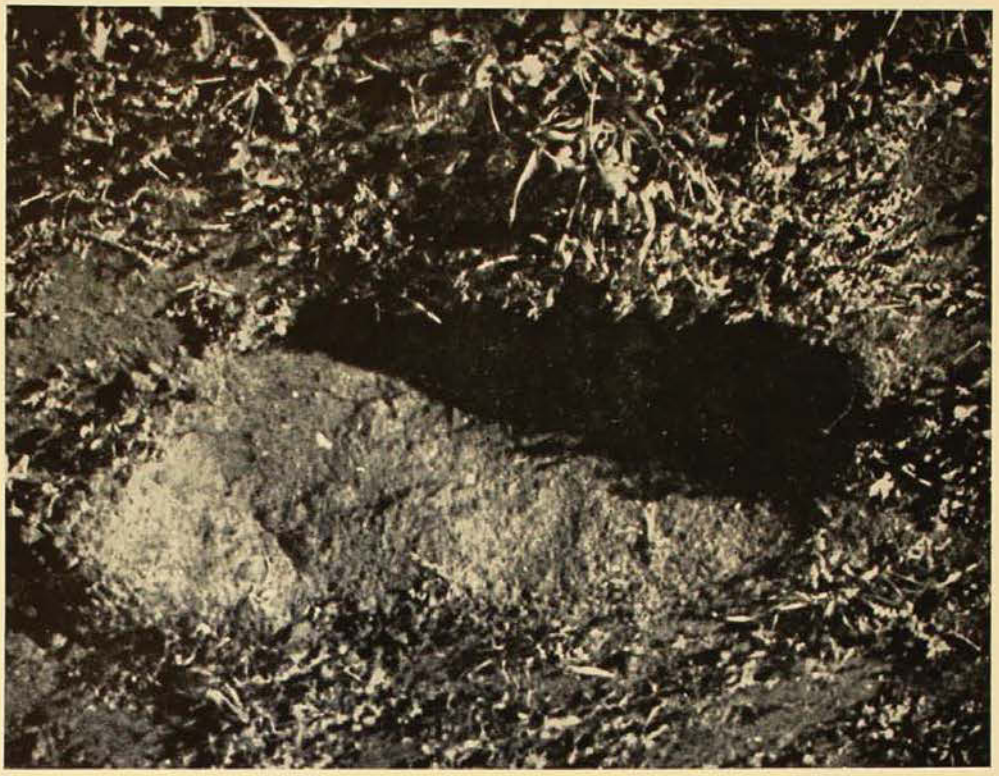
Strangely, although this complete stone fell within the radius of the fragments of the larger stone, Mr. Stokes did not hear or see it. It is just possible that it fell at exactly the same time as one of the five pieces of the larger stone.

Mrs. A. Coles of Windmere very wisely sent a small portion of one of the stones to the Mining and Geological Museum, Sydney, seeking confirmation of its meteoric origin. Mr. H. F. Whitworth, curator of that museum, immediately informed this museum of the discovery, and so I was sent to investigate.

Through the generosity of Messrs. Stokes, Passmore, Hordern, Harley, and Bahr the Trustees acquired three of the five fragments of the larger stone and the almost complete smaller stone. The total weight of all these is forty-nine pounds.

Meteorites enter our atmosphere at the tremendous speed of from ten to forty-five miles a second. They begin to glow at a distance of about sixty miles above the surface of the earth. They glow because their great speed causes enough friction even in this rarefied atmosphere to produce sufficient heat to melt the surface of the meteorite. If the meteorite is travelling in the same direction as the earth its speed relative to an observer on the earth will be reduced by eighteen miles per second. If it is travelling toward the lower and denser parts of the atmosphere its speed will again be enormously reduced by friction, so much so that the heat produced is no longer able to fuse its surface. Lastly there is the force of gravity which may be sufficient to overcome the force of the reduced speed and bring the meteorite to earth. Incidentally the question "What is the difference between a meteor and a meteorite?" is often asked. As soon as a meteor hits the ground it becomes a meteorite—that is the only difference.

It is possible that all these things happened to the Forest Vale meteorite. It may have entered our atmosphere a hundred miles or even more from Forest Vale when almost certainly there was a display of light in the sky, even though it happened in the daylight. As it travelled towards Forest Vale it speed would be enormously reduced so that no more fusion of the surface took place, and it is probable that if the larger stone had not broken in the air no one but Mr. Stokes and his twin sons would have known anything about the fall. The only definite evidence of the direction of flight comes from Mr. A. L. Jones, headmaster of the Condobolin Intermediate High School, who reports that about six successive puffs of smoke appeared to the south-west of Condobolin in an east to west direction. We are still endeavouring to collect evidence and the newspaper



The hole, approximately eighteen inches in diameter, made by the impact of the largest fragment of the meteorite, which weighed more than twenty-two pounds.
Photo.—
T. Hodge-Smith.

West Wyalong Advocate is very generously assisting in this effort.

Meteorites may be broadly classified as nickel-iron, stony-iron, stone, and glass. The Forest Vale meteorite belongs to the stone division. It consists mainly of two minerals, olivine and enstatite, both of which are silicates of iron and magnesium. In addition there is a little nickel-iron scattered throughout the mass as very small grains.

The first discovery of a meteorite in Australia was made in 1845 at Barratta Station, some thirty miles north-east of Deniliquin, New South Wales. This belongs to the stone division, but it was not seen to fall. Up to the present eight separate masses have been recovered; these have a total weight of about two hundredweight. It is thought that these belong to the one meteorite which broke up in the air in the same way as did the Forest Vale meteorite.

It was not until 1879 that the first fall of meteorites to be recorded in Australia was observed at Tenham Station, Kyabra Creek, thirty miles south-east of Windorah, western Queensland. This was perhaps the most spectacular shower of meteorites ever to be recorded. Over two hundred and thirty separate stones have been preserved, the largest weighing one hundred and thirty-five pounds and the smallest three-quarters of an ounce. One hundred and twenty of these stones are now preserved in the Queensland Museum, Brisbane.

The next meteorite seen to fall was at Emmaville in 1900 when a stone weighing four and a half ounces struck a house. The occupants heard the noise, noted a mark on the wall where the stone hit it, and picked up the meteorite.

Two years later at 9.30 a.m. on 17th July, 1902, a stone was observed to fall at Mount Browne, in the north-west of New South Wales. At first an explosion was heard and a hut caught fire. Then followed a whizzing sound and the stone struck the ground some distance from the hut, raising a cloud of dust. It weighed twenty-six pounds. It was picked up a few minutes after its fall while it was still warm.

About four miles from Binda, New South Wales, on the night of 25th May, 1912, a stone weighing twelve pounds fell. It was not found until ten days later when it was dug out of what looked like a freshly made rabbit burrow.

At 7.15 p.m. on 8th April, 1928, a stone fell in the backyard of a home at Narellan, New South Wales. A man called by some children to see the fireworks in the sky estimates that fully ten minutes elapsed between the time of the fireworks and when he heard a noise like that of an aeroplane. This was followed by a heavy thud and a slight tremble when the stone weighing twelve and three-quarter ounces buried itself six inches into rocky ground.

About 6.30 p.m. in the month of October, 1930, at Moorleah, which lies six miles west of Wynyard on the north-west coast of Tasmania, a "streak of fire", travelling from east to west, was observed. This ended in a loud explosion which was followed by ten or twelve smaller ones resembling the back-firing of a motor car. After each of the minor explosions a whine like that of a spent bullet was heard. Only one piece, which was complete, was found the next day buried about three feet in a grass paddock.

In the same year, on 25th November at 10.53 p.m., at Karoonda, South Australia, an immense ball of bluish-white colour, equal in diameter to the full moon, sped across the sky at a steep angle in an east-south-east direction. The nearest observer to the actual point of contact was two and a quarter miles away. The meteorite, again a stone, was found badly broken on a sandy surface. It made a crater-like hole in the sand about eighteen inches in diameter and about the same depth. It is estimated to have weighed ninety-two pounds when whole.

Thus the Forest Vale meteorite is the eighth fall to be recorded as having been witnessed in Australia, though it is the ninetieth known Australian meteorite. These consist of fifty-two nickel-irons, nine stony-irons, and twenty-nine stones.

It is certain that there are other meteorites which have fallen in Australia, some of which must have been seen by people, but it is seldom that anyone takes the trouble to write to museum authorities giving all information. It is even more rare for anyone to send a specimen as did Mrs. Coles in this particular case. Usually when either a meteorite is seen to fall or is found we are told of several meteorites that fell twenty or thirty years ago. When further inquiries are made we are invariably told that either no one bothered about it or the specimen was lost. A notable and tragic example of this is a definite record of meteoric stones falling in the streets of Rockhampton, Queensland, in the spring of 1895, between 4 and 5 p.m. One piece was kept on the mantelpiece in the office of a local public official. His successor threw it out as rubbish. Thus the only evidence of this fall has been lost. It may be that this particular meteorite may have furnished some new data concerning these interesting objects.

With regret we have to record the deaths of two elective trustees of the Australian Museum, Mr. Fredrick W. Marks, C.B.E., F.C.A. (Aust.), and Dr. G. H. Abbott, B.A., F.R.C.S.

Dr. Abbott had been a member of the Board of Trustees of this Museum since 1917. He was actively interested in the working of the Museum, and until comparatively recently had regularly attended the various board and committee meetings. He had been a member of the University of Sydney Senate, also chairman of the Women's College. He was a recognized authority on numismatics, and was a member of the Royal Numismatic Society. He had, also, been president of the Royal Australian Historical Society. He was closely identified with many philanthropic institutions.

Mr. Fredrick W. Marks was elected a trustee in 1931. Closely identified with the commercial life of Sydney, his experience and counsel were of great value. He was a director of various companies, chairman of the Prince Henry Hospital, Sydney, and had served on many commissions and public enquiries.

Marine Parade
Forster, New South Wales

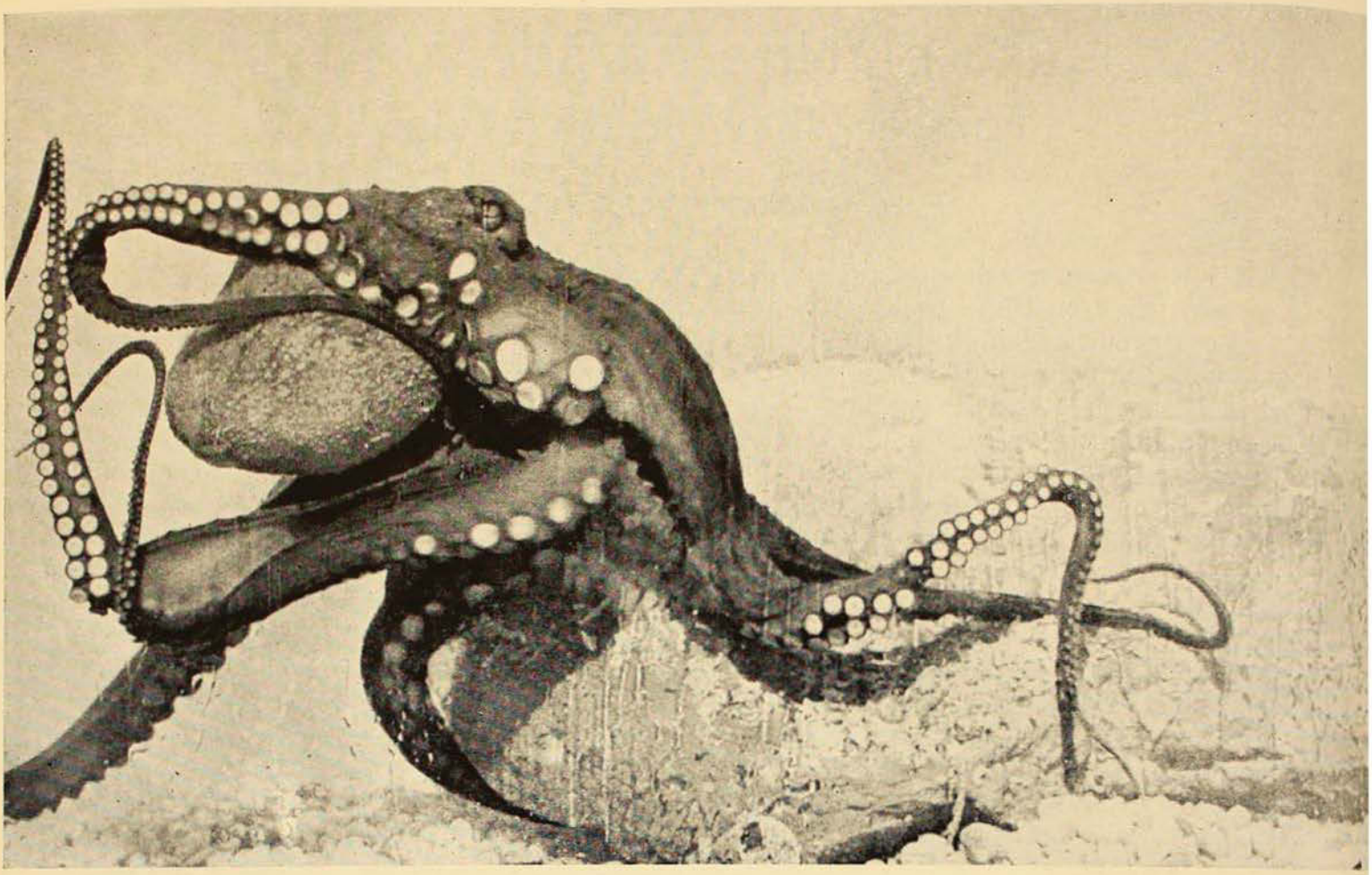
By ELIZABETH POPE, M.Sc.

THE tide was not low enough to go hunting on the rocks for the creatures which hide there and boats were banned, just when we felt most inclined for a seaside ramble. What was to be done about it? We strolled down to the little jetty and lamented our bad luck in chorus, and tried to think of something else to do. The midday sun was pleasantly warm, so we soon forgot our grouch about the state of the tide as we lay stretched out on the warm planks. We lay very still, looking down into the water which was deep for this particular coastal lake—at least five or six feet.

Soon two Flute Mouths swam slowly into view. The current was swift and they contented themselves with keeping in the one place, their fins slowly waving. Their colour so matched the surrounding water in its pale aquamarine tint, that it would have been hard to see them, but for their waving fins. They stayed in one place, swimming constantly for ten minutes or so. This was not good enough for us. We wanted more action. A hand groped for a pipi shell discarded by a fisherman. Plunk, a good shot! It landed practically on top of them and what a reaction we got. It far surpassed our expectations. Each fish began to swim violently forwards, then, after about ten inches had been covered, thought the better of it and settled down to the old routine, but here was our great surprise. When startled, they forgot to maintain their very effective camouflage and underwent a most startling colour change to bright blue—to frighten us, we guessed. Almost immediately after the discharge of this "broadside of bright colour" they reverted to their former aquamarine tint and faded into their surroundings. Delighted with the success of our experiment, we threw more shells at them and each time the Flute Mouths obliged with an encore, but as time went on, the colour change became weaker and they responded less and less, till they became quite oblivious to the missiles we hurled. They were no longer startled and merely moved aside, out of the way of the sinking shells. From their reactions we concluded that the colour change must be a reflex nervous response by the fish when startled, and, either the mechanism which produced the colour change had become fatigued by repeated performances, or else the colour change only took place when the fish was truly frightened.

Next we noticed one of the many-armed, prickly starfishes (*Coscinasterias calamaria*), travelling in haste towards some food, crossing the sea floor by means of hundreds of tiny stilt-like tube-feet. We decided to time it over a measured foot. After about fifteen minutes our patience gave out and we reduced the distance of trial to six inches. By this time, it was all of half-way and we turned to find something else with more action about it to watch.

The longer we stayed and the quieter we were, the more the local marine fauna gathered round to entertain us. Some rod-fishermen had been filleting Blackfish (*Girella tricuspidata*) and had thrown the offal and backbones into the water. We watched the various fish as they vied with one another to tear off dainty morsels. Shiest of all were the large Black Bream (*Roughleyia australis*) which turned on their sides, flashing like mirrors, as they tore the flesh off the backbones. One movement on our part was sufficient to scatter them in fright; not so with the Blackfish. They just went calmly on with their meal of flesh, thus proving themselves to be not only



An octopus (Polypus cyaneus) next appeared on the scene, emerging slowly from his home among the stones, to see what was doing. There is something sinister about octopuses.

carnivorous, but also cannibals, when we had believed them to be exclusively "grass eaters". Hovering round the outskirts of this free meal were numerous small fish, Striped Trumpeters, Sweeps, Stripies and Silver Bellies, but they were careful to keep out of the way of the larger fish. An occasional foray by some large Tailor would scatter the small fry in terror—many leaping from the water in their efforts to escape the cruel jaws and needle-sharp teeth.

An octopus (*Polypus cyaneus*) next appeared on the scene, emerging slowly from his home among the stones, to see what was doing. There is something sinister about octopuses and we felt quite justified in teasing it with a long piece of wire. It showed plenty of fight, wrapping itself around the enemy, but making no impression on it since it could not come to grips. Mr. Octopus soon swam away in disgust, looking particularly streamlined as his tentacles trailed behind.

Altogether we counted thirty-three different creatures into whose lives we pried as we lay there watching. There were six or seven kinds of starfishes and sea urchins, numerous small fish and hermit crabs. Squids and Parrot fish went by in the passing parade and hundreds of Mullet continued to make patterns on the surface of the water as they rose in shoals and lazily marked time there, causing rings and ripples, making the sea look like watered silk.

Then the most delightful creature of all appeared on the scene. Lacking the proper name for it, we christened it the Hula-hula fish because its body actions suggested the hip movements of the Hawaiian dancers.* Its eel-like body was comparatively long and graceful, for all

* We subsequently found out that our fish was probably *Trachinops taeniatus*.

the world like one of our little common or garden skink lizards. The four-inch long body was dark brown above and light below and had two long, yellowy stripes, running from head to tail on the brown part of the body. It swam with easy action through the water, occasionally stopping to carry out a sort of loop-the-loop movement. While our eyes strayed from it for a moment, to watch some other creature, it disappeared from view in a part of the sea-bottom where there was very little cover. Suddenly it appeared again and we knew it must have some hideout nearby. We determined to find its home, but the obstinate fish had decided not to return for some time, at least. At last, wearied by continual wanderings, it swam towards the bottom and "marked time" in the vicinity of a hollow bone, the ends of which had been sawn off by the butcher, leaving a hollow drain-pipe-like section about six inches long. The fish approached the bone and inspected the interior narrowly. All seemed to be well inside, but the fish swam away a few inches, only to return and peer in as before. This time apparently the risk could be taken and the fish turned round and inserted its tail into the bone. There followed some exceedingly comical actions and body-wiggles as the fish swam backwards into its home. It was on this account that we gave it the name Hula-hula fish.

Soon the fish stuck its head and part of its body out of the front door of its house, like a rat peeping out of its hole, and, as it watched the surrounding neighbourhood, it swayed slowly from side to side. A food fragment was quickly noticed and the fish darted out to seize it, returning home again and going through the ritual double inspection before entering it once again. We tried to confuse the fish by altering the appearance of the surroundings of its home by introducing small boulders or moving its house. This was no trouble to the quaint householder. Never for a minute did the fish falter, but always found its front door with the greatest ease.

Soon we noticed several other Hula-hula fish, all with different types of homes—one lived in a hollow stick and another in a section of hollow piping. Though we observed carefully and went back on subsequent days, we didn't see a fish enter a home that was not its own. Perhaps this was why the careful, preliminary inspections were carried out.

By this, some time had elapsed since we had first lain down on the jetty and our hip bones and elbow joints were issuing distress signals. We had to move to ease our cramped limbs. Our movements immediately dispersed the players from our little stage under the water and we abandoned our watch for the time being. But, what of our trip to the rocks? Surely, by this, the tide should be right for our purpose. We looked at the time to find to our amazement that we had spent two hours watching the inhabitants of the lake, with never a dull moment. We had had all the fun of our seaside ramble and none of the work and trouble.

Shark Tagging Operations

Since 1942 sharks and other fishes have been tagged off south-eastern Australia by the Fisheries Division of the Commonwealth Council for Scientific and Industrial Research.

The tag, or label, is a tongue-shaped strip of white celluloid, about 2 by 1 inches, and bears a number, in black, on one side, and "Reward for return to Fisheries Lab., Cronulla, N.S.W.", on the other. Such tags have been inserted harmlessly in the bodies of sharks so that they are to be found amongst the viscera when the fish are being cleaned. Their white colour and black lettering enable them to be seen amongst the intestines and other organs.

These tagging operations are designed to yield information on the movements of the sharks and their growth and age.

A reward of 2s. is offered by the C.S.I.R. for the return of each tag accompanied by information on: Kind of shark or fish, date and place of its capture, its length, and any other features such as weight or condition, sex, stomach contents, embryos ("pups"), etc. In addition, some teeth should be sent for which postal charges, etc., will be refunded.

The information secured in this work is extremely valuable and will be used to the benefit of fishermen and of the public. Fishermen are therefore urged to maintain a sharp watch for the tagged fish and to ensure the return of accurate information.

Primitive Man and His Larder

By MELBOURNE WARD, F.Z.S., F.R.Z.S.

NATIVE peoples have always had to find their own food. Flesh food, including birds, reptiles, pigs and indigenous mammals are sought in the jungle, sea food along the shores, and freshwater animals in the rivers and lakes.

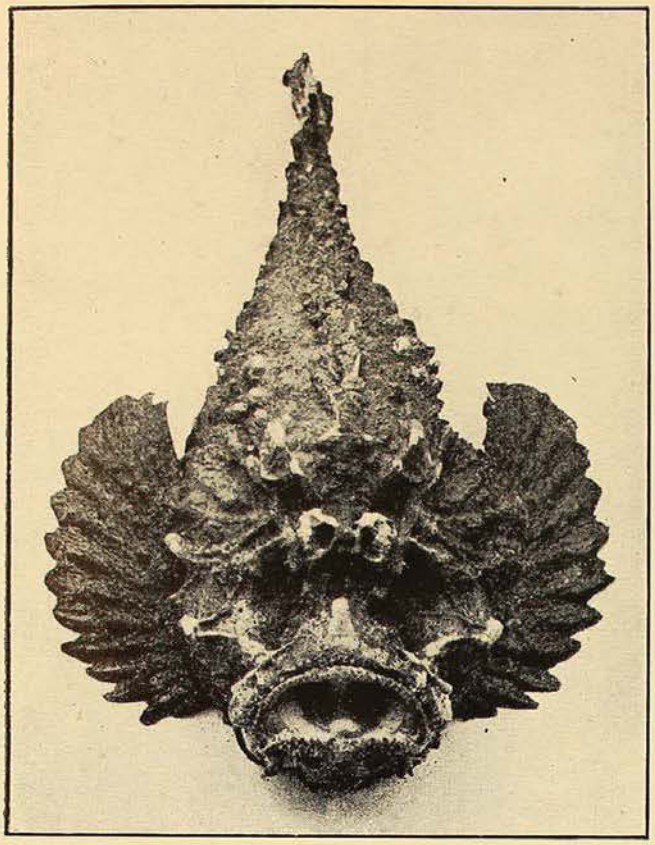
On the majority of the South Sea islands the natives have developed their own gardens, where they plant bananas, coconut palms, tapioca, breadfruit, yams, and other edible plants and fruits which they have brought in from the jungle. On some islands, such as Murray, Torres Strait, large tracts of the jungle become tabu and act as great reserves from which plants may be transplanted to the native garden; and in these reserves the fruits or roots cannot be eaten. Destruction of the protected plants is followed by dire punishment of the culprit. The Australian aboriginal, on the other hand, is not an agriculturalist, but a hunter and a forager.

Animal foods of the natives may be divided into a number of groups according to their habitat and their way of life.

MARINE FOODS.

The animals of the sea-shore may be classed as active and sedentary. In the active groups are the fish, dugong, turtles, and most crabs; these all require some aid in their capture, such as nets, spears, or lines. The sedentary forms are oysters, clams, barnacles, and sea urchins. Again, we must take note of the type of locality where the food may be found. In the South Sea islands one finds atolls, cays, and mountainous islands. All have considerable coral growths, but also there may be extensive mangrove areas, especially on the shores of large mountainous islands. In other localities there may be volcanic platforms washed by the rollers where coral growths are limited to small, stunted colonies taking shelter in any protected pools. Then again, there are great lagoons, sheltered by barrier reefs, and fringing reefs where one can walk almost dryshod from the beach at low tide out over the coral reef to the living edge. All the different types of locality have specialized fauna, the greater part of which is edible. The difficulty is

Murray Island, Torres Strait. Between the hills may be seen a tract of jungle, and from this reserve plants are removed to the native gardens. In the left foreground there may be seen two of these cultivation patches.
Photo.—Melbourne Ward.



The deadly Stonefish which so simulates its surroundings that it is only with great difficulty that it can be recognized.
Photo.—W. Boardman.

knowing what to look for and what the creature will be like when found.

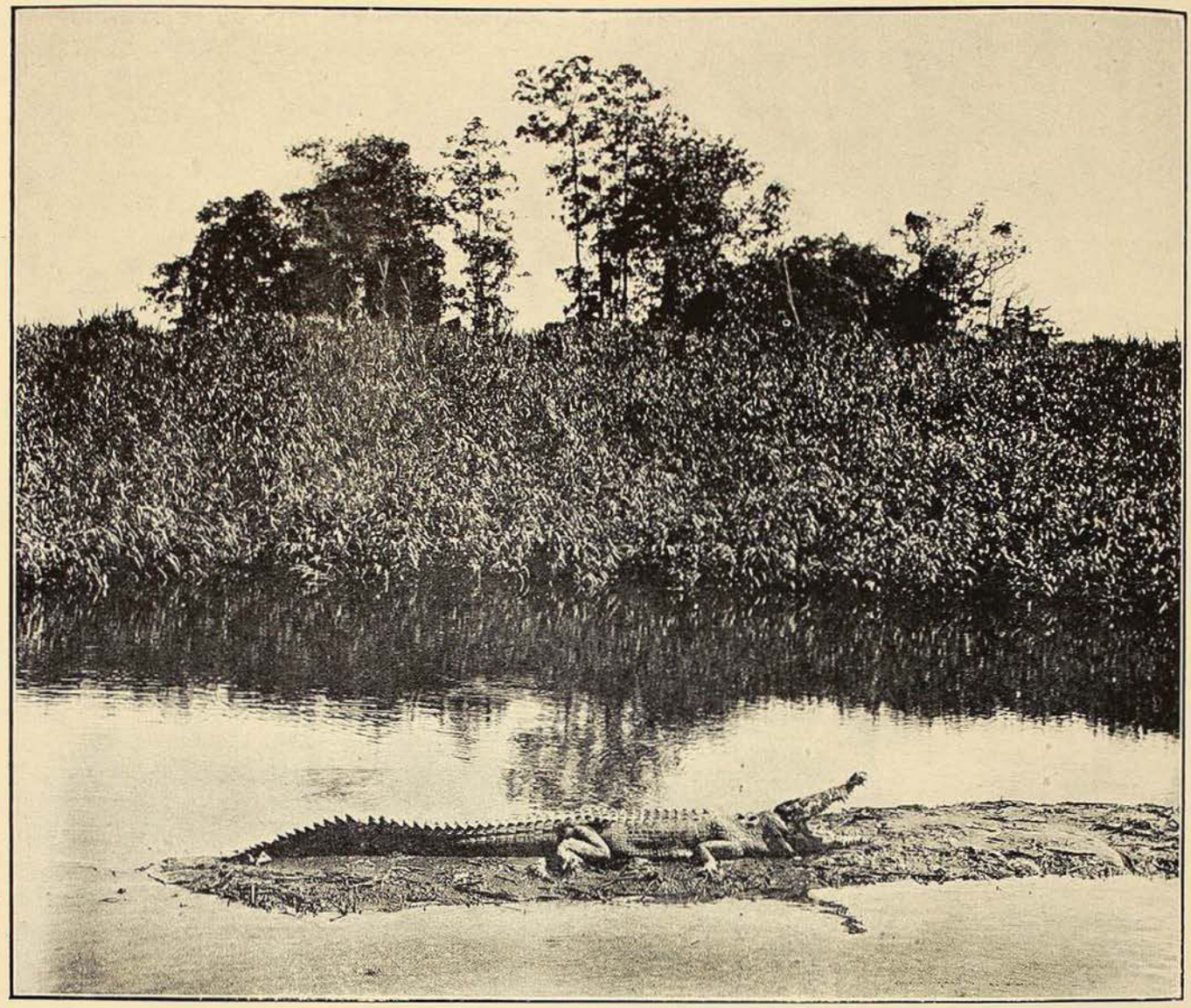
Let us take a typical mangrove swamp and have a look for the worth-while creatures upon which a substantial meal can be made. Naturally we must wait for low tide. If we are on the shoreward side we can usually find a narrow area of trees through which to work our way seaward. Sometimes there may be a narrow waterway like a creek, the bed of which will probably be firmer than the mud banks, and so we wade along it, but if the water is above the knees there is a possibility of crocodiles so a scramble over the mangrove roots or the soft mud of the banks should be preferable. The smaller sizes of crocodiles, up to four or five feet in length, can be eaten, but they should be well cooked.

Having traversed the mangroves and come out on the seaward side, we may find ourselves in a shallow lagoon with mud bottom covered in zostera or eel-grass, or the mangroves may be on the edge of a dead coral reef, in which case there will be a very rough bottom of friable coral rocks. Care should be taken in walking lest one step upon the Stone Fish (*Synanceja horrida*). This hideous fish closely resembles an eroded piece of coral rock and is generally quite indistinguishable. In spite of the deadly nature of its dorsal spines, the flesh is edible, but care must be taken in cleaning it for food.

Oysters attach themselves to the roots of mangroves, especially at the mouths of streams and rivers, and where dead coral reefs abut on the mangroves, the large cockscomb oyster is found attached to the dead corals. This oyster is readily recognized by its great size and the curious formation of the lips which interlock like the teeth of a rabbit-trap or giant clam. In the mud around the roots of the mangroves is a large bivalve mollusc which has a shining coat of brown skin. These molluscs can be made into a good stew, or if thrown whole on to a fire they roast very well.

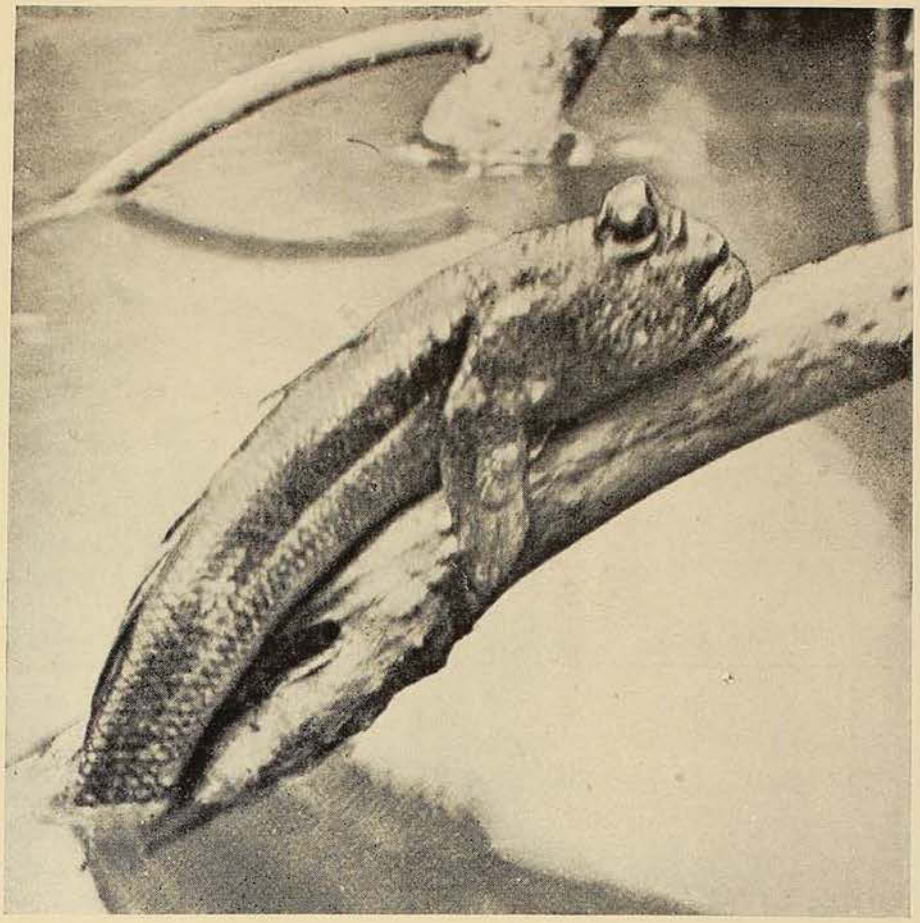
There are two large edible crabs in the mangroves and adjacent mud flats. The larger, *Scylla serrata,* is a swimming form which has been taken far from land at the surface of the sea, but its usual habitat is the mangrove creeks where it excavates deep burrows in the mud. During the daytime the crab has to be dug out or enticed out with a hooked wire or long piece of rattan steamed into a long hook. But at night the crabs come out and forage along the edge of the tide and can be speared or scooped out of the water with a stick. They are formidable creatures and can inflict savage wounds with their nippers. They are readily recognized by the smooth condition of limbs and body, by the large nippers and by the dull coloration, generally dark green to brown.

The second species is the blue crab, *Portunus pelagicus,* the common edible crab of the Sydney markets. It is widely distributed in the South Seas and can generally be found on zostera-covered mud banks in a foot or two of water. There are other smaller types of crabs in the mangroves and all these may be eaten. I have seen people eat them raw, but no doubt the average white man prefers to boil them or roast them on the fire.



Estuarine or Salt-water Crocodile (Crocodilus porosus) basking on a mud-bank.
Photo.—Frank Hurley.

A most interesting experience is to be at the seaward edge of a mangrove flat, watch the rising tide, and see the way the fish put in an appearance. We will imagine ourselves in such a situation. The seaward side of the swamp is lined by an extensive mud flat extending unevenly for some hundreds of yards before the edge of the water is reached. During the low tide various molluscs and crabs come out and move about on the surface of the mud. These creatures all start to bury themselves or retire to prepared burrows just a few minutes before the rising tide comes creeping over the mud. The slowly advancing water fills all depressions in the surface and in the advancing edge come first of all toados. These are small, thick-set fish, with parrot-like beaks, and have a habit of inflating themselves into globular form. The toados are not used as food by humans because of the poisonous quality of their flesh. They attack any disabled crabs or other creatures which have not been able to hide. As the water deepens small rays and shovel-nosed sharks come in. These may be speared and used as food; in the ray the wings or flaps are cut off and eaten and good steaks may be cut from the tail of the shovel-nosed shark. When the water is about twelve inches deep schools of mullet and larger mangrove-frequenting fish put in an appearance and can be caught either by net or with spear. The commonest fish in tropical mangroves is the mud skipper, *Periophthalmus koelreuteri*. This is generally too small for



The Goggle-eyed Mangrove Fish or Mud Skipper (Periophthalmus koelreuteri), which resides in the mangrove areas of tropical Australia. As may be seen, the fish spends a considerable amount of time out of the water, hence it breathes with a specially adapted tail.
Photo.—A. R. McCulloch.

food, though in some localities it grows to a foot or more in length. The aborigines in Arnhem Land do not use them as food because they have a superstitious dread of them, calling them devil-devil. In logs lying in water courses through the mangroves one may expect to find the ship worm, Teredo. This is a long, worm-like mollusc which can be dug out of the log and eaten.

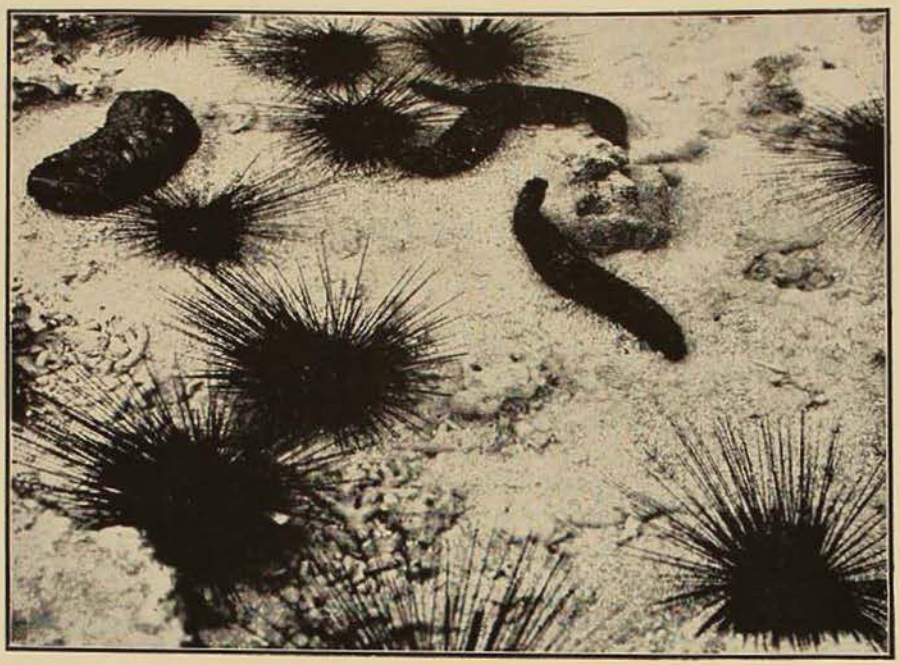
Finally, the fruit of the White Mangrove, *Avicennia officinalis*, can be eaten after being specially prepared. The aborigines dig a hole in which they light a good fire and in which they also place stones. When these become thoroughly heated they are spread over the bottom. On these they place the fruit, sprinkled with a little water. This is then covered with bark and sealed with earth to prevent the steam escaping. Whilst this baking is going on, for about two hours, they dig another hole in the sand. The softened fruit is then placed in this, and after water has been poured over it twice it is then ready for eating.

METHODS OF COOKING.

In districts where bamboo is readily obtainable the natives make cooking utensils from the cane, taking sections of the thickest plant and leaving one end closed so that a long narrow "pot" is formed. Naturally the best to select is the green bamboo. Having made the vessel, cut up the food and pack it in, fill with water and plug with ball of grass or other leaves. Place the bamboo at an angle across the fire and by the time that the cane is dried out and shows signs of cracking, the food it contains will be cooked.

Where bananas are common the leaves can be used to wrap flesh foods in before placing them on the fire. Put a couple of green logs on the fire, place the parcel of food on these and it will be cooked beautifully without getting covered with ashes. This is an excellent method for cooking fish.

In the South Seas a well-practised method is the oven of hot stones. A good fire is lit in which stones, about as large



Bêche-de-mer and Sea Urchins.
The common and well-known cotton fish (Holothuria impatiens) lying in a sandy lagoon off Hayman Island, Whitsunday Passage, Queensland. In the top left corner may be seen the edible variety commonly known as Curry-fish (Holothuria scabra). Surrounding them are Long-spined Sea Urchins (Centrechinus setosus).
Photo.—F. A. McNeill.

as a man's head, are placed and left until they become very hot.

A crater should be formed of these heated stones in which the food, wrapped in banana leaf, is stacked, and the spare stones heaped on top. Over this green leaves, simply boughs torn from nearby trees, are laid. These are covered with sheets of bark, blanket, or bagging, and, finally, the steaming mound is sealed with sand or earth. The oven, as it now is, should be left for a couple of hours. I have seen a mound containing pig and fowl left all day and when opened in the evening the food was all nicely cooked.

In districts where stones do not occur, balls of clay can be placed on the fire and heated. Clay can also be used in cooking birds and reptiles. Cover the bird, feathers included, so that it looks like a ball of clay, and place in the fire for an hour or so, after which the feathers will come away with the clay from the cooked bird. Lizards can be done in much the same manner. If cooking a python first make a mound of clay, a core, around which the snake can be wound, thus making a compact coil. Cover this with an inch of clay and build the fire around the mound, and leave for an hour and a half. When the baked clay is broken away the skin of the snake will be removed and the cooked flesh exposed.

The Mountain Minnow

SOMETIME ago I wrote an article on the Mountain Minnow (*Galaxias coxii* Macleay)* in which I assumed that this fish was only found at the lower levels in valley beds. In that article I made notes on its occurrence at Whipcord Creek, Katoomba, Blue Mountains, at an altitude of 3,000 feet. Further, I published notes based on observations made at my home at Katoomba.

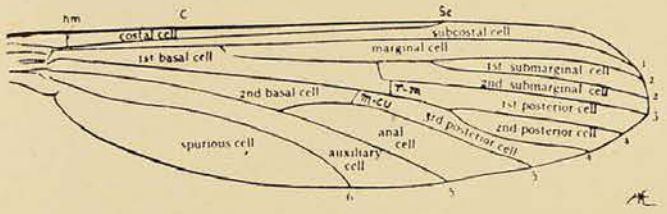
I now have amplifications to make. Last July I discovered the Mountain Minnow in the headquarters of the Valley of the Waters. This is on the central ridge of the mountains, at an altitude of approximately 1,400 feet. It is significant that at the lower level the fish was not hibernating, as it does at the higher levels and which I recorded in the article cited.—FRANK WALFORD.

* Walford.—The Mountain Minnow. THE AUSTRALIAN MUSEUM MAGAZINE, vol. iii, 1928, p. 274; vol. vii, no. 7, December, 1940-February, 1941, p. 234.

Mosquitoes

By FRANK H. TAYLOR, F.R.E.S., F.Z.S.
School of Public Health and Tropical Medicine, University of Sydney.

MOSQUITOES belong to the order Diptera or Flies since they possess but one pair of wings, the anterior or front pair. They belong to the family Culicidae which is divided into three subfamilies, all of which are found in the Australian region, Dixinae, Chaoborinae, and Culicinae, the last-named containing by far the greater number of species throughout the world.



Wing of mosquito. Mosquitoes may be distinguished from other flies by the position of the veins. Veins 2, 4 and 5 are branched; no other flies possess this characteristic. hm, humeral cross-vein; r-m, radio-median cross-vein; m-cu, medio-cubital cross-vein.
Modified from Patton and Evans.

There are some two hundred and twenty different kinds of mosquitoes in the Australian region.

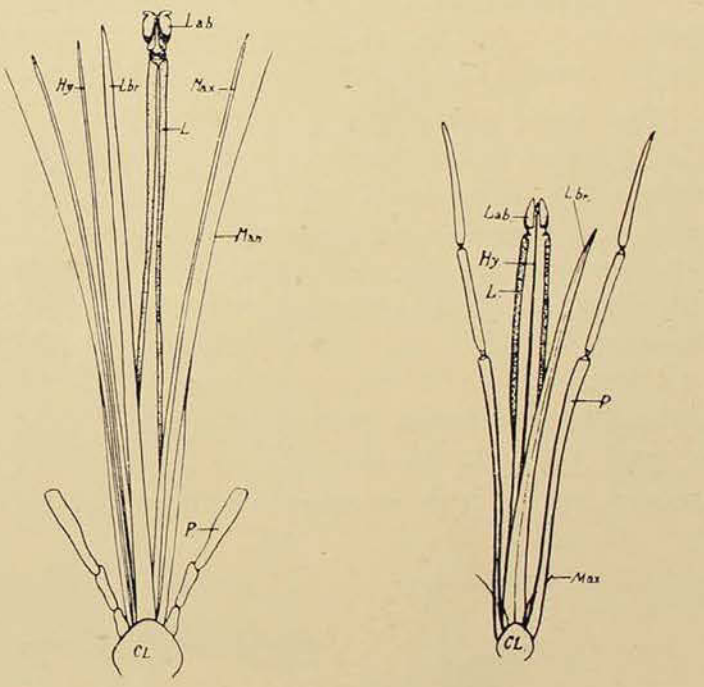
The subfamily Culicinae is subdivided into three tribes—Anophelini with two genera, *Anopheles* and *Bironella*, Megarhini with one genus, *Megarhinus*, and Culicini with many genera.

Megarhinus mosquitoes are the largest and among the most beautiful of all mosquitoes—dark blue and golden colours predominating.

Mosquitoes may be distinguished from all other flies, firstly, by the position of the veins of the wing, and secondly, that the entire insect is clothed with scales. They have a long proboscis only in the subfamily Culicinae.

The proboscis (labium) is a hollow sheath which acts as a covering for the mouth parts, and in the female these comprise two mandibles, two maxillae, a labrum-epipharynx and hypopharynx. The mandibles and maxillae, the jaws, are used for cutting the skin of the victim, while the mouth parts form the food channel up which the female sucks its blood meal—a habit restricted to females. A salivary secretion is injected into the blood as it enters the food channel to prevent clotting.

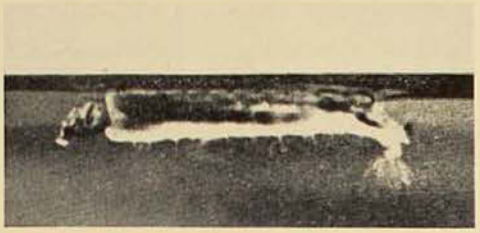
It is a well-established fact that the mosquito is the worst enemy of man. It spreads malaria, yellow and dengue fevers, and transmits the causative agent of filariasis, a minute worm which lives in the blood stream. Malaria and yellow fever have brought about more deaths and ill health than any other causes, wars included.



Mouth parts of mosquito. Right, male; left, female. Cl., clypeus; P., palpi; L., labium; Lab., labella; Lbr., labrum-epipharynx; Hy., hypopharynx; Man., mandible; Max., maxilla.
After Kirkpatrick.

Malaria is transmitted by species of the genus *Anopheles*, though not all *Anopheles* are capable of transmitting this disease.

Malaria fever is caused by a microscopic protozoan parasite which lives in the red blood corpuscles of man and on the wall (as cysts) of the stomach of the mosquito, and in the salivary glands as a sporozoite. The parasites belong to the genus *Plasmodium* and possess two distinct phases—one in the mosquito and one in man. Without infected mosquitoes or a carrier, man, there cannot be malaria.

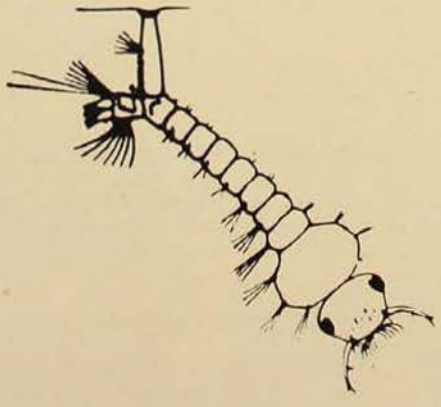


Anopheles larva feeding.
Photo.—Shell Co. of Australia, Ltd.

Yellow and dengue fevers are virus diseases and are transmitted by *Aëdes* (*Stegomyia*) *aegypti* among other mosquitoes. The parasites of these diseases are ultramicroscopic. There is a definite period of time in which man is infective to the mosquito and the mosquito to man.

The most efficient intermediate host of the filarial worm, which is the causative agent of filariasis, is *Culex fatigans*, which is found in many parts of the world and is abundant in Australia. A large number of mosquitoes transmit this disease in the tropics and subtropics. In Australia five mosquitoes are efficient intermediary hosts of this parasite.

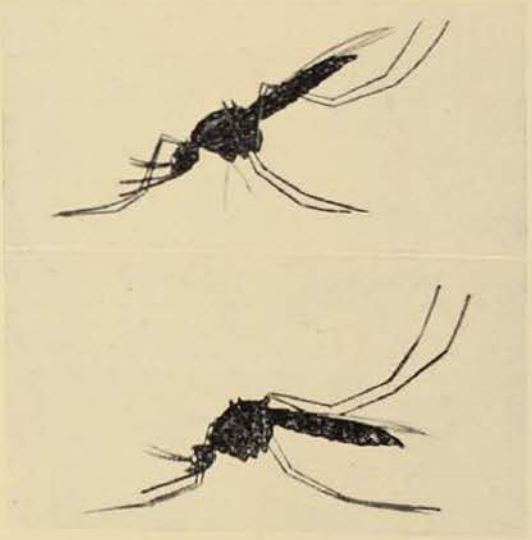
The duration of the life history of the mosquito in the summer and with an abundance of food is about ten to fourteen days.



Culicine larva feeding.

The eggs of *Anopheles* possess lateral floats and are laid singly. Those of *Stegomyia* are cigar-shaped, can withstand freezing and desiccation over long periods and remain viable and, as in all species of *Aëdes* and its subgenera, are laid singly, in some cases above water, where it is damp and water will eventually come. In *Culex* and related genera the eggs, as they are laid, are formed into a raft-shape, with the head of the egg upside down, by the female crossing her hind legs.

The larvae of *Anopheles* are surface feeders and have, in place of the syphon



Resting attitude. Above, Anophelini; below, Culicini.
Photo.—Shell Co. of Australia, Ltd.

of the Culicini, a pair of spiracles for the purpose of respiration. The larvae of *Culex* and related genera all possess a moderately long syphon, while the larva of *Aëdes* and its relatives has a somewhat short, barrel-shaped breathing syphon. The resting position of all Culicini larvae is at an angle of about 45°.

There is little difference between the pupae of the three groups—the breathing trumpets of the *Anopheles* pupa are somewhat shorter and broader than those of *Culex* pupae while those of *Aëdes* are intermediate.

The larvae of Australian *Anopheles* are found in clean water—swamps, hoof-marks of cattle, small collections of casual water, along the grass-grown banks

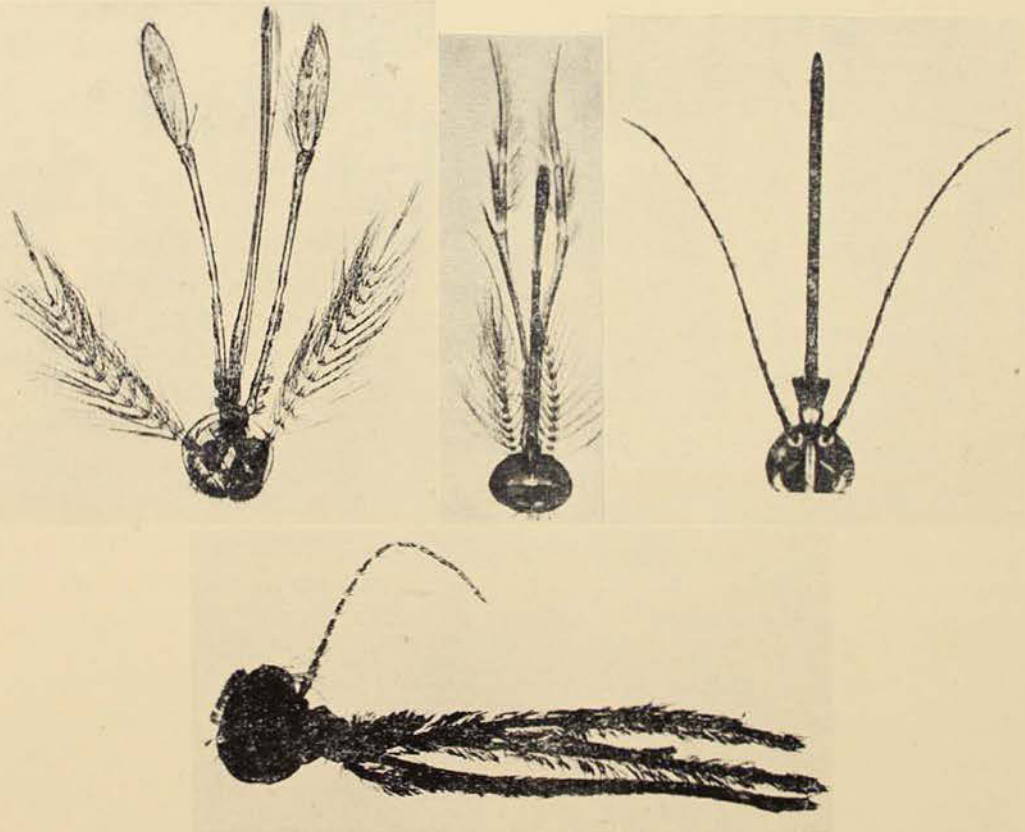
and eddies of creeks and rivers and rock pools. Some species must have the maximum amount of sunshine while others require only the minimum.

For the most part members of the Culicini breed in similar situations to those of *Anopheles*. A few mosquitoes breed only in the leaf-axils of Pandanus, banana plant, taro and like situations; others breed in cavities of stumps and trees, knot-holes, scars, and where branch joins trunk.

Aëdes (*Stegomyia*) *aegypti* is essentially a house mosquito. It breeds in all kinds of domestic receptacles which contain clean water. It does not breed in swamps and other ground water. *Aëdes* (*Pseudoskusea*) *concolor* is the only true salt-water breeding mosquito. It breeds in rock pools along the foreshores and is abundant at Cronulla, Sydney Harbour and elsewhere along the coast of New South Wales. *Culex fatigans*, which is also commonly found in houses in Australia, breeds in any dirty or foul water about houses. It prefers septic tanks, liquid manure containers, street gutters and suchlike places to clean water, but it will breed freely in the latter.

The duration of the egg stage is about 36-48 hours, that of the larva seven to ten days, and the pupa about two days. The quantity of food eaten by the larva determines the size of the adult in all insects, since the latter never grow. The pupa is actively motile and does not feed. It is in this stage that the transformation from the larval to the adult characters takes place.

It is a simple matter to distinguish *Anopheles* from all other mosquitoes by their resting position, which is at an angle



Adult Anopheles may be distinguished from the Culicini by the palpi; in both sexes these are as long as the proboscis. In the male these are clubbed, but not in the female. In the Culicini the palpi of the male Culex, and related genera, are about a segment longer than the proboscis and relatively hairy, but in the female the palpi are about one-quarter as long. In Aëdes, and most related genera, the male palpi are about the length of the proboscis and almost devoid of hairs; in the female they are about one-eighth the length. There are some exceptions in which the male palpi are very short. Top: left, Anopheles head, male; centre, Culex head, male; right, Stegomyia head, female (after Edwards). Below: Anopheles head, female.
Photo.—F. H. Taylor.

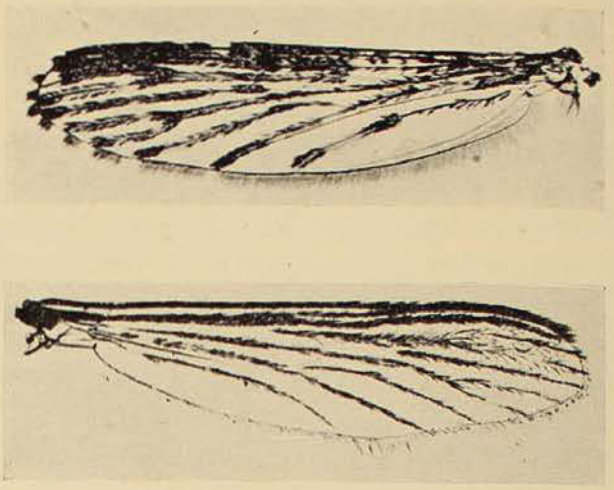
of about 45°, whereas that of all other mosquitoes is horizontal to the surface on which they rest.

The thorax of *Anopheles* is very hairy with scattered semi-erect scales; in the Culicini it is densely covered with narrow-curved scales and few hairs. In the subgenus *Stegomyia* the thorax is always ornamented with silvery-white scales distributed in a definite pattern.

The abdomen in *Anopheles* has relatively few scales on it, although in some species it is densely covered with semi-erect scales but never in the same manner as in the Culicini, where they are said to be imbricate—that is, laid like the tiles on the roof of a house. In addition, the abdominal segments have, in many species, basal bands usually of whitish-coloured scales—sometimes apical banding is also present.

Many species of *Anopheles* have multi-spotted wings, others have wings with but a few spots, others again have no spots at all on the wings. Hence it is quite erroneous to think that all *Anopheles* mosquitoes have spotted wings. The greater number of Culicini have wings devoid of ornamentation, though in a few instances these are mottled and some species of *Culex* have spotted wings.

The legs in *Anopheles* are comparatively long and slender with, in some species, conspicuous spots and bands, particularly on the femora and tibiae. In the Culicini the legs are stouter and less ornamented than in *Anopheles* although there are some species, especially those of the subgenus *Stegomyia*, which have the tarsal segments conspicuously banded with white.



Above, wing of Anopheles; below, wing of Stegomyia.
Photo.—F. H. Taylor.

Important dates associated with mosquitoes and disease are:

1897. Ronald Ross, afterwards Sir Ronald Ross.
The discovery of the development of the malaria parasite of man and transmission by *Anopheles* species to man.

1898. T. L. Bancroft.
The discovery of the mode of transmis-mission of the filarial worm by the mosquito *Culex fatigans* Wied. from man to man.

1901. Major Reed (Chairman) and Doctors Carroll, Agramonte and Lazear discovered the transmission of the virus of yellow fever in *Aëdes* (*Stegomyia*) *aegypti*.

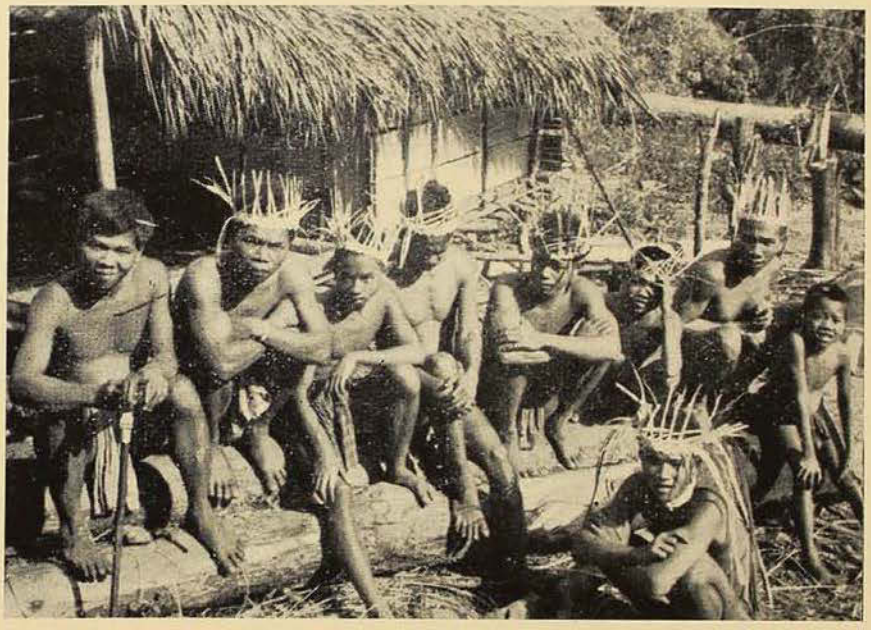
1906. T. L. Bancroft.
The discovery of the transmission of dengue fever by the mosquito *Aëdes* (*Stegomyia*) *aegypti* Linnaeus.

Jungle Dwellers of the Malay Peninsula: The Ple-Temiar Senoi

By F. D. McCARTHY

IN 1937 I had the pleasure of visiting several villages of these people in company with Mr. H. D. Noone, Field Anthropologist in Perak, who had been engaged for several years in making an intensive study of their culture. There are two divisions of the Senoi, the low-land Semai and the mountain Ple-Temiar, and a marked difference exists between the down-river Senoi, whom Noone terms the "older strata", and the mountain people.

They are a handsome people, averaging five feet three inches in height, of slim build and light honey-coloured skin, the women well proportioned and the men well developed. The face is lozenge-shaped, with a pleasant cast of features, and a happy smiling expression the greater part of the time. The lips are medium in thickness, the brow-ridges are not conspicuous, and the nose is well shaped. The hair of the men is close-cropped, while the women either let let theirs hang loosely to the shoulders or adopt the smooth coiffure of the Malays.

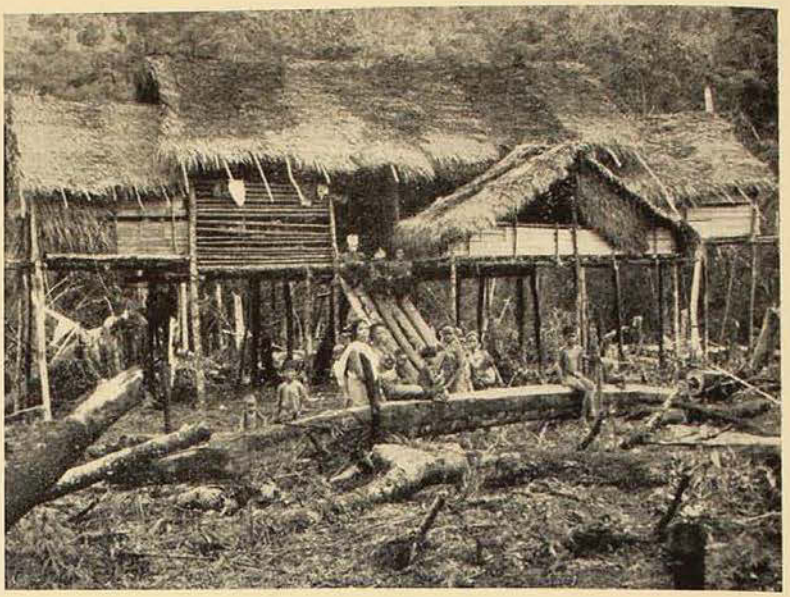


A group of Ple-Temiar Senoi men and boys.
Photo.—F. D. McCarthy.

The Ple-Temiar Senoi are predominantly Indonesian in type, but among them is a sprinkling of individuals manifesting tall Australoid and dwarf Mongoloid strains. They are related to other mountain peoples of the Asiatic mainland and the Malayan Archipelago. In the Perak-Kelantan watershed there are about ten thousand Ple-Temiar, healthy and comparatively free of disease, and prolific enough to average between two and three children per family, although infant mortality is relatively high.

A COMMUNAL HOUSE SOCIETY.

The most notable social unit is the extended family occupying a communal long-house and a plantation. It consists of the families of a man, his younger brothers and sisters, and a few of their friends, in all about sixty individuals. Leadership is vested in the line of the eldest son, interrupted only when he is



A small communal long-house on slender piles, set among the trunks of trees felled in the garden clearing at the base of a jungle-covered ridge high up in the mountains.
Photo.—F. D. McCarthy.

either incapable or has already set up a community of his own. A number of these groups possess all rights over a recognized section, or *saka,* of the jungle, and form the largest economic and legal unit among the Ple-Temiar. The balance of leadership rests with the middle generation, and policy is in reality the expression of common opinion. Outstanding ability is recognized by deputing men to lead food-quests and ceremonies.

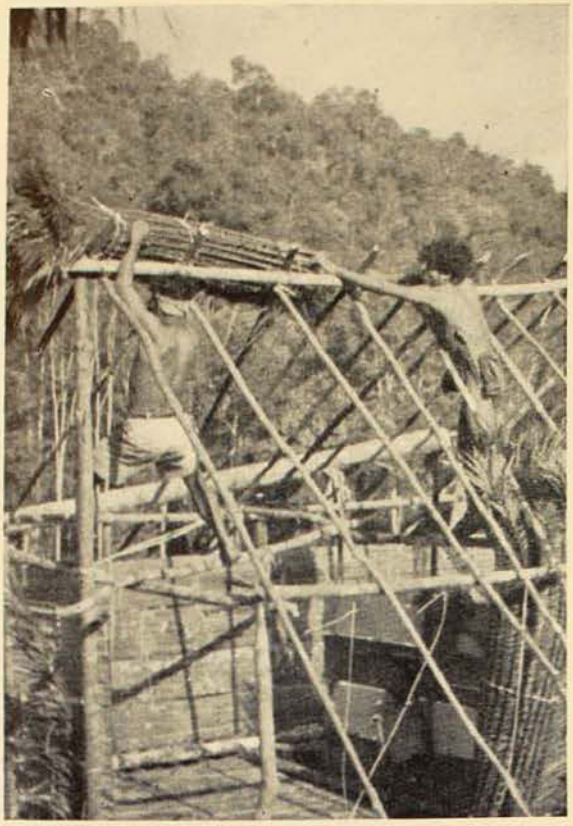
The "long-house" is about one hundred feet in length, with a corridor down the middle, and compartments along each side beneath the sloping sides of the thatched roof. The main frame is of wood, the interspaces of bamboo and plaited mats, and the floor of bamboo is up to ten feet above the ground. There is a dais at one end for the reception of visitors. Each single family of husband, wife, and children occupies one compartment, and has its own hearth. In some of the cubicles food is stored, while chattels are hung on the walls or placed on the rafters. When the community becomes too big, one or more sections break away and set up their own house and clearing in the *saka.* Established communities move to a new locality after some years have elapsed.

In such a community private property is limited to weapons, ornaments, and jungle products for barter, theft being an unusual crime. Most disruptions of an otherwise smooth tenor of life arise from marriage troubles. If a man's wife elopes he has the right to kill her paramour with a spear or blow-pipe dart, or to employ a sorcerer to bring about his death. Usually the culprit has to pay a heavy fine to the aggrieved husband to prevent a feud, because the latter involves a number of communities and causes unnecessary deaths, and the only way it can be stopped is to even up the deaths on each side by agreement.

Ple-Temiar religion consists of beliefs in spirits which inhabit plants, animals, natural phenomena, and places in the *saka,* and rites are carried out to maintain the balance between life and the natural world. The function of the medicine-man is to appease nature so that the people may make use of the land and its bounty without giving offence and causing the spirit demons to punish the community.

THE PLANTATION.

The members of the "long-house" participate in all communal activities and share the products; these tasks include house-building, clearing and fencing land, planting and harvesting crops, and some forms of fishing and food collecting in the jungle. The community depends



House-builders at work. The roof-thatch is made up into a number of large mats which are bound to the frame of the house. These two men are placing one mat in position, and another mat is standing in the right-hand corner of the floor.
Photo.—F. D. McCarthy.

primarily upon its garden for food, and in the main subsists upon a vegetable diet in which the staple item is tapioca. Other important crops are hill-rice, millet and maize, each of which is grown by separate long-house groups as its main crop; the other groups in the *saka* assist in the planting and harvesting and share in the crops. In addition, each single family plants tapioca and seasonal crops such as taro, sweet potato, paw-paw, bananas, sugar-cane, melons, pumpkins, tobacco, flax, and others. Magical rites are carried out before each major operation in the garden to appease the spirits and ensure the success of the crops. The jungle, too, yields a welcome addition of plant foods, such as numerous fruits, edible roots and leaves, and ingredients for medicines. A hoe or pointed digging-stick is used for cultivation, the seeds and tubers being thrust into holes between stumps and logs in the clearing.

MEN OF THE BLOW-PIPE.

The food supply is augmented by the men, skilful hunters with blow-pipe and spear, with which they kill birds, apes, monkeys, squirrels, flying-foxes, rats and other denizens of the dense bush. The spear has a bamboo or metal head, and formerly the bow, with steel-tipped arrows, was used for fighting.

The finest of blow-pipes are made by the Ple-Temiar. Two rare species of bamboo (*Bambusa Wrayi* or *B. longinodis*), which have very long and slender internodes, provide the inner projection tube, but sometimes two internodes are butted together and covered with a palm-wood sheath. The outer protective case of bamboo is carefully fitted, and the mouth-piece is of wood. The weapon is about seven feet in length. The slender darts are made from the mid-rib of a palm, and are from eight to eleven inches in length, and each fits into a bamboo tube in the quiver. The blow-pipe case and quiver are ornamented with sacred

Women and children digging out tubers in the garden. Young babies are carried everywhere by their mothers.
Photo.—F. D. McCarthy.

Boys setting a noose spring-trap to catch small mammals.
Photo.—F. D. McCarthy.

geometrical designs, and are polished with beeswax to a rich red colour.

The poison is made by mixing together the saps of the Ipoh akar tree and of several climbing plants: it is prepared in various strengths for different purposes. The Ple-Temiar are most accurate with the blow-pipe, which is their principal weapon of the chase, and the poison is almost instantaneous in its effect upon small animals.

Many ingenious rattan and bamboo noose-snares and spring-traps are employed to catch game of all sizes from a rat to a rhinoceros. The spring-trap has a spear of bamboo or wood, with a fire-hardened point: when the animal blunders into it a cord is released, which pulls out a rattan ring, releasing a small and then a large spring, and the spear is either plunged into the animal, or projected across its path to strike it at a certain point. Actually, flesh-food is a luxury to these people, and when secured in quantity is the cause of joy and pleasure. Bird-lime and dogs are also used to secure game.

Fish, too, are relished when obtainable. They are caught with line and hook (made from a curved thorn in former times), scoop and casting nets. Several long-house groups may combine to catch fish with traps, or to build V-shaped dams of wood, bamboo and stones across a stream. When derris and other plant poisons are employed, a communal effort is necessary to collect and prepare the required amount of leaves and stems.

A PEOPLE OF THE BAMBOO.

The Ple-Temiar may well be called a people of the bamboo. They use the bamboo for making tools, utensils, weapons, houses, water-pipes, rafts, fences, ornaments, and musical instruments. It is a light but strong material with a knife-like edge, and is well suited for the innumerable purposes to which it may be put by a semi-nomadic people. The Ple-Temiar do not use stone implements; they have worked iron deposits for a long period, and by a primitive method have forged tools, and spear and arrow heads. In addition, metal tools obtained from the Malays and Chinese have been in use for centuries. Fire is made by the thong method; a hole is made in a piece of bamboo held down by the feet, palm-down is inserted as tinder, and a rattan thong pulled rapidly up and down from each end.

Clothing is scanty, animal skins not being used. The principal garment is a loin-wrapper, with an apron in front, formerly made of bark-cloth but now of trade cloth. The men wear necklets of black and white seeds, fillets of feathers, and porcupine-quill nose-styles. The

women use seeds, shells, bones, sweet-smelling roots and flowers as ornaments, and wear bamboo combs. Brass rings for armlets are in great demand in trade.

Apart from the daily routine of work, the Ple-Temiar indulge in smoking and betel-chewing. Their musical instruments include flutes, jews' harps, clap-sticks, stringed harps, skin-drums, and bamboo internodes for stamping on a log—all simple forms of percussion, wind and friction instruments.

KEEN TRADERS.

A well-established trading system exists between the Ple-Temiar, who contribute blow-pipes, poultry, rattan, bamboo, medicines, gutta-percha and other jungle products, and the Malays and Chinese, who barter trinkets, brass wire, cloth, steel *parang* knives, casting-net chains, beads, goats, and pigs. The Ple-Temiar maintain special trading agents, called *Pangku* or *Mikong*, to whom adequate gifts are made for their services. Although the Malays and Chinese are astute traders who drive a hard bargain, they are sometimes summarily treated by the Ple-Temiar, who, when too unfairly burdened with interest on their transactions, burn down the offender's house or store.

The history of the Ple-Temiar is thus one of adherence to their own mode of life, which is well suited to the environment, of intermixture and no doubt conflict with earlier and later peoples, and of absorption of advanced ideas and techniques which have lifted their own culture to a somewhat higher plane. They now build dugout canoes and even sampans, fell and haul timber, act as elephant boys, and are excellent carriers. They are intelligent and keen to improve their general knowledge, especially of garden plants and methods of cultivation.

Sections of bamboo serve as water holders, and the women make numerous trips to a nearby creek to maintain the domestic supply.
Photo.—F. D. McCarthy.

Mr. John Spence, C.M.G., who, in his capacity as Auditor-General of this State had been an official trustee, was elected a member of the Board at its meeting during September.

. . . .

The Russian Medical Aid and Comforts Committee is appealing for gifts of sheepskins for Russian victims of the war. Undamaged skins, from off shears too short for appraisement to any length, are acceptable.

Messrs. T. Dewez and Company have undertaken to classify skins and arrange for their distribution to various dressers. Such gifts should be addressed as under:

Gift Skins—not for sale.
Russian Medical Aid and Comforts Committee,
c.o. T. Dewez and Company,
Darling Harbour, Sydney.

The N.S.W. Department of Railways has agreed to carry such skins per goods trains, free of charge.

Australian Insects. XVIII

Hemiptera, 3—Aradidae-Cimicidae

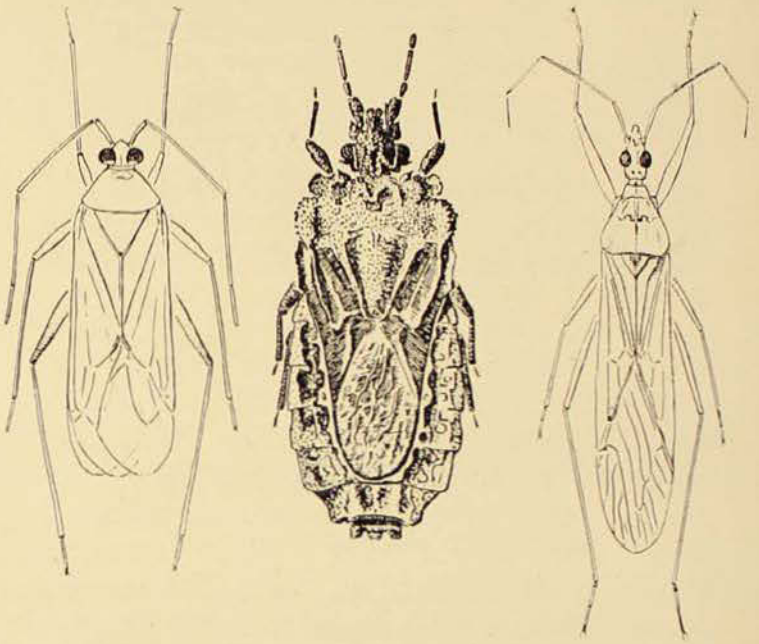
By KEITH C. McKEOWN, F.R.Z.S.

THE previous article in this series brought us to the Pentatomidae, or Shield Bugs, the dominant family of the true Bugs (Hemiptera-Heteroptera). The review of the families, like the catalogue of the Trojan ships in the Iliad, must now be continued, and the tale taken up with the Aradidae.

The small family Aradidae, which contains the Fungus Bugs and Bark Bugs, is of considerable interest on account of the curious flattened form of the insects, an adaptation to their mode of life; the small wings which scarcely cover the abdomen, and the manner in which the margins of the abdominal segments—especially in immature forms—are scalloped and excavated so as to give them a very irregular outline. Their colour is usually a drab brown, but may be varied with patches of lighter tints. This coloration, coupled with their irregular and un-insect-like outline, renders them extremely difficult to detect as they rest under flaking bark fragments or on tree-trunks. Unfortunately the life-histories and habits of most of the Australian species remain unknown.

The family Nabidae is somewhat closely related to the Reduviidae, but its members differ from these insects in the possession of a four-jointed rostrum or beak. *Nabis capsiformis*, a slender species, has been recorded as inflicting painful 'bites' on man with its sharp beak, designed for sucking up the juices of its prey.

The Assassin Bugs (Reduviidae) form quite a large family, and some 125 species have been described from Australia. All are carnivorous, and extract the body fluids from their victims by means of a slender, curved, three-jointed beak; they differ considerably in form, but all are linked by the form of the rostrum, and in their habits. Some species are



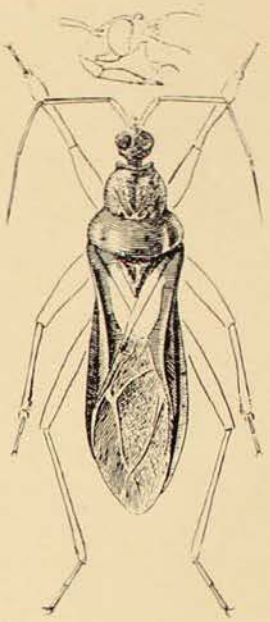
Typical bugs: a Mirid Bug (Megacoelum modestum), an Aradid Bug (Artabanus sp.), and a Capsid Bug (Nabis capsiformis).

N. B. Adams, del.

adequately winged; others are completely wingless in all stages. The 'Bee-killer' (*Pristhesancus papuensis*) is among the largest species, and is well-known from its reputation as a destroyer of bees. These bugs rest upon the flowers and capture the insects that visit them in search of nectar. It cannot be said that the assassin has a preference for bees, but where the latter are numerous, as in the vicinity of an apiary, they naturally fall victims in considerable numbers to the voracious hunters. It sometimes happens that the bugs destroy more insects than they actually require for food, and the ground below their resting place becomes littered with discarded bodies. The 'Bee-killer' is a general brownish-yellow colour. Another large and common species with a wide distribution is *Pirates ephippiger*, a blackish insect with a patch of yellow on the base of the horny portion

of each forewing. It frequents the trunks and foliage of gum trees where it carries on its 'piratical' activities towards its weaker and defenceless relatives in the insect world. The genus *Harinthus* contains four rather striking smaller black and red species, while *Gminatus* includes a number of similar, but duller insects which have the 'waist' constricted in a manner fashionable among the fair sex in past days.

Ptilocnemus is perhaps the most interesting of all the Reduviid genera of which we have knowledge of the life-history, by reason of the amazing habits of some, if not all, of its members. The perfect insects are small black and yellow bugs, which would probably escape attention were it not for the possession of hind legs thickly fringed on either side with close, fluffy black hairs, giving them a plume-like appearance which at once suggests the popular name—Feather-legged Bugs. These feathery limbs seldom fail to excite the interest of even the most casual observer—and one is irresistibly reminded of the wide hairy chaps worn by the typical cowboy of the 'movies'! But the interest of the bugs is not confined to their appearance. The Feather-legged Bug preys upon ants, but here there is no straightforward assassination—the victim is drugged before it is slain! On the lower surface of its body, the bug has a specialized gland which secretes a substance irresistibly attractive to ants. On the approach of a foraging ant, the bug, which usually lives under bark or stones, raises its body high upon its legs, and so exposes the gland, which is eagerly licked by the ant. In a few seconds, or perhaps minutes, the potent drug beings to take effect, and the 'opium eater' staggers about in a drunken manner, and finally collapses in apparent stupor. All this while, the bug pays but little heed to its prospective victim, or victims, which litter its dining table. But, once the ant is stupefied, the bug inserts its slender needle-like beak in the junction of head and thorax, and proceeds to suck up the juices of the unfortunate inebriate. The story of the Feather-legged Bug and its victims provides a horrifying example which might be exploited to the full by the advocates of Prohibition! Like the 'Bee-killer', already mentioned, the Feather-legged Bug frequently destroys far more ants than its hunger justifies, and the ground about it becomes massed with their bodies, for the drugged ant does not seem to recover from its potations, even if untouched by the assassin. The commonest of these bugs is *Ptilocnemus femoratus*.



The large Reduviid Bug (Pirates ephippiger), an Assassin Bug.
N. B. Adams, del.

The habits of most of our Reduviid Bugs are unknown, but these surprising revelations of the behaviour of the Feather-legged Bug indicate the probability that equally amazing discoveries may be made by those who have the patience to observe other members of the family. It is discoveries like this that give the study of the insect world such infinite fascination.

The Lace-Bugs (family Tingidae) are very small plant-feeding insects, easily recognized by the intricate network of veins supporting the forewings, which gives them the appearance of being made of the finest Brussels lace. *Froggattia olivina* is sometimes a pest of olive trees, sucking the sap from the foliage and causing the leaves to wither and fall. Another fine species appears to be confined to the Antarctic Beech (*Nothofagus*). Intensive collecting and study are required before we have anything approaching an adequate knowledge of these exquisitely beautiful little creatures.

Ptilocnemus with rostrum extended to extract the juices of the Green-head Ant.

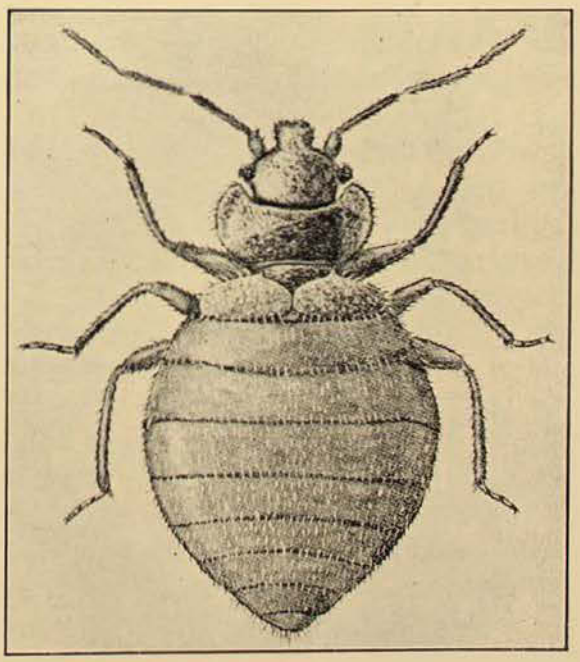
Photo.—N. Geary.

A beautiful example of the Lace Bugs (Tingidae), Tingis drakei.
N. B. Adams, del.

The Miridae, also known as the Capsidae, are usually referred to in the text-books as 'Plant Bugs' or 'Leaf Bugs' —names notable only for their extreme vagueness. They are small and uninteresting in appearance, and of brown or leaf-green colour. Many of them are important pests of crops, and several, as yet undetermined, species infest tobacco, sucking up the sap and producing blemishes which considerably depreciate the quality of the resulting leaf. One species, *Cyrtorhinus mundulus*, deviating from the typical habit of the group, is carnivorous and feeds upon the eggs of leaf-hoppers. It has been introduced into Hawaii to combat the Sugar-cane Leaf-hopper (*Perkinsiella saccharicida*), and is of considerable economic importance in the control of the pest.

The family Cimicidae is known in Australia by only one species—and that an introduced one—the notorious Bed Bug (*Cimex lectularius*). This deservedly unpopular insect is usually an inhabitant of poor and dirty environments, where it thrives and multiplies; but it is not confined to such habitats, and its appearance in even the cleanest and best-kept homes should not cause undue surprise. The bugs are frequently carried on the clothing of persons from infested homes, and may be transferred to others in trains, trams, buses, and other public conveyances—they may even be transported in library books! Once established they may remain undetected until they have become established and have increased to great numbers, when their control becomes a problem of some complexity, and necessitates patience and perseverance before one is assured that the pest has been exterminated. The Bed Bug is wingless, somewhat rounded in outline, very strongly flattened, and of a dull brownish colour; after feeding it may have a reddish tint from the contained blood. By day the insects, aided by their flattened form, hide behind skirting-boards, in the cracks and crevices of wooden bedsteads, and similar secluded situations, but when night falls they emerge from hiding, and suck the blood of sleeping humanity. In view of its feeding habits, the Bed Bug has been strongly suspected as a carrier of disease, but, despite patient and continuous research, the verdict is, in most instances, 'not proven'. But the insect is still suspect. The egg of the insect is a remarkably beautiful object when viewed under the microscope; it is elongate, slightly curved, and highly sculptured from end to end; the apex is closed with an ingenious lid through which the young bug emerges on hatching.

The next two families are aquatic or semi-aquatic in habit. Only three species of Slender Water-striders (family Hydrometridae) are known from Australia. *Hydrometra strigosa*, a dark brownish insect, is found in swamps in the vicinity



The Bed Bug (Cimex lectularius).
After Patton and Cragg.

of Sydney, where it skims over the surface of the water on its long, slender legs. The Gerridae—also Water-striders—are far more common. They are rather stout-bodied creatures with long spindly legs; they, too, stride rapidly over the surface of the water in streams and waterholes. *Gerris australis* is found on the waters of Sydney Harbour, but details of its life are unknown. It probably feeds upon small marine creatures. The eggs of Water-striders have been found attached to the floating feathers of birds far out at sea. *Halobates whiteleggei* also inhabits Sydney Harbour. A number of dark, slaty insects belonging to this family inhabit swiftly running streams in eastern Australia, but they seem to have received but scant attention from the specialists, or, for that matter, from the general observer. Trout, however appreciate their presence on the streams, and consume them in great numbers where they are lucky enough to surprise family parties of the insects disporting themselves on the surface. It seems likely that the fresh-water forms of these bugs feed upon living aquatic insects, or their dead bodies where these float on the surface in eddies and back-waters. The detailed study of the Water-striders should reveal a rich and unknown world of strange lives and habits.

Review

AUSTRALIAN INSECTS: AN INTRODUCTORY HANDBOOK. By Keith C. McKeown, F.R.Z.S. (Sydney: Royal Zoological Society of New South Wales, 1942. 304 pp.). Price, 7s. 6d.

THERE has been need for such a book as this, something cheaper than Tillyard's *Insects of Australia and New Zealand*. Mr. McKeown in his foreword informs us that the book has "no pretensions to being a text-book, and those who require such information must refer to existing volumes for the 'dry bones' of Science". This is well, for such a book as this is intended to be should not be cluttered up with a mass of highly technical detail, but be based on scientific fact. The volume is profusely illustrated and generally the illustrations are good.

There are two short introductory chapters, and each successive chapter is concerned with a separate order in which is found a general description of the insects contained therein, followed by a more or less brief account of each of the families. The last chapter deals with the collecting and preservation of insects.

It was disappointing, when reading about the ants, to find that there was no mention of the intriguing subject of colony-founding, which was dealt with by the late Professor William Morton Wheeler when writing of our bulldog ants in 1933.

In a book of this type one would like to see a greater degree of accuracy than is found, for example, in the Diptera, since it has been written for the "man in the street", who perforce must take what he reads as "gospel". It is unfortunate that the literature of the last ten years has not been more freely consulted. Mr. McKeown, writing of the Psychodidae, says: "The Phlebotominae contains the one example of biting Psychodids found in Australia, *Phlebotomus queenslandi* Hill, which occurs in North Queensland", but other species have been described by Tonnoir from Canberra and Yass. Speaking of *Aëdes vigilax*, he says that it bites "persistently at dusk", but bright sunshine is no deterrent. Again, "*A. eggypti* Linn., is present in the north, but as a rule does not extend much further south than Newcastle, New South Wales. . . ." This mosquito has been known for a number of years from localities as far south as Narrandera, while in Temora it is so prevalent that it must be long established

there; it may be observed that the correct spelling of its name is *aegypti*. It is stated that "the largest of our species of mosquitoes . . . is *Mucidus alternans* Westw.", but the largest known mosquito is *Megarhinus speciosus* Skuse. This exceeds an inch in length, and is distributed along the coastline from Sydney to Darwin. Mr. McKeown says: "The Dixidae is a small family with only six Australian representatives, mostly belonging to the genus *Dixa*. Nothing seems to be known regarding our species." Actually the Dixidae are true mosquitoes and form the subfamily Dixinae of the Culicidae. There are fourteen species distributed in one genus and two subgenera. There are no species of *Dixa* known in Australia.

In amplification of what the author has written, it may be said that the almost microscopic blood-sucking sandflies, so prevalent at times, belong to the family Ceratopogonidae and are distributed in several genera. The best known species is *Culicoides molestus* Skuse; in "Australian Insects" this is placed in *Ceratopogon*. Whilst it is true that some species of the Pangoninae, family Tabanidae, live on plant juices, the great majority of them are equipped for biting, possessing the usual well developed mouth parts of blood-sucking insects. Referring to the Conopidae, or Waspflies, it is stated "some twelve species have been recorded from Australia—all of them placed in the genus *Conops*", but this is incorrect. There are numerous species of the family, and they are distributed amongst several genera. They were monographed a few years ago by Kröber.

One does not wish to be ungenerous in criticism, for the book has its merits; but it is a pity that where there were experts in Australia, the relevant chapters were not submitted to them for reading prior to the book going to press. The day has gone when any one author can write a general book on entomology.

F. H. Taylor.

Charles Davies Sherborn,
Hon. D.Sc. (Oxon.)

In a recent number of *Nature* we read of the death in London on 21 June, 1942, of Dr. C. D. Sherborn. His death occurred within a few days of his 82nd birthday, for he was born in London on 30 June, 1861.

His death robs the science of zoology of one of her ablest workers, for he had acquired international fame as a bibliographer, and his *Index Animalium* has placed all taxonomic zoologists under a deep debt of gratitude to him. This work, commenced in 1890 and completed in 1933, after forty years' diligent research, comprises thirty-four parts constituting about eleven volumes.

The *Index* consists of the scientific names of all animals described between the years 1758 and 1850, together with the name and date of the publication in which the genera and species are described. The names are arranged alphabetically. Its object was to clear up the synonymy and the confusion which had arisen since the appearance of the 10th edition of Linné's *Systema Naturae* in 1758, and thus place the science of zoology on a more precise basis.

The first section of the *Index Animalium* deals with the names of animals from 1758–1800, and was published in 1902 by the Cambridge University Press. The venture was assisted by the British Association for the Advancement of Science, the Zoological Society of London, and the Royal Society of

London. In writing of the progress of this first section in the *Proceedings of the Zoological Society of London*, 1901, Vol. ii, pp. 2–3, Sherborn pointed out that it "had taken him over eight years to compile, arrange, and get ready for press".

At the British Museum (Natural History), South Kensington, where Dr. Sherborn carried out his work of compilation, the Trustees of the Museum, realizing the success of the first volume and its value to scientific workers, undertook the publication of the second section, which ran into thirty-three parts, and was published between the years 1922 and 1933.

In the Epilogue to Part xxix, Dr. Sherborn sums up some of the difficulties he encountered, and his words may be read with advantage by all interested in bibliography:

> Now my work is finished it may be well to glance at the difficulties met with during its compilation. In any well-appointed Natural History Library there should be found every book and every edition of every book dealing in the remotest way with the subjects concerned. One never knows wherein one edition differs from or supplements the other, and unless these are on the same table at the same time, it is not possible to collate them properly. Moreover, for accurate work it is necessary for the student to verify every reference he may find; it is not enough to copy from a previous author; he must verify each reference itself from the original. Bad work, for which there is little excuse, is only too common. This want of every book and every edition has been a serious hindrance and loss of time to me while working for over forty years in the British Museum (Natural History), and though I have acquired over a thousand volumes for the libraries there, gaps still remain to be filled.

It is interesting to read the above, because in London, at the heart of things, Dr. Sherborn was in the unique and enviable position of having access to libraries second to none in the world. He was fortunately equipped too with a zeal which, in spite of indifferent health, enabled him to see his huge task through. The skill and care he has shown in the citation of references have rendered the work of the greatest value. Only those who have attempted bibliographical work of this nature can appreciate how difficult it is to be constantly on the alert to avoid the many pitfalls and snares which beset the path of the recorder. The need for including the exact date of publication in a reference was early recognized by Dr. Sherborn as an indispensable aid to taxonomists, and, in collaboration with B. B. Woodward, of the British Museum (Natural History), he published many interesting bibliographical facts in the *Annals and Magazine of Natural History*.

On 10 March, 1931, the University of Oxford conferred upon him the degree of Doctor of Science (*honoris causa*), "in recognition of the services which he had rendered science by the compilation of his great work the 'Index Animalium'".

In 1936 The Society for the Bibliography of Natural History was founded in London with Dr. Sherborn as its President. A *Journal* in which papers and items of bibliographical importance could be published was the outcome, and so the work initiated by Dr. Sherborn was assured of a future.

Dr. Sherborn was the son of Charles William Sherborn, well known as a line-engraver and etcher. He was educated at St. Mark's College, Chelsea, and his earlier years were devoted to geology and palaeontology, subjects upon which he had written papers. He was an Honorary Fellow of the Zoological Society of London, and was elected an Associate of the Linnean Society of London on 7 March, 1912, and an Honorary Associate Member of the Royal Zoological Society of New South Wales in 1933. His interests ranged over a wide field, including genealogy and numismatics.

It was the privilege of the writer to meet him in London in 1934–35, and to partake of the hospitality of his house, where, on occasions, he gave informal "smoke and chat" evenings to scientists from the four corners of the earth.