The Echinodermata

By C. A. GIBSON-HILL

No comprehensive collection of echinoderms was made until Mr. M. W. F. Tweedie's visit in 1932. His material, which consisted of about thirty specimens belonging to thirteen species, gathered from Flying Fish Cove and the reef at Little Ann Beach, was examined by Dr. Th. Mortensen (Echinoidea and Ophiura) and Dr. W. K. Fisher (Asteroidea and Crinoidea), but no full list was published. The present collection, covering most of the coast, adds one species to the fauna, an Ophiuroid, *Ophioplocus imbricatus*.

ECHINOIDEA

Echinothrix diadema (Linn.).

This species occurs on the reef in the neighbourhood of all the beaches, in sheltered corners of the seaward pools a little below the low tide level, and over portions of the rock-pool shelf. It is never found in situations where it is likely to be left dry. It is very common in the vicinity of Lily Beach, and in Flying Fish Cove it is abundant in hollows on the face of the fringing reef down to the five fathom level. Alive in the water it appears black. The long spines, which are waved freely, break very readily and may cause considerable inconvenience to inexperienced divers.

Echinometra mathaei (de Bl.).
Echinometra picta Agassiz and H. L. Clark.
Echinometra oblonga de Bl.

Seven specimens of *Echinometra* collected by Tweedie were allocated by Mortensen to the three species listed above. At the same time (in litt.) he said that he gave the names " with some reservation ..... possibly it is all only one, highly variable species." The same opinion was expressed by Clark (Cat. Rec. Sea-Urchins in B.M., 1925. p. 143–144) who described *E. oblonga* as " probably ..... a form of *E. mathaei*," and dismissed *E. picta* under the latter with " various forms have been given names, one of the best marked of these being *E. picta*, but nothing is gained by the naming of inconstant forms, with no special geographical range." The present collection contains some thirty specimens taken from various parts of the island, but in view of the relative insignificance of the differences between the forms, and the doubts of these authorities, no attempt has been made to

distribute them among the species. The spines vary considerably, ranging in a continuous series from stout and black to fine and black (several of the darker specimens having the milled ring on the primaries white), and from fine and dark grey through olive and pinkish-grey to very stout and off-white.

Taken collectively these forms are very common, almost abundant, all round that coast. They occur only in narrow cracks and crannies in the rocks bordering the sea-edge of the raised portion of the fringing reef, at about the low tide level, and along the edge of the rock-pool shelf. Their habitat is thus less sheltered than that of *Echinothrix diadema*, and they may be left uncovered at low water. They seem to spend the greater part of their life in one place and some of the larger specimens, taken from unduly narrow cavities, appeared to have developed unequally to continue to fit into their restricted surroundings. The tests were slightly elongated in one radial plane, while the spines along the sides thus formed were appreciably shorter than normal.

Colobocentrotus atratus (Linn.).

This fairly common species occurs in scattered groups or colonies, spread unevenly over the whole coast, on smooth rock surfaces between the tide-marks. It is never found on the reef proper though, as at the mouth of Sydney's Dale, it may inhabit the edge of the rock-pool shelf. The most usual site, however, is the bare portions of the base of the sea-cliff, especially over the more exposed stretches where there is an abundance of wave movement. Here it affords shelter to a small pinkish-brown crab, *Proechinoecus sculptus* Ward (Bull. Raffles Mus. 1934, No. 9, p. 7) which is only found living under its test.

On two occasions, at Lily Beach, a planarian was discovered under the test. Elsewhere, on Krakatau in the Sunda Strait, and on Hawaii, a planarian, identified as *Ceratoplana colobocentroti* Boch., has been found in the same situation.

When alive *C. atratus* is a deep purple, so dark that it is almost black.

Heterocentrotus mammillatus (Linn.).

This is the least plentiful of the echinoids on Christmas Island. Its habitat is roughly the same as that of the *Echinometra*, but it seems to occur in only a few places, principally in the neighbourhood of Lily and Little Ann Beaches and between the mouths of Sydney's and Driver's dales. Its colour is variable, ranging from a deep, dark purple to a mid brownish-purple, with golden-brown tips to the blunt spines.

ASTEROIDEA

Ophidiaster squameus (Fisher).

Mr. Tweedie collected three examples of this species. They were taken on coral sand, in shallow water, just over the edge of the fringing reef along the south side of Flying Fish Cove. When examining the bases of the loading piers in a diving-suit I found it fairly plentiful in a similar habitat at a depth of one to four fathoms. Fisher's original specimens from Hawaii were collected from a depth of 18 to 41 and 130 to 151 fathoms. It is, therefore, possible that this species is much commoner on Christmas Island in deeper water, towards the centre of Flying Fish Cove. Unfortunately the only material that I was able to obtain from this area was fine ooze, containing only a few, small crustacea.

Fresh specimens are dull vermilion, with faintly indicated, richer, more orange coloured spots.

Linckia multifora (Lamark).

This species is plentiful on the coarse sand, under stones and coral fragments, over the raised portion of the reef at both Flying Fish Cove and Ethel Beach. In the Cove, at least, it also occurs over the edge of the reef and I saw a number on the sea-bottom at the five-fathom level. Mutilation appears to be common, and individuals with four or six limbs can be found fairly easily.

The colour is rather variable. Smaller examples are usually a dull blue-green, with dull red spots scattered irregularly over the dorsal surface. In the larger specimens the basal shade is generally a pale yellow-green, bluer at the tips of the arms. The number of darker spots also varies considerably, and some specimens are almost entirely dull crimson.

Neoferdina cumingii (Gray).

On Christmas Island this species, like *Ophidiaster squameus*, has only been taken in Flying Fish Cove, from the deeper water outside the fringing reef. Three specimens were found under dead coral on a sandy slope, at depths ranging from one and a half to five fathoms.

In a fresh specimen the knobs are pale orange, with the sulci between them dull madder on the dorsal surface and rich crimson on the ventral surface. The anal pore is bright crimson.

OPHIURA

Ophiocoma scolopendrina Lam.

This species, which is abundant all round the island, occurs in cracks and cavities in the fringing reef and rock-pool shelf, about the low tide level. It is also very plentiful under stones

and coral fragments on the sheltered portions of the reef itself. A number of the latter specimens lie nearer to the high tide level, and may be left dry at low water.

Minor variations in form, particularly in the extent to which dorsal granulation of the disc passes over to the ventral surface and the degree to which the distal border of the under-arm plates is notched, are common. The thickness of the spines and the general coloration are also not constant. The latter ranges from black to olive-green with slight black markings, and even to varying shades of olive with paired brownish streaks above the insertions of the arms. In the younger forms the arms are frequently banded with dark and light colours.

Ophiocoma erinaceus Müller and Troschel.

This brittle-star is very similar to the preceding, and its validity as a distinct species has been questioned. Clark (1908, Bull. Mus. Comp. Zool., Vol. 51, No. 11, p. 297) suggested that more extended field observations would indicate that *erinaceus, schonleini, scolopendrina* and *wendtii* were intergrading forms of a single variable species. Koehler, however, (1922) expressed the opinion that in spite of the rather extensive variations of *O. scolopendrina, O. erinaceus* could always be distinguished from it. This would appear to be true as far as Christmas Island is concerned. *Scolopendrina* is highly variable and frequently, as in the specimens which Koehler records from Mauritius, approaches *erinaceus* fairly closely, but the latter nevertheless remains, though the habitat of the two species is roughly the same, a distinct form. It can be readily distinguished by the coarse granulation of the dorsal surface of the disc stopping sharply at the periphery, the distal border of the under-arm plates never being notched, the stout, robust, spines, and the presence of two tentacle scales along the greater part of the arm. In addition it is nearly always completely black in colour, and reaches a larger size (the largest of some sixty *scolopendrina* measured 18·5 mm. across the disc, while the two largest *erinaceus* were both 29·5 mm.). *Erinaceus* is common on Christmas Island, but less plentiful than *scolopendrina*.

Ophiomastix annulosa Lam.

On Christmas Island, this species is known only from the fringing reef along the south side of Flying Fish Cove, where it occurs under stones and coral fragments below the low-tide line. It is not very plentiful. In the water, alive, it is most attractive, appearing a delicate brown-pink with a soft fringe. Examined in detail, the spines are off-white with grey rings, while the remainder of the dorsal surface is a light pinky-brown with darker, richer reticulations. The largest specimen collected measured 16·5 mm. across the disc.

Ophioplocus imbricatus Müller and Troschel

This species occurs under stones and coral fragments along the shore border of the fringing reef, near the low-water level, on the south side of Flying Fish Cove and at Ethel Beach. A large specimen, measuring 15·5 mm. across the disc, was a dull biscuit-brown, with the dorsal surface of the disc blotched, and the arms ringed, with off-black. Two smaller individuals, of which the largest was 6·25 mm., were a pale fawn-grey with the limbs narrowly ringed with umber (proximal) and white, each band of umber and white being separated from the next by an equal width of fawn-grey.

CRINOIDEA

Lamprometra palmata (Müller).

Several specimens of this species, of which three were collected, were seen on a coral bank near the base of the loading piers, at a depth of two and a half to three fathoms. Mr. Tweedie took one example from Flying Fish Cove, but the exact location is not recorded. The Raffles Museum also contains a number of specimens collected in Singapore harbour from a depth of eight fathoms.

When alive it is a dull purplish brown, with a series of pale purple (almost white) bands across the proximal half of the arms. In the water it bears considerable resemblance to a resting scorpion fish, *Pterois russellii*.

HOLOTHUROIDEA

At least four Holothurians occur on Christmas Island, but unfortunately no specimens survived for identification. Two of the species, which are very dark grey brown or black in colour, and extend to a length of ten to fourteen inches, are fairly common. They occur all round the island on the raised portions of the fringing reef. The other two species, which are smaller and lighter in colour (one being fleshy white and the other white and ochreous brown) appear to be confined to Flying Fish Cove and Ethel Beach, where they live under the coral fragments which litter the shore border of the reef.