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A SUPPLEMENTARY LIST OF THE ECHINODERMS COLLECTED
BY SURGEON LIEUTENANT-COMMANDER W. E. J. PARADICE,
R.A.N., IN QUEENSLAND AND NORTH AUSTRALIA.

By

FRANK A. MCNEILL, Zoologist and A. A. LIVINGSTONE, Assistant in
Zoology, Australian Museum, Sydney.

(Plate xvii.)

The following list, with notes, is intended to supplement the preceding contribution on Echinodermata by Dr. H. Lyman Clark, and deals with the balance of the material of that group secured by Surgeon Lieutenant-Commander W. E. J. Paradice, R.A.N. in the waters of north and north east Australia. This section of the collection includes one hundred and ten specimens, representing twenty-six species which are contained in twenty-two genera. Only four of the species listed (representing three genera) are recorded by Dr. Clark in the preceding paper, but with the exception of a single example of one of these, the localities are additional.

Much of the material dealt with has been submitted to Dr. Clark for examination from time to time, and his ready assistance has enabled us to correctly determine those species not seen by him. We wish to tender our sincere thanks to this authority, on whose advice we acted in compiling the present list in order to make a complete record of the fine collection of Echinodermata gathered by Dr. W. E. J. Paradice.

CRINOIDEA.

LAMPROMETRA GYGES (*Bell*).

One dusky brown example (in spirit) of this species was secured in shallow water on a coral reef at Port Darwin, North Australia; its oral arms measure about 65 mm.

OLIGOMETRA CARPENTERI (*Bell*).

Two spirit examples, brownish ochre in colour, were taken at the Sir Edward Pellew Group in the Gulf of Carpentaria. They were found clinging to the stems of an alcyonarian (probably *Iciligorgia* sp.), no doubt obtained in deep water.

The single specimen in the Australian Museum has one oral arm 75 mm. in length; the duplicate specimen of the species is in the Museum of Comparative Zoology, Cambridge, U.S. America.

COMANTHUS ANNULATUS (Bell).

One juvenile example of this species in the collection has the upper part of the oral arms and disc dark brown, the latter being lighter on the underside. The longest oral arm measures about 72 mm.

Locality.—From between 5 and 15 fathoms, off Ellison Reef, outer Great Barrier Reef; Aug., 1924.

This species is included by Dr. H. L. Clark in the main report immediately preceding these notes.

ASTEROIDEA.

ANTHENA TUBERCULOSA Gray.

One dry specimen from a coral reef pool at Thursday Island. R. = 62 mm. The species is well known from the region.

ASTROPECTEN MONACANTHUS Sladen.

A single example from the tidal sand flats at Paradise Bay on North Island, Sir Edward Pellew Group, Gulf of Carpentaria.

R. = 37 mm. Superomarginals about 28. This species has not hitherto been recognised from northern Australia, though Döderlein says it is found "und bis Australien."

LINCKIA LAEVIGATA (Linn.).

Thirteen examples of this elegant blue species are in the collection from two localities on the Great Barrier Reef. These include three examples (R. = 104 to 108 mm.) from Young Reef, northern Great Barrier Reef, and ten examples (R. = 81 to 113 mm.) from reefs exposed at low tide on the outer Great Barrier Reef between 17° and 19° S. lat.

The species was found to be very common at these two localities, which are in an area apparently previously neglected in the literature of the form.

OREASTER GRACILIS Lütken.

One large dry specimen of this well known and conspicuous sea-star was secured on the tidal flats at Paradise Bay on North Island, Sir Edward Pellew Group, Gulf of Carpentaria. R. = 175 mm.

The interest of the acquisition is enhanced by some detailed colour notes of the species made in the field by Surgeon Lieutenant-Commander Paradise, supplemented by a colour diagram from the brush of the collector.

"*Aboral surface*.—With a fine mosaic pattern of white and olive green, the white predominating, but not occurring on the ridges between the tubercles. Tubercles orange coloured, tipped with yellow; their bases a hue half way between orange and olive green. Tips of rays yellowish orange. Madreporite yellowish orange with a centre of olive green.

"*Oral surface*.—White, with a creamish tinge and pale blue at the inter-radials around the mouth. Marginal spines white with an orange tinge. Tips of rays orange. Tube feet reddish brown, with orange suckers.

"Area between marginal tubercles of oral and aboral surfaces chrome green."

OPHIUROIDEA.

OPHIARACHNA INCRASSATA (*Lamk.*).

Three examples, with disc diameters 28 to 56 mm., from the following localities.—

In coral pools between tides on Ellison Reef, outer Great Barrier Reef (two examples).

In pool on coral reef, High Island, Frankland Group (one example).

This species is included by Dr. H. L. Clark in the main report immediately preceding these notes.

OPHIOLEPIS SUPERBA *H. L. Clark.*

Two specimens of this brittle-sea-star are in the collection, with disc diameters of 14 to 20 mm. They are from Sir Edward Pellew Group in the Gulf of Carpentaria, and on reef at Low [Woody] Island, off Port Douglas, Queensland.

OPHIARACHNELLA MARMORATA (*Lyman*).

In all, five specimens of this species were secured, two of which are now in the Museum of Comparative Zoology, Cambridge, Mass., U.S.A. The remaining three have disc diameters of 7 to 16 mm.

Localities.—Sir Edward Pellew Group, Gulf of Carpentaria (one specimen); Port Darwin, North Australia (two specimens out of a total of four previously in the Australian Museum collection).

OPHIARACHNELLA INFERNALIS (*Müller and Troschel*).

There is one small representative of this species in the collection from Port Darwin, North Australia, with a disc diameter of 9 mm.

OPHIOCHASMA STELLATA (*Lütken*).

A solitary example of this pentagon-disc'd species was gathered on the reefs at Low [Woody] Island, off Port Douglas, Queensland. Disc diameter, 14 mm.

OPHIOTHELA *sp.*

After careful examination by Dr. H. L. Clark, numerous juvenile examples of this genus in the collection are considered to be probably referable to *O. danae* Verrill. They are undoubtedly *Ophiothela*, but are too immature for certain identification of the species.

Locality.—Sir Edward Pellew Group, Gulf of Carpentaria; found clinging to the stems of the same alcyonarian (? *Iciligorgia*) which harboured the examples of the crinoid *Oligometra carpenteri* (Bell) supra.

OPHIOPLOCUS IMBRICATUS (*Müller and Troschel*).

Two examples of this form in the collection are from Sir Edward Pellew Group, Gulf of Carpentaria. One of these is now in the Museum of Comparative Zoology, Cambridge, U.S.A.; the remaining specimen measures 14 mm. across the disc.

OPHIACTIS SAVIGNYI (*Müller and Troschel*).

A total of ten specimens of this species was obtained; three of them are now in the Museum of Comparative Zoology, Cambridge, Mass.,

U.S.A. The balance of specimens before us have disc diameters ranging from 5 to 8.5 mm.

Localities.—Port Darwin, North Australia (9 specimens); from pores of sponge taken from the railway pier at the same place (one damaged specimen).

OPHIOTHRIX LONGIPEDA (Lamk.).

Six well preserved specimens of this curious form occur in the collection, one of this total being now in the collection of the Museum of Comparative Zoology. The disc diameter of the five remaining examples before us ranges from 10.5 to 20.5 mm. in their present contracted condition. One long arm of the largest example measures approximately 460 mm.

Localities.—Amongst coral on reef at High Island, Queensland, 17.7.1924 (two specimens); Sir Edward Pellew Group, Gulf of Carpentaria (one specimen); Port Darwin, North Australia (three specimens, two of which were secured in the pores of the same sponge as the damaged specimen of *Ophiactis savignyi* (supra)).

OPHIOTHRIX STELLIGERA Lyman.

There is one dry individual species in the collection with unusually long arm spines. Disc diameter 6 mm.

Locality.—Port Darwin, North Australia.

OPHIOTHRIX SMARAGDINA Studer.

A unique dry example of this species is in the collection from Port Darwin, and has a disc diameter of 15 mm.

OPHIOTHRIX MARTENSI AUSTRALIS H. L. Clark.

In all, three examples of this form were collected, one of which is now in the possession of the Museum of Comparative Zoology, Cambridge, Mass., U.S. America. The two specimens before us have disc diameters of 5 and 10 mm.

Locality.—Port Darwin, North Australia.

ECHINOIDEA.

PERONELLA LESUEURI (Agassiz).

One small adult specimen (bare) of this species measures 72 x 67 mm., and was secured on a tidal flat at the south west of Vanderlin Island, Sir Edward Pellew Group, Gulf of Carpentaria; 26 May, 1923.

Another smaller specimen (bare), with apical disc wrecked, and measuring 40 x 36 mm., can be referred only doubtfully to this species, which it appears to approach more closely than others. It was collected on Oyster Cay, Great Barrier Reef, Queensland.

A third specimen (bare) measuring 28 x 25.5 mm. is probably a young *lesueuri*, but is too much damaged to make identification certain. This specimen was collected with a series of the next species listed (*P. orbicularis*), all being washed up on the shore of Paradise Bay, North Island, Sir Edward Pellew Group, Gulf of Carpentaria.

PERONELLA ORBICULARIS (*Leske*).

A series of six examples of this species measuring 23.5 x 23 to 32 x 30 mm. are bare and bleached, but quite typical of the form. They were found washed up on the shore of Paradise Bay, North Island, Sir Edward Pellew Group, Gulf of Carpentaria. Two of the series are now in the Museum of Comparative Zoology, Cambridge, Mass., U.S. America, the balance being stored in the Australian Museum.

The species is already known from the above region.

LAGANUM DEPRESSUM *Agassiz*.

Eight examples in the collection, ranging from 38.5 x 51 to 57.4 x 71.5 mm., agree perfectly with the characters given by H. Lyman Clark in his keys to the Laganidae and to the genus *Laganum*¹. They were collected alive on a sand flat at low tide—Low [Woody] Island, off Port Douglas, Queensland.

Judging from the number of representatives of this species in the collection of the Australian Museum, it appears to be a very common inhabitant of the Queensland coast.

ARACHNOIDES PLACENTA (*Linn.*).

Two specimens (bare) of this form were secured on a tidal flat at the southwest of Vanderlin Island, Sir Edward Pellew Group, Gulf of Carpentaria. They measure 61 to 69 mm., one of the examples is now in the collection of the Museum of Comparative Zoology, Mass., U.S. America.

Seven specimens (collected alive) on a tidal sand flat in Paradise Bay, North Island, Sir Edward Pellew Group, Gulf of Carpentaria, measure 38 to 49 mm. Two of these examples are now in the collection of the Museum of Comparative Zoology, Mass., U.S. America.

Another wrecked specimen (bare) measures approximately 60 mm., and was found washed up on the shore at Paradise Bay, North Island, Sir Edward Pellew Group, Gulf of Carpentaria.

The species is known from the regions indicated.

MARETIA OVATA (*Leske*).

This well known and delicate-spined Queensland species is represented in the collection by five examples (48 x 39 to 50 x 43 mm.) secured alive by dredging in 15 fathoms amongst seaweed on a sandy bottom—Northeast Bay, Great Palm Island, near Port Denison, Queensland.

Another bare test measuring 61 x 52 mm. was secured on Oyster Cay, Great Barrier Reef, Queensland.

TRIPNEUSTES GRATILLA (*Linn.*).

Three examples of this typical Queensland form (69 to 110 mm., not including spines) were secured alive at High Island in the Frankland Group, Great Barrier Reef, Queensland; the two smaller specimens from the lagoon sand flats at low tide, the larger from a sandy bottom pool on 15.7.1924.

Three bare tests of the same species (85 to 113 mm.) were also collected on the reefs at Low [Woody] Island, off Port Douglas, Queens-

¹Clark—Mem. Mus. Comp. Zool., xlvi, 1, 1914, pp. 44-45.

land. One of these is now in the Museum of Comparative Zoology, Mass., U.S. America.

ECHINOMETRA MATHAEI (*Bl.*).

(Plate xvii).

Several specimens of this form were collected at the localities enumerated below. The species occurs abundantly throughout the regions indicated.

Sir Edward Pellew Group, Gulf of Carpentaria.—One typical adult (36 x 32 mm., exclusive of spines).

Pearce Island, Queensland.—One bare test 61 x 49 mm.

Low [Woody] Island, off Port Douglas, Queensland; reefs.—two bare tests 56 x 46 to 67 x 56 mm., and one adult 38 x 49 mm. exclusive of spines.

Frankland Group, Great Barrier Reef, Queensland; from burrows in dead coral on the reefs.—one half grown and three typical adults with test measurements ranging from 37 x 26 to 57 x 48 mm.

Some interesting notes on the habits of this species at Lord Howe Island in the South Pacific were made by Ramsay,² and later supplemented by the late Allan R. McCulloch,³ who observed the destructive effect of the urchin on the local clams. Quite recently Mr. A. Musgrave has visited the same island and verifies the former observations with the fine photograph which appears on Plate xvii. He remarks "In the flat coral rock at the back of the reef we came across clams. These were babes in size when compared with the big ones which flourish among the reefs of New Guinea and the Queensland coast; eight inches is the maximum length of the Lord Howe Island species, *Tridacna maxima*, var. *fossor*. They do not exist on the outer edge of the reef, being driven back as a result of the presence of the purple-spined sea-urchin *Echinometra mathaei*, which, like others of its kind, has the habit of tunnelling in the coral rock. Should a clam by any chance lie in the path of a tunnelling urchin it may ultimately be dislodged, and if swept by the waves into a sandy pool—dies."

CENTRECHINUS SETOSUS (*Leske*).

We refer to this species two adult specimens (tests 65 and 103 mm.) which were secured alive in a reef lagoon at Russel Island, Great Barrier Reef, Queensland.

The specimens have spines with a decided reddish brown tinge, and the cuticle on the inter-ambulacral plates of the aboral surface has light whitish patches.

Two bare tests (57 and 69 mm.) were also collected on the reefs at Low [Woody] Island, off Port Douglas, Queensland. One of these tests is now in the Museum of Comparative Zoology, Mass., U.S. America.

The form is well known from the regions indicated above.

A record of the species is also included by Dr. H. Lyman Clark in the main report immediately preceding this paper.

²Ramsay—Australian Museum Memoir ii, 1889, p. 37 (as *Echinometra lucunter*, Leske).

³in Hedley—Rec. Austr. Mus., xiii, 4, 1921, p. 171 (as *Echinometra lucunter*).

CENTRECHINUS SAVIGNYI (*Michelin*).

Two dark purple specimens (69 and 102 mm.) are referred to this species. The larger example has some of the short oral spines greenish brown at their bases, but the brownish hue of the longer of the fine secondary spines on the test is considered to be due to the dissolving properties of the alcohol fixative used in the killing of this now dry specimen.

Locality.—Russel Island, Great Barrier Reef, Queensland; in reef lagoon.

A record of this species is also included by Dr. H. Lyman Clark in the main report immediately preceding this paper.

EXPLANATION OF PLATE XVII.

A section of the outer edge of the coral reef flat at Lord Howe Island, three hundred miles east of Port Macquarie, New South Wales, showing numerous individuals of the sea-urchin, *Echinometra mathaei* (Bl.). The channel-like tunnels formed by this species are plainly discernible; some of them may be noticed near the clam in the background (page 198).



ANTHONY MUSGRAVE, photo.