

NOTES ON THE OPHIUROID GENUS *TRICHAETER*, WITH A DESCRIPTION OF *T. ACANTHIFER* DODERLEIN.

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(Plate XIII).

The following notes are based on the material of the genus *Trichaster* collected by Lieut.-Col. R. B. S. Sewell in 1913, when employed as Surgeon Naturalist on board the R. I. M. S. "Investigator." Col. Sewell worked on this material for a short time, but owing to pressure of other more important work gave it up. He has very kindly entrusted the entire collection to me with a suggestion to identify the animal specifically and to prepare a diagnostic key by which the known species of the interesting genus *Trichaster* can be distinguished from one another. I have great pleasure in offering my thanks to Col. Sewell for giving me the material and for helpful suggestions and criticisms.

Genus **Trichaster** L. Agassiz, 1835.

In the present state of our knowledge only three species of the genus *Trichaster* are known, viz., *T. elegans*¹ Ludwig, *T. palmiferus* (Lamarck) and the new species recently described by Doderlein as *T. acanthifer*. The last species was based on a single specimen, which its author in 1911 had doubtfully identified as *T. palmiferus*. In 1927, however, he seems to have examined the specimen more closely for he gives its chief distinguishing characters and establishes it as a type of his new species. Doderlein, at the same time, seems to have come to the conclusion that the three species of *Trichaster* are merely varieties and expressed the view that future researches will show that the three species are synonymous. I have examined twenty-two specimens of *Trichaster acanthifer* collected from three different localities and find that it is not only a well-marked species, but is distinguished from the other two on fundamental diagnostic characters. Before I discuss these differences between the three species I propose to redescribe Doderlein's species from fresh material obtained from the Indian Ocean.

Trichaster acanthifer Doderlein.

1911. *Trichaster palmiferus*, Doderlein (in part), *Japan, u. andere Euryalae*, taf. ix, fig. 5.

1927. *Trichaster acanthifer*, Doderlein, *Indopacifische Euryalae*, taf. ix, fig. 1.

¹ Since the preceding note went to the press, a valuable addition has been made to our knowledge of the Ophiuroidea, by the publication of Doderlein's (4) paper on "Die Ophiuroiden der Deutschen Tiefsee-Expedition. 2: Euryalae". The author is led to believe that the species *T. elegans* Ludwig is synonymous with *T. flagellifer* v. Martens, the latter name having already been employed for the species found at Singapore. An examination and description of the two by the author revealed to him no material difference which could justify their separation. Doderlein has therefore retained v. Martens' name *flagellifer* for the species generally referred to as *elegans*, though it is regretted that *elegans*, a far more suitable name, has to be discarded.

In the collection of the Zoological Survey of India *T acanthifer* is represented from the following localities :—

Station.	Date.	Position.	Nature of bottom.	Net.	Depth of net (fathoms).	Number of specimens.
548	21-X	12° 49' 23" N. 98° 23' 30" E.	M. S. Sh. ¹	A. T. ¹	23	8
549	21-X	12° 48' 00" N. 98° 16' 10" E.	M. S. Sh. ¹	A. T. ¹	24	5
554	21-X	12° 47' 30" N. 98° 15' 30" E.	M. S. Sh. ¹	A. T. ¹	24	9

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The above constitute new distribution records for a species which is already known in literature.

In the specimens from station 549 the disc is comparatively small. It is 16 millimetres from the end of a radial shield to the opposite inter-brachial margin and the length of the arm up to the first bifurcation is from 49 to 53 mm. ; the disc is pentagonal owing to its being slightly excavated in the inter-radial spaces and, unlike *T elegans* and *T palmiferus*, more sharply marked off from and slightly raised above the surface of the arms. In the example from station 554 the disc is slightly larger. The collection from this station includes forms which range from very small to very large ones, representing all growth-stages. The disc diameters vary between 10 to 20 mm. and so also do the arm lengths vary. The arms are about five times as long as the disc diameters ; they are long, slender and fairly rigid, slightly higher than wide at the base and quadrangular in transverse section. The width of the arm at the first bifurcation being one-fourth of that at the base.

The spines present on the arms are arranged in two alternating and outwardly directed rows ; they are prolonged and curved in the proximal part of the arm, simple in the middle ; they diminish in length as they approach the tip of the arm and on the distal one-third of the arm the spines completely disappear. In transverse section the arm is distinctly circular in outline.

The disc is also beset with spines like those on the arms. The constancy in the number of disc spines is very striking for there are not more than two at the base of each arm. In general the spines vary in size and, approximately, proportionately to the size of the animal.

The drawings given illustrate the character of the spines at different heights of the arm.

The skin on the dorsal and ventral surfaces of the disc is opaque and granular. The radial shields have the same form as in *T elegans* ; they are narrow, bar-like structures, gently raised and forming ridges with distinct outlines. Their tapering ends do not quite reach the centre, while they are armed with spines near their outer ends. The

¹ M=mud. S=sand. Sh. = shell. A. T. = Agassiz trawl.

lateral arm plates are also expanded at their outer ends as in *T palmiferus* and carry the spines.

I give below some measurements for comparison with the other species.

Disc diameter (largest specimen)—20 mm.

Arms.	Length.	Number of segments.
Base to first bifurcation	56 mm.	34
First to second bifurcation	13 „	13
From second to third bifurcation	11½ „	16
From third to fourth bifurcation	11 „	15
	Breadth.	Height.
Base of arm	8 mm.	6 mm.
Near first bifurcation	2½ „	2½ „

Spines height—3 mm. Width at base— $2\frac{1}{4}$ mm.

Space between a pair of disc spines— $4\frac{1}{2}$ mm.

Oval inter-brachial space—Length 5 mm. Width— $3\frac{1}{2}$ mm.

Bursal aperture, vertical diameter— $2\frac{1}{4}$ mm.

Interval between a pair of bursal apertures—2.5 mm.

The apertures of the genital bursae in the present specimen are situated in an oval space; the openings are elongated oval in outline, a little diverging dorsally and separated by a wide wall along the edges of which are large grains which appear very much like papillae.

Doderlein states that the number of segments up to the first bifurcation on the five arms is as follows:—44, 36, 43, 38 and 44, which is very approximately what obtains in my specimens; this being so it will be seen that very little taxonomic importance can be attached to the number of segments in the arms.

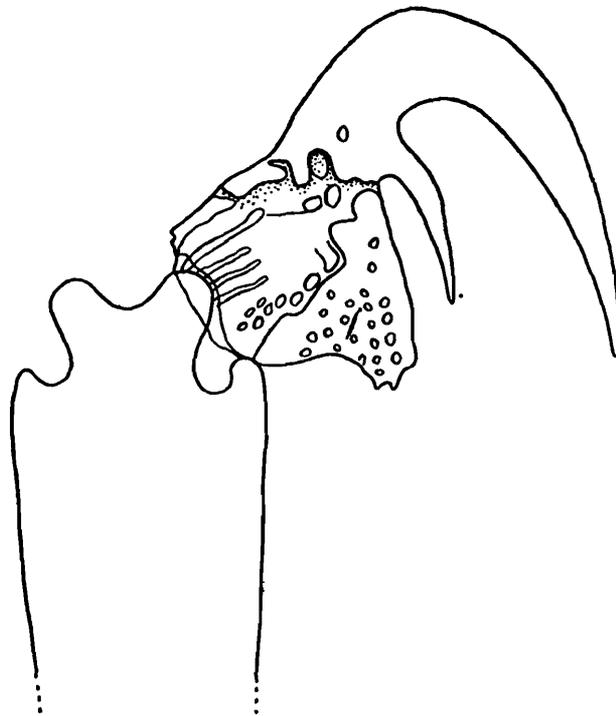
Affinities and distinctive features.—The most important feature in which this species is distinguishable from *T palmiferus*, without referring to minor points of difference, are the very wide space between the inter-brachials, the very widely spaced stigmatal fissures and the presence of very well developed spines. The possession of such well-marked and constant structures, as the spines in the present species, precludes the possibility of its being either *T elegans* or *T palmiferus*.

Doderlein argues that the differentiating characters in the three species of *Trichaster* are so variable and dependent on age and preserving conditions that, if a study of a large number of individuals is undertaken, it will lead to an amalgamation of the three species under one specific name. I have been fortunate in being able to compare this specimen with a specimen of *T elegans* Ludwig (Reg. No. ZEV $\frac{5480}{7}$) from the Bay of Bengal, described by Bomford (1913), and *T palmiferus* (Lamarck) (Reg. No. ZEV $\frac{5481}{7}$) presented to the Indian Museum by Dr. Hungerford who obtained it from Hongkong. My examination of twenty-two (mostly mature) individuals confirm my determination and afford evidence that the three species, though closely allied, are yet in every case sufficiently distinct to be recognisable from their outward form alone by casual observation.

I am not in agreement with Doderlein's views, for *T. acanthifer* has a well-developed combination of characters which have specific significance and accord neither with *T. elegans* nor *T. palmiferus*. *T. acanthifer*, as now recognised and defined, occupies an intermediate position between the already recognised species. It seems evidently to be more closely related to *T. elegans*, which has like itself a large inter-brachial space and well separated bursal apertures, but differs from the latter in the general facies, presence of well-developed spines, character and number of arm bifurcations and other minor characters.

I was able to count only four bifurcations in this species as contrasted with six in *T. elegans*.

The microscopical character of the talons borne on the tentacle-papillae, while agreeing with the type common in the family and figured by Bomford, is distinguished by slightly greater development of the lower branch, which is comparatively more elongated (text-fig. 1).



TEXT-FIG. 1.—Tentacle hooks of *Trichaster acanthifer* Doderlein. $\times 140$.

Key to species of *Trichaster*.

- A. A robust and much more heavily built species; disc circular in outline with the arms merging insensibly into the disc; inter-brachial space narrow, so that the two genital slits are very close together and form a single aperture; arms almost triangular in section with 62 arm joints within the first bifurcation, each proximal arm joint bearing a pair of stumpy tubercles on the dorsal side; arm width at the first bifurcation about one-third of that at the base.

Colour in alcohol.—Whitish or very pale yellow.

T. palmiferus.

- B. A slender, large and elegant species; disc circular in outline with the arms merging insensibly into the disc; inter-brachial space not extremely narrow, so that the two genital slits are well separated from each other; arms quadrangular in section with thirty-nine to fifty-three, usually forty-five, arm joints within the first bifurcation; arms entirely free of stumpy tubercles; arm width at first bifurcation being less than one-fourth of that at the base.

Colour in alcohol.—Space between the radial shields and the grooves in the median-dorsal line of the arms yellowish-brown; the rest light yellow. *T. elegans*.

- C. A slender and comparatively small form ; disc more or less pentagonal in outline and more sharply marked off from the arms ; inter-brachial space as wide as in *T. elegans* and the genital slits rather well separated from each other ; arms quadrangular in section with thirty-four to forty-five, usually thirty-seven, arm joints within the first bifurcation ; arms and disc provided with well-developed spines ; arm width at the first bifurcation being one-fourth of that at the base.

Colour in alcohol.—Uniformly white.¹ *T. acanthifer.*

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¹ Colonei Sewell informs me that the colour of the animal was slaty-grey in the living condition.