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# ON SOME NEW AND LITTLE-KNOWN AUSTRALIAN ASTEROIDS.

By

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(Plates iv-viii.)

Every species referred to herein has been seen by Dr. H. L. Clark, of the Museum of Comparative Zoölogy, Cambridge, Massachusetts, United States of America, to whom I wish to express my sincere thanks for kind advice and assistance. Giving me his tentative opinion in each case where his advice was sought he allowed me every freedom in action, and so greatly do I value his opinion that, in most cases, I have adopted his suggestions after due consideration. As Dr. Clark's time was short when he visited the Australian Museum in November of 1929, he did not have an opportunity to investigate each species fully, so in fairness no blame for error in judgment, should there be any, can be ascribed to him.

Family GONIASTERIDÆ Forbes 1841 (emended).

Sub-family GONIASTERINÆ Verrill 1899 (extended).

*Pseudogoniodiscaster* gen. nov.

*Diagnosis.*—Rays tapering and blunt, moderately wide. Abactinal plates distinct, coarsely granulated, separated, except for faint line-like connecting plates which give the entire abactinal surface a reticulated appearance, by large papular areas. Papular areas with one or two minute pincers. Abactinal interradiial plates enlarged; third from superomarginals the largest. Five large primary radial tubercles on disc forming a pentagon. Small bivalved pedicellariæ on infero- and superomarginal plates. Marginal plates of both series increasing in width from interradius to apex of ray, noticeably so in inferomarginals. Third superomarginal from apex of ray is the widest. The corresponding plate below in the inferomarginal series is slightly narrower, but is either the widest or as wide as any other in its series. Superomarginals and abactinals in some cases bear fairly large tubercles. Tubercles most numerous on superomarginals in interbrachial arc. Actinal surface smoothly granulated. Plates fairly well defined and provided with very large bivalved pedicellariæ as seen in *Hippasteria* and *Anthenea*. Adambulacral armature in three series. Long pincer-like pedicellariæ between spines of adambulacral armature.

*Type.*—*Pseudogoniodiscaster wardi* sp. nov.

*Affinities.*—Many characters possessed by the type species of this genus suggest alliance with both *Goniodiscaster* and *Anthenea*, but neither of these genera could claim *Pseudogoniodiscaster wardi* sp. nov. as a representative. *Goniodiscaster* possesses more characters in common with *Pseudogoniodiscaster* than *Anthenea* or any other known genus of the family Goniasteridæ, and they are as follows: a pentagon of five tubercles on disc; marginal plates of both series

regularly increasing in size from interradius to apex of ray; the median series of abactinal interradiial plates enlarged; bivalved pedicellariæ on both surfaces. Small pincer-like pedicellariæ on papular areas.

The characters possessed by *Pseudogoniodiscaster* distinguishing it from *Goniodiscaster* are as follows: Outlines of abactinal and actinal intermediate plates distinct, most decidedly so on the former mentioned area; papular areas with many papular pores, always more than five to an area, even on ends of rays; actinal surface with very large bivalved pedicellariæ. Not all plates are closely granulated, but only those of marginal series, and even on these the granules are smooth.

The salient feature separating *Pseudogoniodiscaster* from *Anthenea* is the former's lack of a thick skin overlying and obscuring the outlines of the plates. The lack of coarse granules on the actinal plates and marginals and the presence of two types of pedicellariæ instead of only one, the widened bivalve type, further distinguish *Pseudogoniodiscaster* from the genera of the sub-family Antheneinæ.

***Pseudogoniodiscaster wardi* sp. nov.**

(Pl. iv, figs. 1-2; Pl. v, figs. 1-3.)

*Description.*—R. = 77 mm., r. = 37 mm., R. = 2.08 r., Br. ray at base (between interradials) 42 mm. Rays five, flattened both actinally and abactinally; broad and bluntly rounded at tips. Disc large and raised. Interbrachial arcs rounded. The broad rays taper from base towards apex. The abactinal skeleton is made up of a number of plates all more or less uniform in size except those of the median radial and median interradiial series, which are, on the whole, larger than any other plates on the abactinal surface. All, except most of those in the median interradiial series, are connected by faint line-like connecting plates and the plates closest to the superomarginals are connected to these latter in a similar manner. All the plates on the abactinal surface are covered by fairly fine granules. Besides granules, some plates bear well developed tubercles, which are conical and bluntly pointed. All plates on the abactinal surface are provided with from one to six bivalved pedicellariæ which are situated at random between the granules. All abactinal plates are arranged in regular order. Between the interradiial furrows and, omitting the plates of that series, there are seven series of plates. These are made up of the median radial series and three lateral series on each side. The median radial or carinal series contains thirteen plates, which are slightly larger than those in the series alongside. The median radial series in each case is interrupted near the top of the disc by one of five large radial tubercles which collectively form a pentagon. These radial tubercles are very large. They are granulated basally and entirely bald on their free extremity. They are round and bluntly pointed. The median radial series of abactinal plates terminate near the tip of the ray between the third and fourth superomarginal. The series next to the median radial contains ten plates and ends towards the tip of the ray between the sixth and seventh superomarginal. The next lateral series in turn contains three or four plates, while the last series contains only two plates. The interradiial furrow is conspicuous. Its plates are four in number; the third from the margin is not only the largest of the

series, but is also the largest on the abactinal surface. The madreporite is large and measures 5 mm. by 6 mm. It is situated at the inner extremity of the interradial furrow and between two of the five tubercles which form a pentagon on the disc.

The abactinal papular areas are sunken below the level of the abactinal plates. They are large and scattered with some regularity between the plates. The papular areas vary in size and shape; sometimes they may be as large in extent as most abactinal plates or, on the other hand, they may be very small. The presence of such papular areas gives the abactinal surface a peculiar mottled appearance. The number of pores in the papular areas ranges from eight to thirty-eight. Minute pincer-like pedicellariæ occur in ones or twos on the papular areas. The papular areas are granulated.

The marginal plates of both series increase regularly in size from the interradius to the apex of the ray. The third superomarginal plate from the apex of the ray is swollen, and is the widest in either series. The plate corresponding to the fourth superomarginal in the inferomarginal series is slightly smaller, though it may be as wide as or even wider than any other plate in its series. The superomarginals are covered by very fine and closely packed granules which give them a smooth appearance. Tubercles varying considerably in size from enlarged granules to conspicuous and rounded bosses occur at random along the superomarginal series. The largest tubercles usually occur on plates in the vicinity of the interbranchial arc. No tubercles or even enlarged granules occur on plates in the inferomarginal series. Small bivalved pedicellariæ occur at random among the granules of both marginal series. These pedicellariæ, however, are, for the most part, confined to plates of the interbranchial arc. Corresponding plates of both marginal series are, in the main, of equal width, but, besides the difference described as occurring in the vicinity of the tips of the rays, there is a difference seen in the narrowness of inferomarginals in the interradius when compared with the superomarginals in that region. Everywhere except near the tips of the rays the inferomarginals project outward beyond the superomarginals, so that they are visible on a vertical view.

Actinal plates clearly defined, decreasing in size as they approach the margin. Plates near margins smoother and more closely granulated than those further in. Nearly all plates, except those near margins, bear very long bivalved pedicellariæ similar to those seen in *Anthenea* and *Hippasteria*. The largest measures 4.5 mm. long and the smallest 2 mm. In isolated cases the pedicellariæ are branched or distorted, thus becoming tri-radiate.

The armature of the adambulacral plates consists of a furrow series of six to seven (usually six) spinelets which are stout and flat-sided. Their length is evenly graded so as to form a fan-like crescent. The middle spinelets are both the longest and thickest. Most are widest at tip, but usually the two smallest spinelets on the lateral extremities of the comb are flattened and sharply pointed. Immediately behind the furrow series is a second series of three to four, usually three, extremely broad and stubby spinelets. The middle spinelet is usually roundly rectangular and is widest at the tip. The lateral spinelets of this second series are a little shorter, though flat-sided like the central spinelet. On the outer margin of the adambulacral plate lies a series of spine-

like granules which are both short and stout. They are arranged in twos or threes, are flat-sided, and in section would appear triangular, rectangular, or diamond-shaped.

Situated near the innermost side of most adambulacral plates, especially in the free half of the ray, lies a pedicellaria which varies both in size and proportion. In some cases these pedicellariæ are higher than wide, and appear like stout spines split longitudinally in half, while in other cases, which are not so common, the pedicellariæ are wider than high and appear like very much raised bivalved pedicellariæ. Sometimes these pedicellariæ take the place of spines in either the second or third adambulacral series.

*Colour*.—Mr. Melbourne Ward, for whom the species is named, states that in life the colour of the specimen was a dark green, abactinally resembling the colour of the weed on which the specimen was found.

*Holotype*.—The holotype is the only known specimen and is housed in the Australian Museum, Sydney.

*Locality*.—Among weed, Rat Island, between Curtis Island and Facing Island, Port Curtis, Queensland; collected by Messrs. M. Ward and W. Boardman, July, 1929.

#### *Ferdina ocellata* H. L. Clark.

(Pl. vi, figs. 1-2.)

*Ferdina ocellata* H. L. Clark, The Echinoderm Fauna of Torres Strait, 1921, p. 60, Pl. vi, fig. 5; Pl. xxxi, figs. 1-2.

There are two specimens in the Australian Museum collection. One is undoubtedly the species described by Dr. Clark, while the other presents characters which make an understanding of the species and its near allies rather difficult. The specimen most like Dr. Clark's species comes from Mer, Murray Islands, the type locality, and was collected there in 1907 by the late Messrs. Hedley and McCulloch. The other specimen was collected near the edge of a coral reef at North-West Islet, Capricorn Group, Queensland. Specimens of the species are by no means common either at Mer or North-West Islet, and this fact renders the collection of a series for comparison very difficult.

The North-West Islet specimen, despite its varying characters, cannot be associated with any other species of the genus. It agrees with the characters set out by Clark (*loc. cit.*) to distinguish his species from closely allied species of the genus, so that its nearest known relative is *ocellata*. Until further specimens are obtained it will not be possible to ascertain the limits of Clark's species or determine whether the specimen from North-West Islet is a variable form of *ocellata* or a totally distinct species.

The measurements of the two specimens before me are:

Mer, Murray Islands specimen—R. = 42.5 mm., r. = 12 mm., R. = 3.5 r., Br. ray at base (between the first and second superomarginals) 11.25 mm., R. = 3.6 br.

North-West Islet specimen—R. = 42 mm., r. = 12 mm., R. = 3.5 r., Br. ray at base (between first and second superomarginals) 12 mm., R. = 3.5 br.

It is of interest and importance to note that Clark's holotype and the two present specimens are all about the same size.

Following is a review of the characters possessed by the North-West Islet specimen and differing from those set out by Clark (*loc. cit.*) for his specimen and also from those of the specimen before me from Mer, Murray Islands.

Superomarginal plates 18 to 20 instead of 13 to 15. Superomarginal series most irregularly arranged and in no way alternately arranged as described by Clark and exhibited by the specimen from Mer before me. The first superomarginal of each series not enlarged and its adjoining fellow, although closely placed, does not assist in "forming a conspicuous area on the interradial margin of disk" as described by Clark. Superomarginals much smaller than indicated by Clark or shown on the present specimen from Mer. There are 18 to 24 inferomarginals as against 16 to 18 on Clark's specimen and the other one from Mer. Inferomarginals not regularly placed. Abactinal plates, on the whole, larger than those seen on the present specimen from Mer. Bare plates scarce on abactinal surface; none confined to distal half of each ray or arranged either as depicted by Clark or as seen on the specimen from Mer.

*Colour.*—Colour in life not noted. Colour when dry after preservation in alcohol is:

Mer, Murray Islands, specimen, dark cream abactinally, paler actinally. Deep orange-brown along abactinal interradial furrows.

North-West Islet specimen, pale biscuit yellow actinally and abactinally. Bright orange in the vicinity of interradial areas.

*Localities.*—Mer, Murray Islands, Torres Strait; collected by the late Messrs. C. Hedley and A. R. McCulloch, 1907. Near edge of coral reef between tide marks, North-West Islet, Capricorn Group, Queensland; collected by Messrs. M. Ward and W. Boardman, 1929.

#### *Ophidiaster confertus* H. L. Clark.

*Ophidiaster germani* Etheridge Jun. (*non* Perrier), Austr. Mus. Memoir, ii, 1, 1889, p. 39.

*Ophidiaster germani* H. L. Clark (*non* Perrier), Austr. Mus. Memoir, iv, 1909, pp. 519, 520 and 529.

*Ophidiaster confertus* Coleman, MS.

*Ophidiaster confertus* H. L. Clark, Biological Reports, "Endeavour," iv, 1916, p. 53, Pl. xv, figs. 1-2.

*Ophidiaster confertus* H. L. Clark, Echinoderm Fauna of Torres Strait, 1921, p. 83.

As the history of this species has become a little involved it has been considered necessary to review the literature and make it more readily comprehensible. Additional records as to the occurrence of this species are given below.

*History.*—The first mention of the species was made by Etheridge Jun. (*loc. cit.*) under the name *Ophidiaster germani* Perrier. This wrongly identified specimen is before me and is undoubtedly *Ophidiaster confertus*.

In 1909 Clark (*loc. cit.*) referred to *Ophidiaster confertus* also under the name *Ophidiaster germani*, but made known his doubt as to the validity of his identification. Clark's "Thetis" specimen is also before me labelled in that author's handwriting as *Ophidiaster germani*. There is no doubt that this specimen is, like Etheridge's, *Ophidiaster confertus*.

Coleman evidently realised that *Ophidiaster germani* of Etheridge and Clark was not the species intended by Perrier and applied the manuscript name

*Ophidiaster confertus* to some specimens in the collection of the Australian Museum. The name was never published by Coleman.

It fell to Clark in 1916 to publish a name for the species, when he used for the purpose some Lord Howe Island specimens sent him by the authorities of the Australian Museum with the "Endeavour" collection of echinoderms.

The last published reference to the species was made by Dr. Clark in 1921 when dealing with his Torres Strait material. In this work he states that the species is as yet known only from Lord Howe Island. It may be well to mention that Dr. Clark<sup>1</sup> considers that *Ophidiaster germani* Perrier is a synonym of *Ophidiaster cribrarius* Lütken. Dr. Clark states that the colour in life of *Ophidiaster confertus* has not been recorded, but Etheridge (*loc. cit.*) states that it is "a dull red colour".

*Localities.*—Lord Howe Island, South Pacific.

The specimens in the Australian Museum collection are:

2 specimens from Long Reef, Collaroy, on coast about 7 miles north from Port Jackson, New South Wales. Collected by M. Ward, 1927.

R. = 87 mm., R. = 54 mm.

1 specimen from Shellharbour, south coast of New South Wales, between tide marks. Collected by G. McAndrew.

R. = 30 mm.

1 specimen from Little Bay, about 6 miles south of Port Jackson, New South Wales, between tide marks, under stones.

R. = 82 mm.

1 specimen from North-West Islet, Capricorn Group, Queensland. Collected by Messrs. Ward and Boardman, July, 1929.

R. = 115 mm. (ray curled).

#### *Nardoa mamillifera* sp. nov.

(Pl. vii, figs. 1-5.)

*Description.*—One single dry example, R. = 63 mm., r. = 11 mm., br. ray at base (exclusive of tubercles) 14 mm. Judging by the three-rayed abnormal specimen before me it appears that, when normal, the species possesses five rays. The disc is small and slightly elevated. Interbrachial arcs acute. The rays taper slightly, though distinctly, towards their tips and are semi-circular dorsally and flattened ventrally.

The abactinal skeleton is composed of a number of plates which are extremely variable in both size and shape. Moreover, they exhibit no systematic arrangement. The largest plates are in the form of large rounded tubercles as seen in *Nardoa frianti* Koehler.<sup>2</sup> These tubercles are clothed in granules which are quite visible to the naked eye, particularly in the central areas where they are largest. The large abactinal tubercles measure as much as 4 mm. in diameter, but others, which are smaller, are in the vicinity of 2.5 to 3.5 mm. Still smaller tubercles are scattered at random between their bigger fellows and measure between 1.5 to 1.75 mm. across. These smaller tubercles are most numerous

<sup>1</sup> H. L. Clark.—Echinoderm Fauna Torres Strait, 1921, p. 77.

<sup>2</sup> Koehler.—Indian Museum Asteroidea, 1910, p. 158, pl. xvii, figs. 3-4.

in the region of the ray tips. The entire abactinal surface is covered by coarse and spaced granules of varying sizes. Between the granules the papular pores occur either in lines, circles, or in groups of from ten to twelve. The pores are more numerous on the disc than elsewhere. The madreporite is small and somewhat diamond-shaped; 1 mm. wide. It is situated on the side of a medium-sized tubercle on the disc. It lies in the interradius about half way between the centre of the disc and the margin.

The actinal surface is made up of three regular series of plates counting the inferomarginal series. Every plate of the three series is covered by a number of stout well spaced granules, the biggest of which occur in the centre of the plate. Whether big or small, each granule is slightly elongate and straight-sided, thus making a section appear roundly pentagonal or square. The largest elongated spinelet-like granules occur on the adambulacrals. The first series of ventral plates, the adambulacrals, are arranged in a regular order. Most plates in this series are rectangular in shape, slightly ovate, their width being about half their length. They are, for the most part, the smallest plates on the actinal surface. Their greatest number, before they are displaced by the inferomarginals near the tips of the rays, is 37. The lowest number counted is 23. The difference in the number of the adambulacrals is due to the fact that in some series they are both large and small, the biggest sometimes equalling an inferomarginal plate in size. A second series of actinal plates occurs between the adambulacrals and the inferomarginal series. There are four plates in each of these second series, which commence at the base of the ray. They terminate at either the second or third inferomarginal counting from the basal end. In size the plates of the second ventral series are a little larger than an average adambulacrals plate.

The inferomarginal series contains the largest plates on the actinal surface, although some, as indicated above, are only as big as a small adambulacrals. The greatest number of plates counted in an inferomarginal series was 35 and the least 25. The largest inferomarginal plate on the specimen measured 2.5 mm. in width. Actinal papular pores are fairly numerous and are arranged both in groups and lines between the regular series of plates. The superomarginal plates are in a more or less regular series. They are well spaced in some places, while in others they are placed close together. In size they vary greatly, measuring anything between 4 mm. and 1.75 mm. in width.

The armature of the adambulacrals plates consists of a furrow series of 4 to 5 (usually 4) stout, flat-sided, long and bluntly pointed spinelets. They are all of approximately the same length. A fifth (or sixth, as the case may be) small and ill-developed, though wide and flattened spinelet, usually occurs on the inner corner of the plate. Each furrow comb is arranged obliquely, with the result that each overlaps its immediate neighbour. Immediately behind the furrow series is a second row of 3 to 4 spinelets, which are, in the main, on a level with those of the furrow series, but differ in being considerably thicker. Like those of the furrow series, the spinelets of the second series are noticeably flat-sided. The central one or pair of this second series is always the thickest. On the outer margin of the plate are 3 to 4 slightly smaller though well-defined spinelets which constitute a third series. These, like the two inner series, are flat-sided and appear like square columns with blunt rounded tips.

*Colour*.—The colour of this species in life is unknown. After preservation in 75% alcohol and dried the colour is pale biscuit yellow.

*Holotype*.—The holotype, the only known specimen, is housed in the Australian Museum, Sydney.

*Locality*.—Mer, Murray Islands, Torres Strait; collected by the late Messrs. C. Hedley and A. R. McCulloch in 1907.

*Affinities*.—The only known species approaching *Nardoa mamillifera* is *Nardoa frianti* Koehler (*loc. cit.*). *Nardoa mamillifera*, however, can be easily distinguished from Koehler's species by the arrangement of the actinal intermediate plates, which is by far the most distinctive character.

*Remarks*.—The single specimen before me has, during its life, been deprived of what would seem to be two rays. This, incidentally, is a common occurrence among members of the genus *Nardoa*. The three remaining rays, however, show the species to be quite distinct from any known members of the genus and well worthy of separation. Dr. Clark has informed me that he has never before seen a *Nardoa* with such characters.

*Nardoa mamillifera* is the fifth species of the genus to be recorded from the Torres Strait region. The other four are *Nardoa pauciforis* von Mart., *N. novaealedoniae* Perrier, *N. mollis* de Loriol and *N. rosea* H. L. Clark.

#### *Tamaria fusca* Gray.

(Pl. viii, figs. 2, 5.)

*Tamaria fusca* Gray, Ann. Mag. Nat. Hist., vi, 1841, p. 283.

*Tamaria fusca* H. L. Clark, The Echinoderm Fauna Torres Strait, 1921, p. 89, Pl. xxviii, figs. 1-2 (and synonymy).

A specimen of this species which agrees well with Fisher's<sup>3</sup> notes and figures is before me and forms a new record for the species. Further, its structure shows little or no variation from the characters described and depicted by Fisher, thus proving that, in some cases at least, specimens from widely separated localities can be constant in form.

The present specimen measures: R. = 50 mm., r. = 9 mm., R. = 5.5 r. As the species is said by Clark (*loc. cit.*) to be very variable, figures of the present specimen have been submitted in order to illustrate the similarity between it and Fisher's Philippine specimens. These latter, according to Fisher, "appear to be fairly typical examples of the species".

*Locality*.—Dredged in 9 fathoms off Lindeman Island, Whitsunday Passage, Queensland, 1929; collected by Mr. Melbourne Ward. (Since this paper was written further specimens have come to hand which affect the status of this specimen. Details will appear in report on Asteroidea of British Great Barrier Reef Exped., 1928-1929.—AUTHOR.)

#### *Tamaria tuberifera* (Sladen).

(Pl. iv, fig. 3; Pl. viii, figs. 1, 3, 4.)

*Ophidiaster tuberifer* Sladen, Voy. "Challenger," Zool., xxx, 1889, p. 404, Pl. lxx, figs. 1-4.

<sup>3</sup> Fisher.—U.S. Nat. Museum, Bull. 100, 1919, p. 388, pl. 95, figs. 5-5a-c; pl. 103, fig. 4; pl. 104; fig. 1; pl. 111, figs. 5-6.

*Ophidiaster tuberifer* Fisher, U.S. Nat. Museum, Bull. 100, 1919, p. 393.

*Tamaria tuberifera* H. L. Clark, Echinoderm Fauna Torres Strait, 1921, p. 90, Pl. viii, fig. 1.

No hesitation whatever is experienced in referring two specimens before me to this species. As was the case with Fisher's material, only two specimens are present for examination, a large one and a very small one.

The smallest specimen measures: R. = 22 mm., r. = 4 mm., br. ray at base 4 mm. It was dredged off Peak Point, north Queensland, 3-6 fathoms.

Like Fisher's smallest specimen the present small one before me lacks the usual large number of papular pores to an area, there being usually only three to six. Only single pores occur near the tips of the rays.

The adambulacral armature is arranged in three series. Many carinal plates as well as most of the marginals bear the characteristic central tubercle and in all other essential respects it agrees with Sladen's description and figures.

The measurements of the larger specimen are: R. = 66 mm., r. = 11 mm., R. = 6 r., br. ray at base 11 mm. This specimen was dredged in the vicinity of Thursday Island. Semon's specimen (1896) was collected at Thursday Island. The presence of a central tubercle on many of the carinal plates as well as the marginals entirely disposes of the suggestion that only the young of the species bear this character. It is therefore necessary to modify the characters so admirably set out by Clark (*loc. cit.*, p. 88) for the species in the form of a key. The marginal plates of both series are well provided with tubercles, particularly on the free half of the ray.

The papular areas are made up of from 10 to 18 pores, but on the tips of the rays the number of pores is small, usually 3 to 4. The papular areas are characteristically large and well defined.

The spines of the adambulacral armature are in three series and arranged as described by Sladen. The outermost series of spines, which are the largest, grow less in number and are spaced wider apart as they approach the tips of the rays.

Both specimens possess the dark patches of brown on the papular areas and elsewhere as described by Sladen, despite the fact that they have been preserved in alcohol for some months and then dried.

Both specimens possess pedicellariæ, but details in the character of those on one specimen differ from those seen on the other. The larger specimen possesses pedicellariæ with crenulated borders as opposed to the smooth borders inferred by Sladen and described by Fisher (*loc. cit.*). All other characters relating to the pedicellariæ on the larger specimen, are, however, as described and figured by Sladen.

In the smaller specimen the pedicellariæ have smooth borders, thus agreeing with Sladen's and Fisher's remarks.

Fisher's larger specimen is 67 mm. The larger specimen before me is 66 mm. In Fisher's specimen the pedicellariæ have smooth borders. In the larger present specimen the borders are crenulate. It is obvious, then, that the variation is not due to growth, but to individual peculiarity.

*Localities.*—Dredged in the vicinity of Thursday Island, north Queensland, 1928; collected by Mr. Melbourne Ward (larger specimen). Dredged off Peak Point, north Queensland, 3-6 fathoms, rocky bottom, 1928; collected by Mr. Melbourne Ward (smaller specimen).

## EXPLANATIONS OF PLATES.

## PLATE IV.

Fig. 1.—*Pseudogoniodiscaster wardi* gen. et sp. nov. Abactinal view of holotype. (Slightly under natural size.)

Fig. 2.—*Pseudogoniodiscaster wardi* gen. et sp. nov. Adambulacral armature and the pedicellariæ among the spines of the armature. The usual type of bivalved pedicellariæ is also shown close to the armature. ( $\times 4$ .)

Fig. 3.—*Tamaria tuberifera* (Sladen). Abactinal view of smaller specimen, R = 22 mm. ( $\times 2$ .)

## PLATE V.

Fig. 1.—*Pseudogoniodiscaster wardi* gen. et sp. nov. Actinal view of holotype. (Slightly under natural size.)

Fig. 2.—*Pseudogoniodiscaster wardi* gen. et sp. nov. Portion of actinal surface of holotype showing details of plates and pedicellariæ. ( $\times 4$ .)

Fig. 3.—*Pseudogoniodiscaster wardi* gen. et sp. nov. Portion of abactinal surface of holotype showing details of plates and papular areas. ( $\times 4$ .)

## PLATE VI.

Fig. 1.—*Ferdina ocellata* H. L. Clark. Specimen from North-west Islet, Capricorn Group, Queensland, which differs from the holotype in general appearance. Abactinal view. (Slightly over natural size.)

Fig. 2.—*Ferdina ocellata* H. L. Clark. Specimen from Mer, Murray Islands, Torres Strait, which resembles holotype. Abactinal view. (Slightly over natural size.)

## PLATE VII.

Fig. 1.—*Nardoa mamillifera* sp. nov. View of abactinal surface of holotype. (Natural size.)

Fig. 2.—*Nardoa mamillifera* sp. nov. Adambulacral armature of holotype. ( $\times 4$ .)

Fig. 3.—*Nardoa mamillifera* sp. nov. Showing the series of four plates occurring between the adambulacrals and inferomarginals of holotype. ( $\times 2$ .)

Fig. 4.—*Nardoa mamillifera* sp. nov. Details of abactinal plates and papular areas of holotype. ( $\times 2$ .)

Fig. 5.—*Nardoa mamillifera* sp. nov. View of actinal surface of holotype. (Natural size.)

## PLATE VIII.

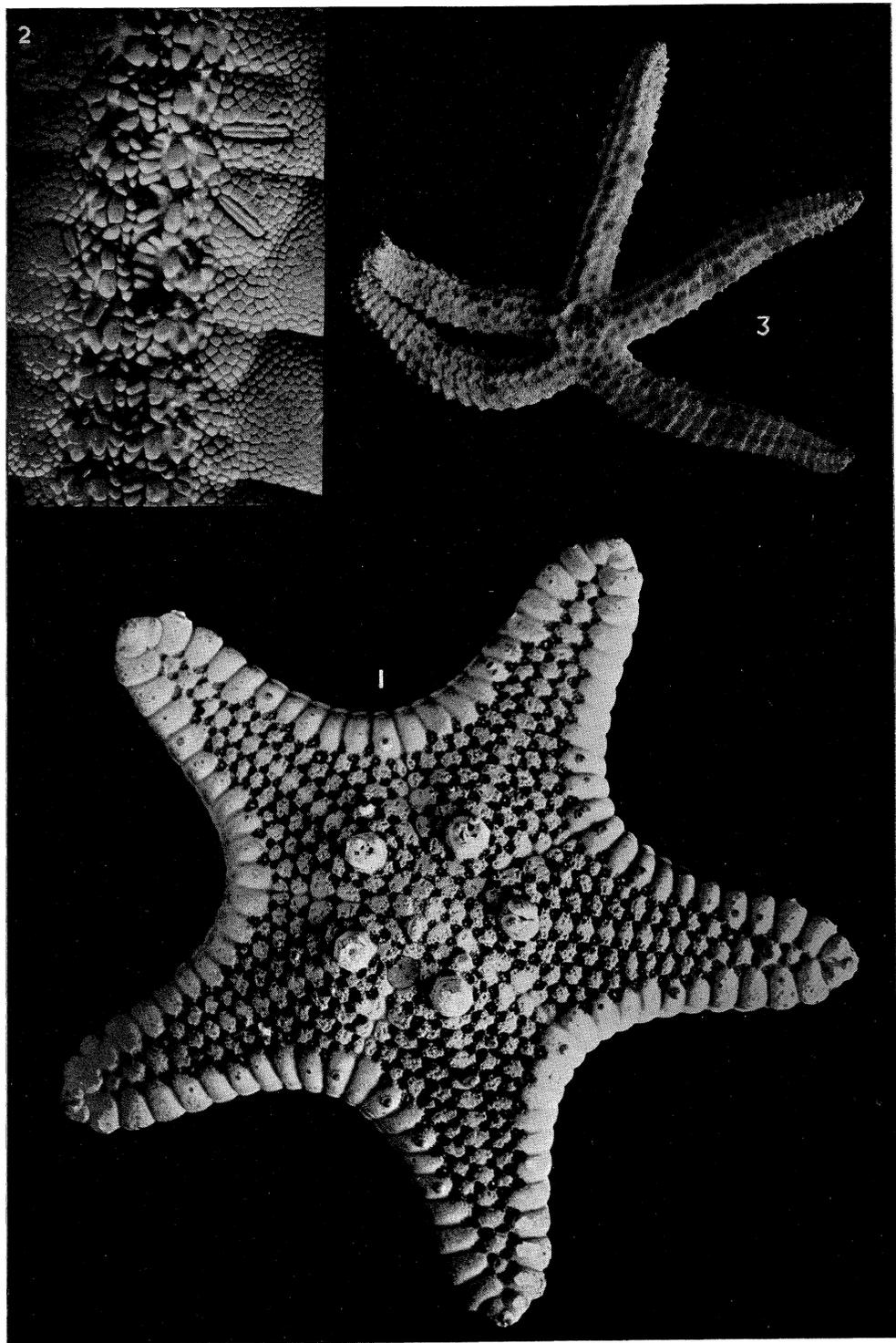
Fig. 1.—*Tamaria tuberifera* (Sladen), Adambulacral armature and surrounding characters of larger specimen. R. = 66 mm. ( $\times 3$ .)

Fig. 2.—*Tamaria fusca* Gray. Portion of actinal surface showing adambulacral armature. ( $\times 3.5$ .)

Fig. 3.—*Tamaria tuberifera* (Sladen). Abactinal surface of three rays of larger specimen. R. = 66 mm. (Slightly under natural size.)

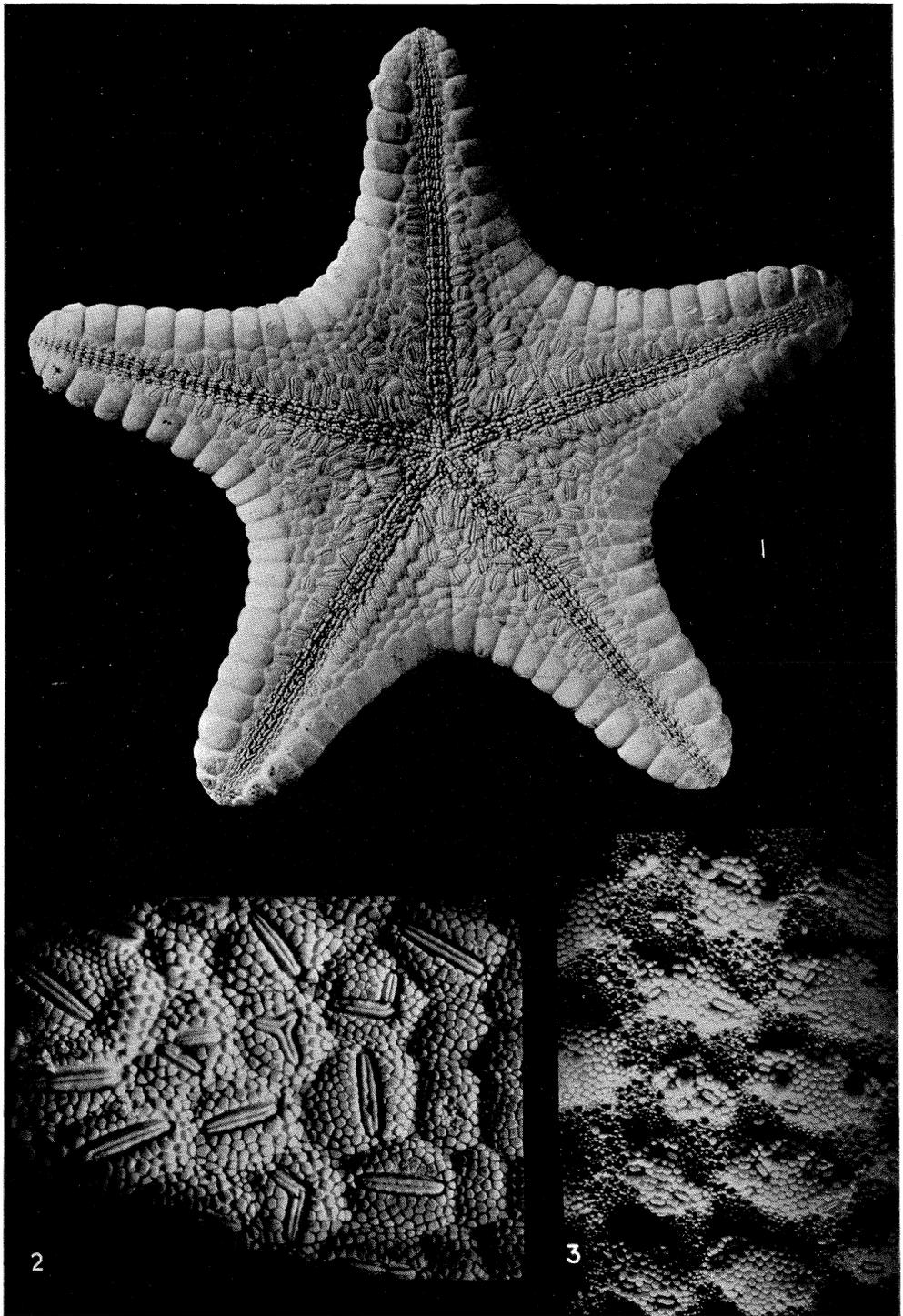
Fig. 4.—*Tamaria tuberifera* (Sladen). Adambulacral armature and associated characters of smaller specimen. R. = 22 mm. ( $\times 3.5$ .)

Fig. 5.—*Tamaria fusca* Gray. Abactinal surface. (Slightly under natural size.)



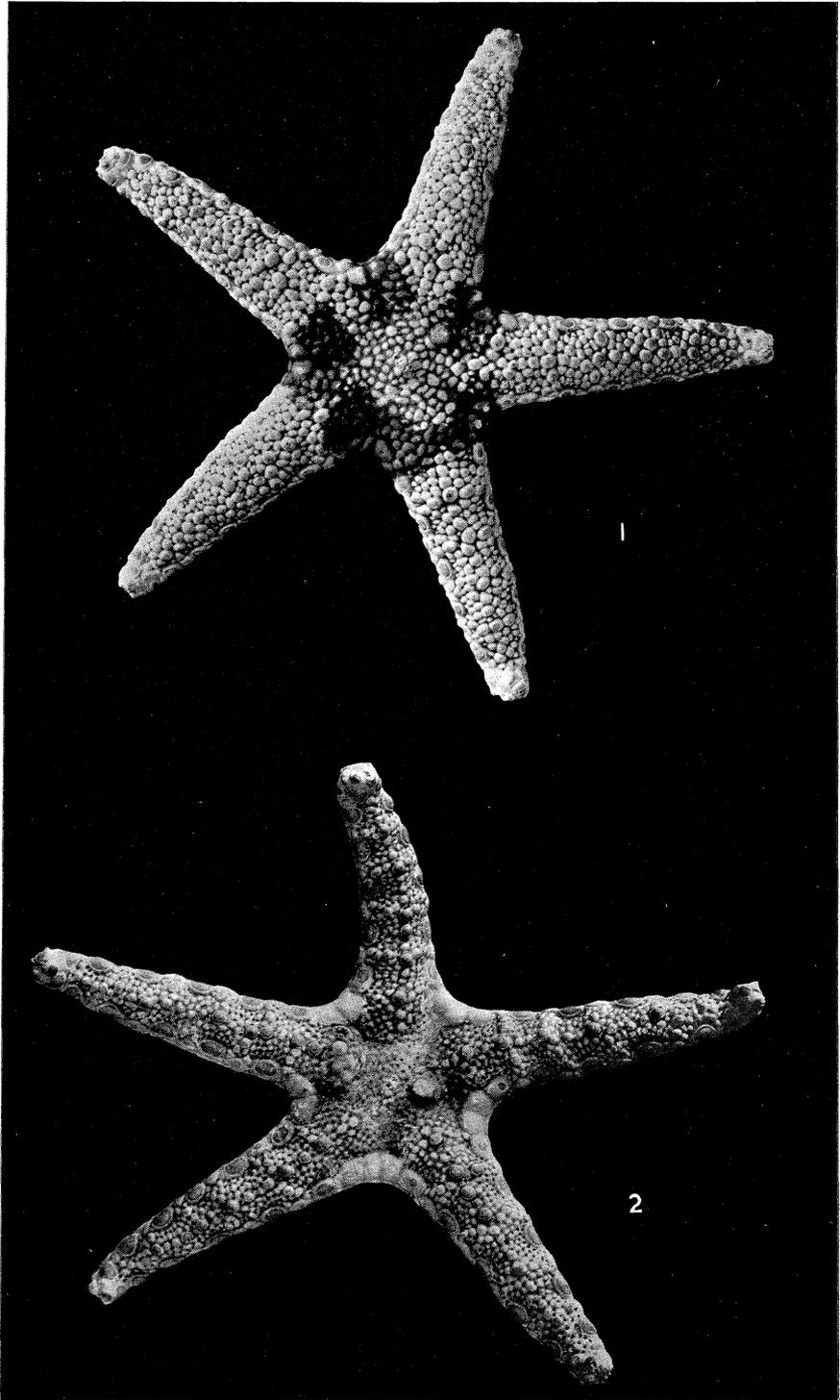
G. C. CLUTTON, photo.





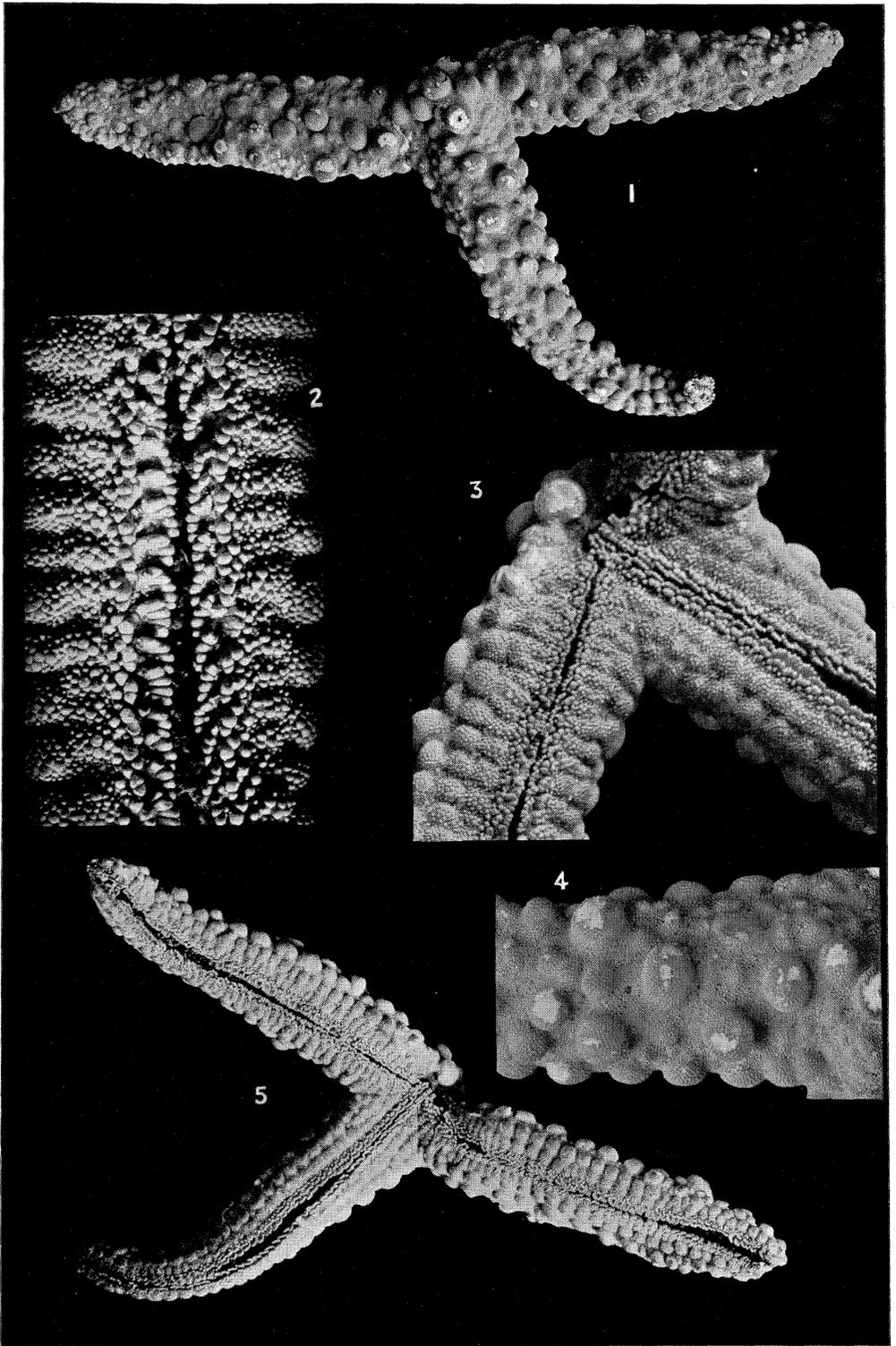
G. C. CLUTTON, photo.





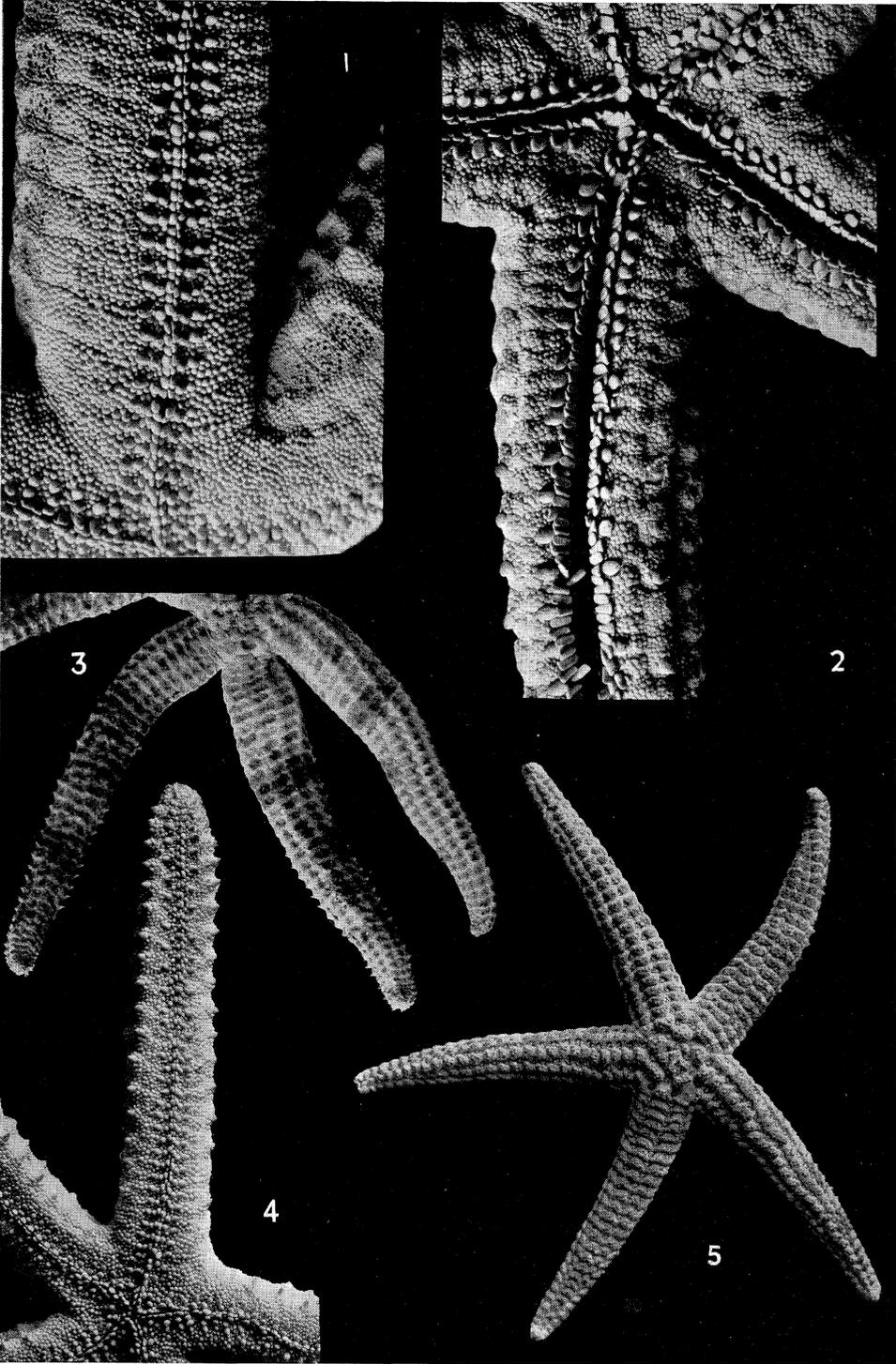
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G. C. CLUTTON, photo.





G. C. CLUTTON, photo.