

NOTES ON THE FAMILY GONIASTERIDAE (ECHINODERMATA: ASTEROIDEA) FROM THE INDIAN SEAS*

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ABSTRACT

In this paper the starfishes *Anthenea regalis* and *A. rudis* are referred to the synonymy of *A. pentagonula*. The identification of Bell (1889) as *A. acuta* refers to *A. pentagonula*. The generic position of *Siraster* is clarified. Only synonymy, discussion, remarks and distribution of the various species are given.

INTRODUCTION

THE Family Goniasteridae is large and cosmopolitan and is represented in the Indian Seas by four genera. They show extraordinary diversity in form and size, most of them are relatively large and conspicuous. The most brilliantly coloured and beautiful starfishes of the Indian Seas are found in this family. The four genera known are separated by the undermentioned key.

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Key to the genera of the family

1. Dorsal skeleton covered by thick skin, outlines of plates not distinct; marginal

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plates massive with large granules; ventral plates with coarse granules and large bivalved pedicellariae....., *Anthenea* Gray, 1840

- 1'. Dorsal skeleton with flat or slightly convex, more or less circular, polygonal or stellate plates covered by granules..... 2
- 2. Body covered by smooth or granular membrane; all plates closely covered by granules, some bearing small tubercles; bivalved pedicellariae absent on the ventral side..... *Goniodiscaster* H. L. Clark, 1909
- 2'. Granulation on the plates either continuous or slightly spaced exposing the glassy knobs on them; atleast distal inferomarginals with a spine or enlarged tubercle at the upper distal ends..... 3
- 3. Radial areas flat, supero-marginal plates forming very broad border..... *Siraster* H. L. Clark, 1915
- 3'. Radial areas distinctly convex; supero-marginals narrower *Stellaster* Gray, 1840

Genus *Anthenea* Gray, 1840

Only one species is known under this genus from the Indian Seas, the other two are considered as synonyms *Anthenea acuta* is a misidentification by Bell (1889).

Anthenea pentagonul (Lamarck)
(Pl. I, A-D)

Asteries pentagonula Lamarck, 1816, p. 554.

Anthene pentagonula:

- Muller & Troschel, 1842, p. 57.
 Perrier, 1875, p. 90.
 Bell, 1888, p. 384; Gulf of Mannar.
 Bell, 1889, p. 6: Palk Bay.
 H. L. Clark, 1915, p. 88: Sri Lanka.
 H. L. Clark, 1938, p. 115: Hong Kong.
 A. M. Clark and Rowe, 1971, pp. 32, 52.

Anthene acuta Bell, 1889, p. 6: Palk Bay (Non *Anthenea acuta* Perrier, 1869, p. 280).

Anthenea regalis Koehler, 1910, p. 82

- H. L. Clark, 1938, p. 115: Madras, Sri Lanka. James, 1969, p. 52: Gulf of Mannar.
 A. M. Clark and Rowe, 1971, p. 32, 52.

Anthenea rudis Koehler, 1910, pp. 86-90.

- H. L. Clark, 1938, p. 116: Mergui Archipelago, Persian Gulf, Sri Lanka.

Anthenea tuberculata James, 1969, p. 52: Palk Bay (Non *Anthenea tuberculata* Gray, 1847, p. 77)

Material: Mandapam (Palk Bay), intertidal, 8 specimens; Tuticorin (Gulf of Mannar), 12-14 metres; 2 specimens, Long Island (Middle Andamans), One large specimen in the Fisheries Museum, Port Blair.

Discussion: The species of this genus seem to grow to large size (R 95-100 mm.) and it is possible that some of the new species described previously were based on small specimens which could well be young forms of other species. Though H. L. Clark (1938) remarked that *A. rudis* is well marked and worthy of recognition the specimens collected from the

Palk Bay (R 24-37 mm.) which resemble *A. rudis* published by Koehler (1910, pl. XI, figs. 4-6) are certainly young forms since the gonads are not developed in them.

Koehler (1910) based his description for *A. rudis* on small forms (R 30 mm). A. M. Clark in A. M. Clark and Rowe (1971) has stated that in case of *A. rudis* R is not known to exceed 40 mm. The type locality of *A. rudis* is given as Mergui Archipelago (Brown, 1910). Both *A. pentagonula* and a small specimen of R 9 mm resembling *A. rudis* were collected from the same place at Tuticorin which goes to prove that *A. rudis* is based on small specimens of *A. pentagonula*.

Anthenea regalis which is reported from the Indian coasts and Sri Lanka is also considered as a synonym of *A. pentagonula*. H. L. Clark (*Op. Cit.*) has already commented that 'the two species of *A. pentagonula* and *A. regalis* are not very clearly separable and they may possibly be identical'. A. M. Clark in A. M. Clark and Rowe (1971) separated *A. pentagonula* from the group of species to which *A. regalis* belongs by the presence of conspicuously bare flat rounded primary plates at the distal parts of the arm. In the group to which *A. regalis* belongs the distal primary plates are said to bear tubercles or enlarged granules. The photographs published by Koehler (1910, pl. ix, (fig. 2) for *A. regalis* also show a few bare flat rounded plates at the distal end of the arms. Conversely some of the distal primary plates have enlarged granules in the present specimens of *A. pentagonula*. It is therefore clear that the presence or absence of bare plates or plates with enlarged granules are certainly due to different modes of preservation and also due to handling. If the specimens are kept dry the distal plates become bare due to rubbing of granules over them and if the specimens are preserved in rectified spirit the

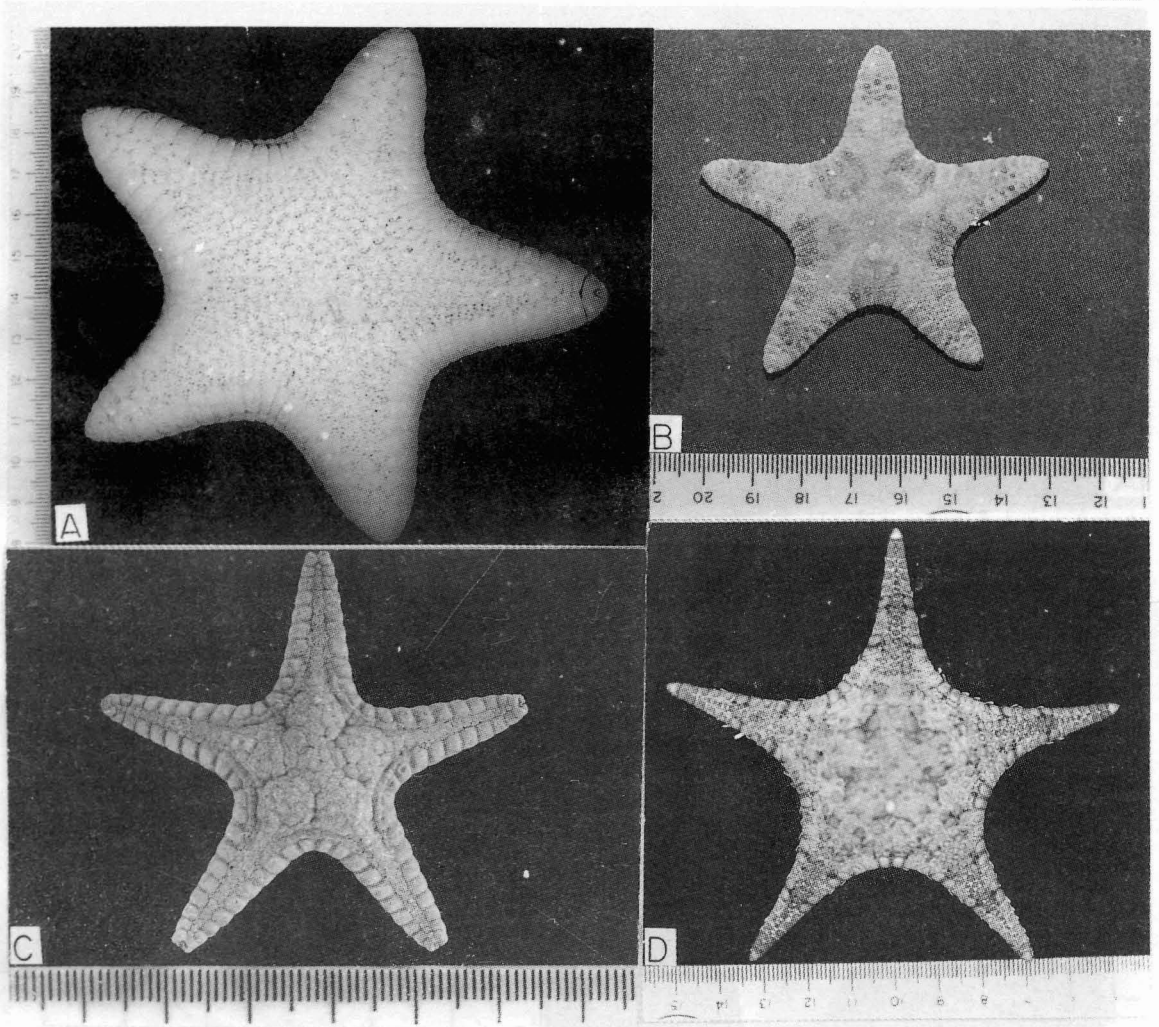


PLATE I A. *Anthenea pentagonula* (Large size, dorsal view) B. *Anthenea pentagonula* (Medium size, dorsal view) C. *Anthenea pentagonula* (Medium size, ventral) D. *Anthenea pentagonula* (Small size, dorsal view)

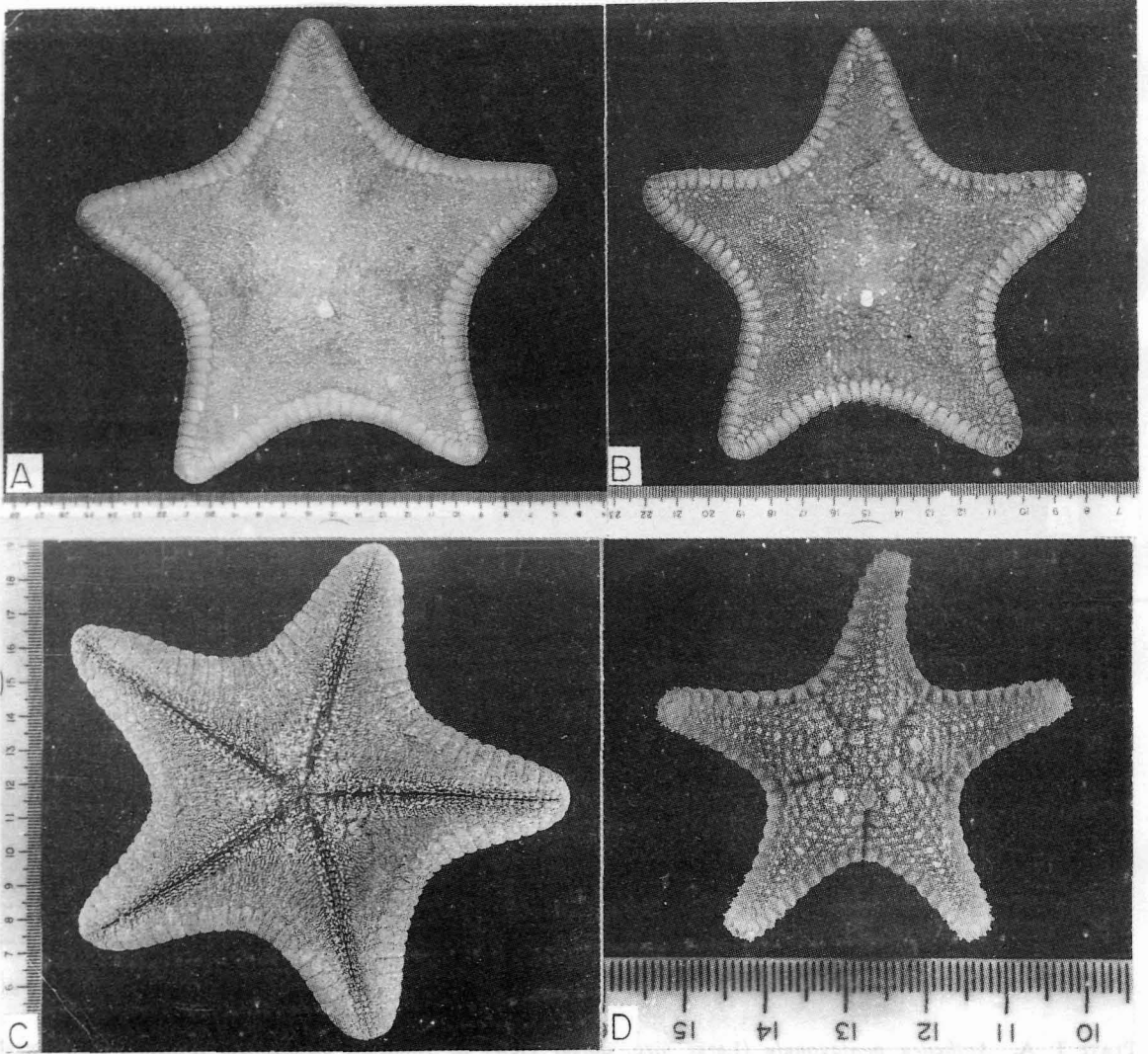


PLATE II A. *Goniodiscaster vallei* (Large size, dorsal view) B. *Goniodiscaster vallei* (Small size, dorsal view).
C. *Siraster tuberculatus* (Dorsal view) D. *Stellaster equestris* (Large size, dorsal view).

granules are in tact. It is interesting to note that both *A. pentagonula* and *A. regalis* are sympatric in distribution at least in part since both of them have been taken from Sri Lanka and from the Bay of Bengal.

Anthenea acuta is known only from North Australian waters. Its record from Rameswaram (Palk Bay) by Bell (1889) is certainly a misidentification probably referable to *A. pentagonula* which is distributed in the Gulf of Mannar and Palk Bay. H. L. Clark (1938) has stated that young individuals have relatively longer arms. The R/r ratio is 1.6 for younger forms (Pl. I.D) and 2.5 for older forms (Pl. I, A-C). It is quite likely that Bell (*op. cit.*) would have based his identification of *A. acuta* on smaller forms of *A. pentagonula*.

Distribution: It is known from Persian Gulf, Sri Lanka, Bay of Bengal and China Seas.

Genus *Goniodiscaster* H. L. Clark, 1909

Only one species is known under this genus from the Indian Seas.

Goniodiscaster vallei (Koehler)
(Pl. II, A & B)

Goniodiscus vallei Koehler, 1910, pp. 75-79:
Bay of Bengal, Gulf of Martabar

Goniodiscaster vallei Doderlein, 1935, p. 85:
East Indies. A. M. Clark and Rowe, 1971,
pp. 32, 49.

Goniodiscaster scaber James, 1986, p. 579:
Gulf of Mannar & Palk Bay (Non
Goniodiscus scabar Mobius, 1859, p. 10)
James, 1988, p. 404: Gulf of Mannar.

Material: Tuticorin and Mandapam (Gulf of Mannar), 2 metres, 2 specimens; Ganjam coast and Santapalli (North east coast of India), 3 specimens from Indian Museum labelled as *Goniodiscus froficulatus*.

Growth changes: There are several well marked differences between the large (R 70 mm) and the small (R 38 mm) specimens examined. In

the large specimens the abactinal plates are distinct only on the arms whereas in the small specimen all the abactinal plates including those on the disc are distinct. The supero-marginal plates of the small specimen has a single enlarged granule on each plate whereas in the large specimen three to four enlarged granules are found on the inner margin of each supero-marginal plate. Small bivalved pedicellariae are fairly common in the large specimen and in the small specimen they are rare. In the small specimen the ambulacral spines are arranged in three distinct rows whereas in large specimen they are arranged in two rows.

Distribution: It is known only from the Bay of Bengal and East Indies.

Genus *Siraster* H. L. Clark, 1915
This genus has only one species.

Siraster tuberculatus H. L. Clark
(Pl. II, C)

Stellaster incei Herdman and Herdman, 1904,
p. 141: Sri Lanka. (Non Gray, 1847,
p. 76)

Stellaster squamulosus Koehler, 1910, p. 81:
Bay of Bengal. (Non Studer, 1884, p. 33)

Siraster tuberculatus H. L. Clark, 1915, p. 83:
Sri Lanka.

A.M. Clark and Rowe, 1971, p. 32.

James, 1986, p. 579: Lakshadweep and
Maldives, Gulf of Mannar and Palk Bay,
Sri Lanka.

James, 1988, p. 404: Gulf of Mannar.

Stellaster equestris A. M. Clark and Davies,
1966, p. 598: Maldives.
(Non Retzius, 1805, p. 12).

Material: Mandapam (Gulf of Mannar), 1
Specimen, intertidal.

Description: since this species is little known, a detailed description is presented here. R 27 mm and r 16 mm. R/r 1.7/1. The centre of the disc is slightly raised and the arms are flat. There is a small groove in each interradius.

The aboral plates are more or less round in shape and are of different sizes. They are covered by small granules. The median carinal plates are slightly elevated from the rest and carry two to three enlarged granules on each arm. The interradial plates just adjacent to the supero-marginal plates are slightly elevated. The papulae are mostly confined to the radial areas.

On each side of the arm there are ten supero-marginal plates. The first two plates at the base of each arm are smaller than the succeeding plates which gradually become smaller towards the tip of the arms. The plates are swollen and covered by granules of markedly different sizes.

The first few infero-marginal plates are small and oval in shape. The rest of the plates are almost square-shaped and flat. They are uniformly covered by granules of the same size.

The oral plates are small, round and fewer in number than the dorsal plates. There are only three rows of ventro-lateral plates none of which reach the tip of the arm. The first row of plates reach the third and the second row reaches the second infero-marginal plate. The third row has very small plates reaching the first infero-marginal plate. Papulae and pedicellariae are absent on the ventral side.

The adambulacral armature consists of two rows of spines. The outer row consists of a single spine at the centre, a pedicellaria at the proximal and an enlarged granule at the distal end. The second row consists of six short, flat spines of which the middle ones are the largest.

The oral plates are large and conspicuous. At the centre of each oral plate there are two rows of enlarged granules arranged in an arc. Eight blunt marginal spines are present on each side of the jaw.

Discussion: H. L. Clark (1915) established the genus *Siraster* with some hesitation. He described a new species under *Siraster* viz.,

S. tuberculatus and included *Stellaster squamulosus* in *Siraster*. A. M. Clark in A. M. Clark and Rowe (1971) recognised *S. tuberculatus* under the genus *Siraster* and removed *S. squamulosus* to *Stellaster*. H. L. Clark (*Op. cit.*) remarked 'more important is the fact that neither has characteristic spines on the infero-marginals which is so conspicuous even in very young specimens of *Stellaster*'. This statement appears to be not correct since A. M. Clark (*op. cit.*) in the key separating the species of *Stellaster* has stated that at times there are no spines on the infero-marginal plates in case of *S. equestris*. She has stated in the same work that the supero-marginal plates form a very broad border in case of *Siraster*.

Distribution: This species is known from Maldives, Sri Lanka and Bay of Bengal.

Genus Stellaster Gray, 1840

Two species are known under this genus from the Indian Seas. Only one species is collected and described in this work.

Key to the species of the genus

Granules around the papulae not different from others; infero-marginals with one spine or sometimes none.....*Stellaster equestris* (Retzius, 1805)

Granules around the papulae distinctly enlarged and visible to the naked eye even when R is 20 mm.....*Stellaster squamulosus* Studer, 1885

Stellaster equestris (Retzius)

(Pl. II, D)

Asterias equestris Retzius, 1805, p. 12

Stellaster childreni Gray, 1840, p. 278: China, Japan.

Stellaster equestris Muller & Troschel, 1842, p. 128: Japan.

Koehler, 1910, p. 79: Bay of Bengal.

- Goto, 1914, p. 411: Japan.
 H. L. Clark, 1932, p. 246: Japan.
 Doderlein, 1936, p. 91.
 Macan, 1938, p. 395: Gulf of Oman.
 A. M. Clerk, 1967, p. 39: Red Sea.
 A. M. Clark and Rowe, 1971, pp. 32,49.
 James, 1986, p. 579: Sri Lanka.
 James, 1988, p. 404: Gulf of Mannar.

Stellaster incei Gray, 1847, p. 76.

- H. L. Clark, 1915, p. 94: Sri Lanka.
 Fisher, 1919, p. 326: Philippines.
 H. L. Clark, 1921, p. 29: Torres Strait.
 H. L. Clark, 1938, p. 94: Australia.
 H. L. Clark, 1946, p. 97: Australia.

Material: Numerous specimens, 10-20 metres depth at Madras.

Remarks: The size of the specimen does not seem to have any relation to the number of tubercles. Two specimens having R 36 and 39 mm. are free from tubercles on the dorsal side whereas another specimen with R 37 mm. has a number of tubercles distributed on the radials, carinals and other plates on the interradial areas. In one of the specimens with R47 mm. one or two supero-marginals also have small tubercles.

Distribution: This species is widely distributed being known from the Islands of Western Indian Ocean, Mascarene Islands, East Africa, Red Sea, S. E. Arabia, Persian Gulf, Sri Lanka, Bay of Bengal, East Indies, North Australia, Philippines, China and Southern Japan, South Pacific Islands, Hawaiian Islands.

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