A REMARKABLE NEW SEA STAR FROM JAPAN.

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Lysastrosoma is remarkable for being the only genus known which is very closely related to *Pycnopodia* Stimpson. The latter is one of the most distinct types of Asteriidae found in the north Pacific, and ranges from Unalaska to California (south of Monterey Bay). It is significant to discover its nearest relative on the Asiatic side of the north Pacific.

Genus LYSASTROSOMA Fisher.[1]

Diagnosis.—Rays 5, soft and weak; abactinal skeleton reduced to isolated small spiniferous plates sometimes interspersed with vestigial perforated spineless platelets; marginal skeleton weak; superomorginals well separated, connected by a chain or festoon of small secondary ossicles; alternate superomarginals reduced in size and spineless; inferomarginals diplacanthid, spaced, sometimes connected by 1 or 2 secondary small ossicles; abactinal and marginal spines surrounded by a conspicuous, tough, retractile sheath expanded distally (and bearing numerous small crossed pedicellariae), that of the inferomarginals common to the 2 spines; adambulacral plates monacanthid, the spinelets without pedicellariae; mouth plates broad, with 1 pair of enlarged postoral adambulacral plates in contact; crossed pedicellariae with a conspicuously enlarged tooth on one side of the end of jaw, two or three smaller teeth on the opposite side, and very numerous small teeth on the shank.

Most nearly related to *Pycnopodia* Stimpson but differing in having the marginal plates disconnected or joined only by secondary intermediate marginal ossicles; broad mouth plates and enlarged postoral adambulacral plates; more conspicuous marginal circumspinal sheaths, the inferomarginal being common to two spines; adambulacral plates not sunken below level of inferomarginals; rays 5, not upward of 24.

Type.—Lysastrosoma anthosticta.

[1] Ann. and Mag. Nat. Hist., sec. 9, vol. 10, Dec. 1922, p. 590 (brief diagnosis).

LYSASTROSOMA ANTHOSTICTA Fisher.

Description.—Rays 5. R=63 mm., r=9 mm., R=7r; breadth of ray at base, 8 to 10 mm. Disk small; rays marked off from disk by a slight constriction at base. The whole body is very weak and flabby much as if it had been decalcified. This is due to the absence of a connected abactinal skeleton and also to the very loose connection between the marginal plates. Even the ambulacral and adambulacral plates are rather loosely articulated and the plates themselves are not hard and firm, but rather spongy.

The abactinal skeleton consists of widely separated, entirely disconnected, small irregular or faintly lobed plates, ordinarily from 0.4 to 0.6 mm. in diameter, each bearing a slender acicular spine surrounded by a thick, tough sheath, broadly expanded at the sum-

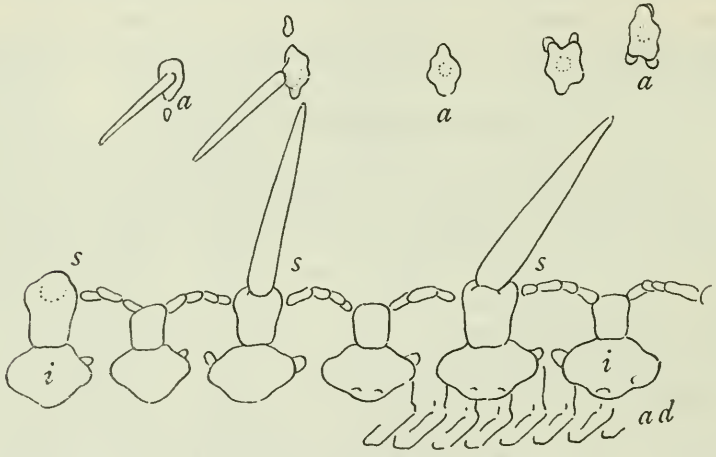


FIG. 1.—LYSASTROSOMA ANTHOSTICTA × 10. MARGINAL AND 5 ABACTINAL PLATES FROM PROXIMAL HALF OF RAY; BASE OF RAY TO THE RIGHT; *a a a*, ABACTINALS; *s s s*, SPINIFEROUS SUPEROMARGINALS; *i i*, INFEROMARGINALS; *ad*, ADAMBULACRALS; SECONDARY MARGINALS SHOWN BETWEEN THE SUPEROMARGINALS.

mit, which is very thickly beset with crossed pedicellariae. These spinelets (1 to 1.5 mm. long) are conspicuously smaller than the superomarginals, and are not at all in regular series. There appears to be the equivalent of about five longiseries, although at the base of some rays the arrangement is far too irregular to admit of exact determination. Scattered all over the abactinal surface, among the spiniferous plates and completely immersed in the integument, are numerous perforated "vestigial" plates of a generally subcircular or elliptic contour, which resemble holothurian plates and are 0.08 to 0.18 mm. in diameter. The skin is rather thickly beset with small, lanceolate straight pedicellariae of several sizes, the number varying in different examples.

Alternate superomarginal plates are spineless and smaller than the spiniferous. While at the very base of the series they touch one

another, over most of the ray they are spaced, and are connected by a curious festoon of small intermediate ossicles, as indicated in figure 1. The alternate and larger subquadrate superomarginals carry a conspicuous acicular spine about 3 mm. long, with a tough sheath expanded and convex at the summit, which usually hides the tip of the spine and is thickly covered with crossed pedicellariae. On the outer part of the ray the vestigial intermediate ossicles disappear entirely, while the marginals become very small (fig. 2).

The inferomarginal plates, which are also disconnected except at the base of the ray, each carry two equal, somewhat flattened, blunt or truncate, stout spines (subequal to the superomarginal) involved in a single sheath, which generally exceeds the spines in length and has an expanded convex summit closely beset with crossed pedicellariae. Vestigial intermediate ossicles subtend the ends of many of

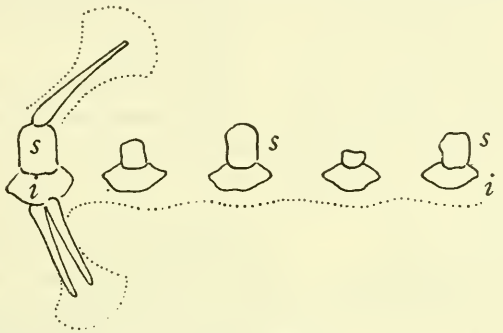


FIG. 2.—LYSASTROSOMA ANTHOSTICTA × 10. MARGINAL PLATES FROM NEAR TIP OF RAY; BASE OF RAY TOWARD LEFT; NOTE ABSENCE OF CONNECTIVES; *s s s*, SPINIFEROUS SUPEROMARGINALS; *i i*, INFEROMARGINALS.

the proximal inferomarginal plates but disappear entirely on the outer half of ray (figs. 1 and 2).

Adambulacral plates small, thin, the surface sunken somewhat below that of the inferomarginal plates which overlap them. The single spine is slender, a trifle tapered, blunt, or else untapered and subtruncate, and devoid of pendent pedicellariae. Small pedunculate, lanceolate pedicellariae occur on the furrow face of the plates.

Papulae large, numerous, in ill-defined longitudinal bands abactinally, and several to each intermarginal mesh. None actinal.

Actinostome not at all sunken. Mouth plates prominent with usually two chisel-shaped, actinostomial spines shorter than length of plate, and one similar, or more tapered, suboral spine, near the outer end of plate. The lateral or outer actinostomial spine bears a flap of tissue covered with numerous very small, lanceolate, straight pedicellariae. The first pair of postoral adambulacral plates is enlarged and in contact interradially; the second pair is widely sepa-

rated. The median suture of the first pair of plates is shorter than that of the oral plates (fig. 3).

Ambulacral furrows wide, with large, very crowded, quadriserial tube-feet. The ampullae are single and very large. The furrow widens at the base, in a very characteristic way, for the length of the first 8 to 12 ambulacral plates. The first two combined ambulacral ossicles are conspicuously enlarged; the others are very thin, and the pores are in four distinct series. Actinostome large and apparently very flexible. The nerve cord of each ray widens abruptly as it approaches the actinostome, and the circumoral cord, or fold, is conspicuous.

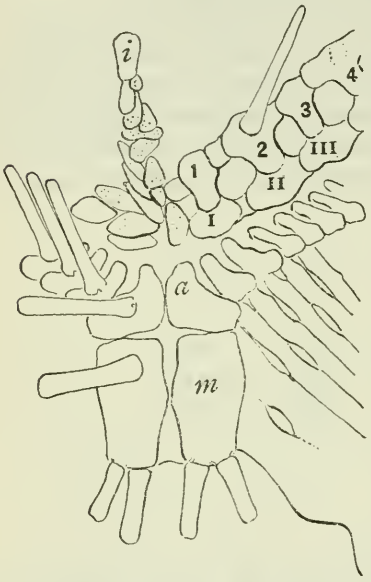


FIG. 3.—LYSASTROSOMA ANTHOSTICTA × 10. DIAGRAM OF PLATES OF MOUTH ANGLE. *1–4*, FIRST FOUR SUPEROMARGINALS; *I–III*, FIRST THREE INFEROMARGINALS; *i*, PROBABLE PRIMARY INTERRADIAL PLATE; *m*, MOUTH PLATE; *a*, FIRST, ENLARGED ADAMBULACRAL PLATE.

The madreporic body, sometimes invisible, is situated near the edge of the disk and surrounded by several spinelets.

Small crossed pedicellariae (0.2 to 0.22 mm. long) are situated, as detailed above, on the distal surface of the abactinal and marginal spine sheaths. Their form is best appreciated by the figure (fig. 5). The enlarged tooth, on one side of the jaw, and the numerous shank teeth are characteristic. Straight pedicellariae are small, slender to broadly lanceolate, but delicate and compressed; jaws apparently never spatulate. They are scattered over the surface of the body and occur on the furrow margin and outer actinostomial oral spine. Length, 0.15 to 0.65 mm.

One of the characteristic features of this species is the fact that the rays are slightly spaced on the circumference of the disk so that there is no sharp interbrachial angle. Back of the mouth plates there is a vertical, broad, axillary channel having several fine, probably ciliated, furrows leading from the abactinal to the actinal surface. This axillary region is bounded by a distinct constriction, or furrow, which encircles each ray at its base, and beneath the skin a series of small plates extends upward from the interradial marginal plates to the abactinal end of the axillary channel, the last plate being probably the primary interradial (fig. 3, *i*). This column acts as a buttress from which a slight but tough membranous inter-

brachial septum projects into the lumen of the disk. The gonads are attached to the dorsolateral body wall, well above the superomarginal plates, at a distance from the base about equal to minor radius. They have the usual branched structure.

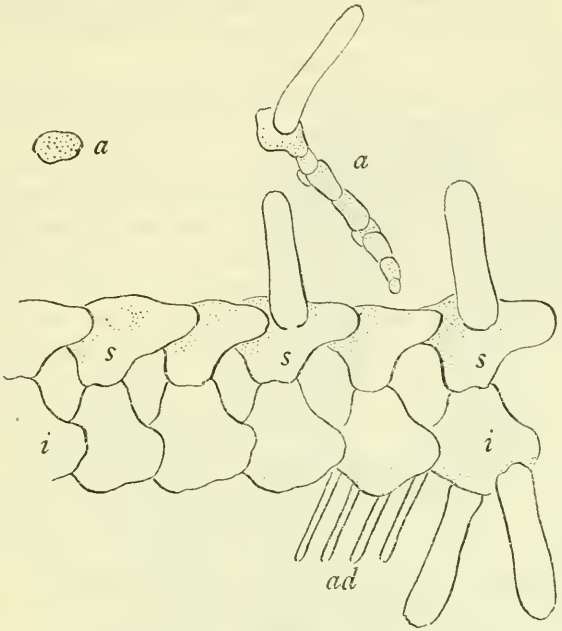


FIG. 4.—PYCNOPODIA HELIANTHOIDES. MARGINAL AND ABACTINAL PLATES OF A SMALL SPECIMEN. *a, a,* ABACTINALS; *s s s,* SPINIFEROUS SUPEROMARGINALS; *i i,* INFEROMARGINALS; *ad,* ACTINAL SURFACE OF 4 ADAMBULACRAL PLATES; BASE OF RAY TO THE RIGHT.

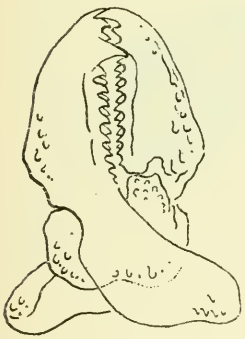


FIG. 5.—LYSASTROSOMA ANTHOSTICTA, A CROSSED PEDICELLARIA 0.21 MM. LONG, × 200.

FIG. 6.—CROSSED PEDICELLARIA OF PYCNOPODIA HELIANTHOIDES, SMALL SPECIMEN. LENGTH, 0.29 MM. × 200.

Type locality.—Mororan, Hokkaido, Japan. Collected by D. S. Jordan and J. O. Snyder.

Type.—Will be deposited in the United States National Museum; cotypes in zoological collection, Stanford University, and in the British Museum (Natural History).

Remarks.—*Lysastrosoma* is sufficiently close to *Pycnopodia* to be included in the Pycnopodiinae.

The structure of the crossed pedicellariae is strikingly similar[2] in the two genera. In *Lysastrosoma* the large inferomarginal spinal sheath envelopes both spines, but in *Pycnopodia* each spine has its sheath with a distinct mass of pedicellariae. The difference in the size of the mouth plates is, of course, due in part to the crowding of the rays in *Pycnopodia*, but not entirely, since some polybrachiate forms—*Coronaster*, for example—avoid extreme compression of the oral plates. The line drawings show the essential difference in the arrangement of marginal plates in specimens of approximately equal size (figs. 1 and 4).

EXPLANATION OF PLATES.

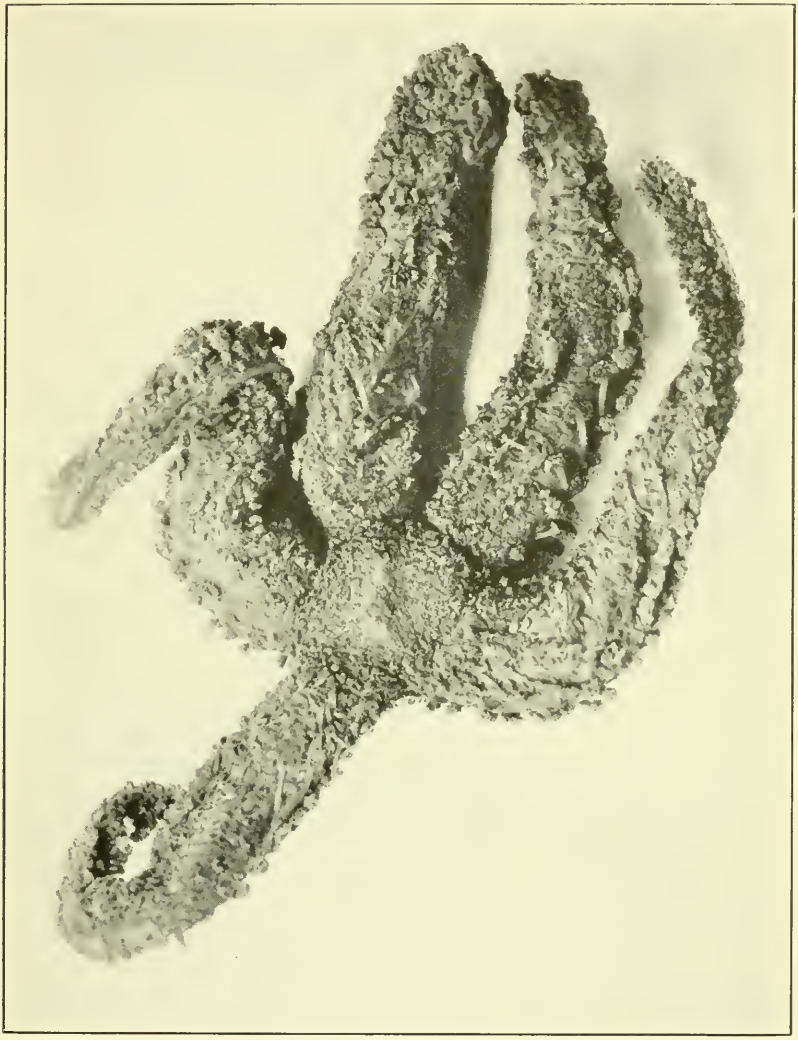
PLATE 1.

Lysastrosoma anthosticta. Abactinal view of type, enlarged.

PLATE 2.

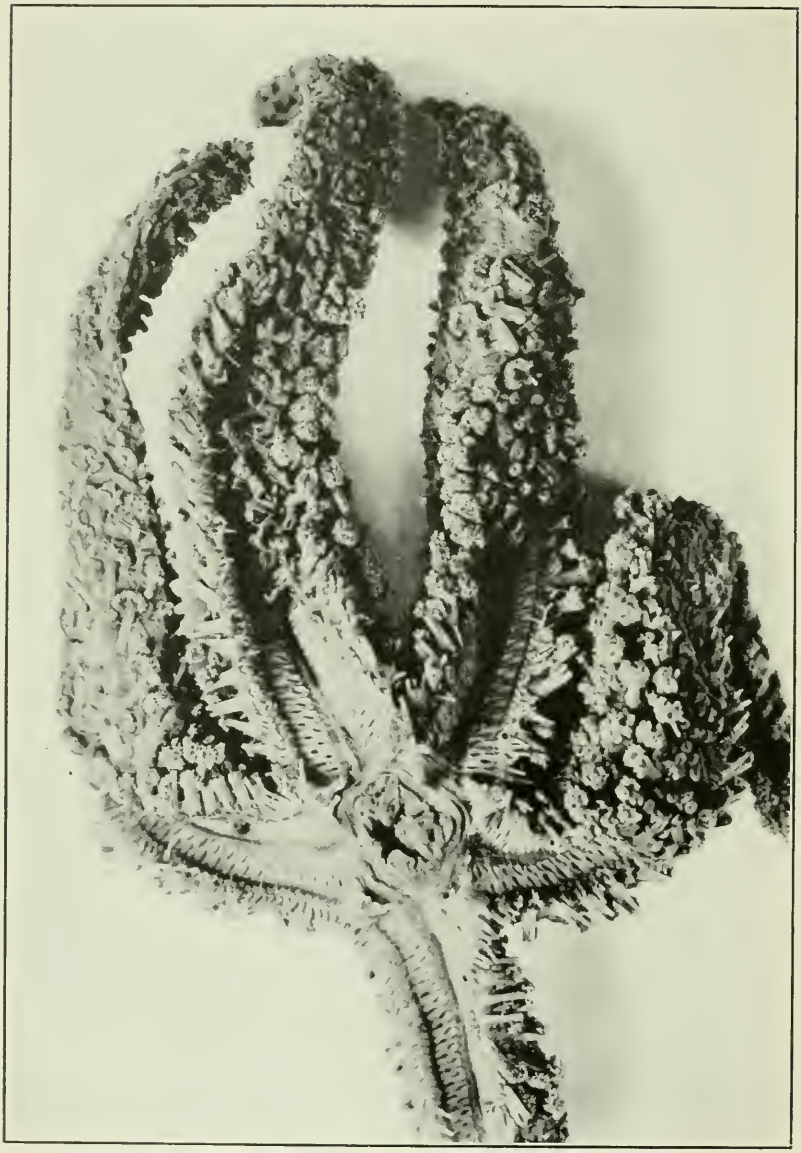
Lysastrosoma anthosticta. Actinal view of type, enlarged.

[2] The figures given by Verrill, Shallow-water Starfishes of the North Pacific Coast, etc., 1914, text fig. 2; pl. 74, fig. 6; pl. 88, fig. 7*c*, for *Pycnopodia* are unlike any pedicellariae I have seen in that species. Some of the figures suggest pedicellariae of *Stylasterias forreri*.



LYSASTROSOMA ANTHOSTICTA. ABACTINAL VIEW OF TYPE, ENLARGED.

FOR EXPLANATION OF PLATE SEE PAGE 6



LYSASTROSOMA ANTHOSTICTA. ACTINAL VIEW OF TYPE, ENLARGED.

FOR EXPLANATION OF PLATE SEE PAGE 6