REPORT ON THE SOUTH AMERICAN SEA STARS COLLECTED BY WALDO L. SCHMITT

By W. K. FISHER

Of the Hopkins Marine Station, Pacific Grove, Calif.

The following list of sea stars is based upon material collected by Dr. Waldo L. Schmitt, of the United States National Museum, in 1926 and 1927, during an extended investigation of the higher crustacea of South America, made under the auspices of the Walter Rathbone Bacon scholarship. General collecting was therefore incidental to the main object of the expedition. The principal localities are: Salaverry and Talara, Peru; Antofagasta, Tocopilla, and Punta Arenas, Chile; the Juan Fernandez Islands; Port Stanley, Port William, and Teal Inlet, Falkland Islands; Deseado, Patagonia.

Especially valuable and perplexing has been a series of *Anasterias* from the Falkland Islands. *Ophidiaster agassizii* is figured for the first time.

OPHIDIASTER AGASSIZII Perrier

Plates 1 and 2; text Figure 1

Ophidiaster agassizii PERRIER, Bull. Mus. Comp. Zoöl., vol. 9, 1881, p. 10; Mém. sur les Etoiles de Mer, 1884, p. 223.—MEISSNER, Archiv f. Naturgesch., 1896, vol. 1, p. 99.—DE LORIOL, Revue Suisse de Zoöl., vol. 8, 1900, p. 79.—LIEBERKIND, Asteroidea, in: The Natural History of Juan Fernandez and Easter Island, edited by Dr. Carl Skottsberg, vol. 3, 1920, p. 387.—H. L. CLARK, The Echinoderm Fauna of Torres Strait, 1921, p. 83.

Juan Fernandez, December 9, 1926, two specimens.

Clark (1921) writes that this species is related to *O. confertus* of Lord Howe Island and *O. kermadecensis* of Raoul Island, Kermadecs, but is perfectly distinct from both. These species belong to the section of the genus characterized by having between the furrow spinelets one or more granules on the inner surface of the furrow, and only one madreporite. Clark writes that the papular pores are numerous (10 to 20 in each area), but in these examples of *agassizii* (R, 27 mm.), there are only 5 or 6. Many of the furrow spinelets are without intervening granules. On the proximal half of the ray

193

there is a characteristic pedicellaria in, or bordering, most of the papular areas; distally they are much less numerous than proximally (text fig. 1).

CYCETHRA VERRUCOSA (Philippi)

Goniodiscus verrucosus PHILIPPI, Archiv f. Naturgesch., 1857, p. 132.
Cycethra verrucosa MEISSNER, Zoöl. Anz. 1898, p. 394.—KOEHLER, Astéries et Ophiures, Further Zoological Results of the Swedish Antarctic Expedition 1901–1903, vol. 1, No. 1, 1923, p. 60, pl. 7, figs. 5, 11, 12, 13; pl. 8, figs. 3–9.

Port Stanley, Falkland Islands, three specimens. Near Teal Inlet, Falkland Islands, one specimen, March–April, 1927.

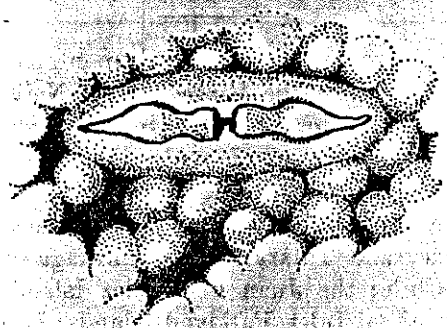


FIGURE 1.—OPHIDIASTER AGASSIZII. A CHARACTERISTIC PEDICELLARIA, X100

Dr. R. Koehler, in the citation noted above, has given a very full discussion of this species together with excellent figures.

PATIRIA CHILENSIS (Lütken)

Plate 3, Figures 1, 2

Asteriscus chilensis C. F. LÜTKEN, Vidensk. Med., 1859, p. 61.
Asterina chilensis C. F. LÜTKEN, Vidensk. Med., 1871, p. 302.—H. L. CLARK, Bull. Mus. Comp. Zoöl., vol. 52, 1910, p. 334, pl. 2, figs. 2, 3.
Patiria chilensis VERRILL, Amer. Journ. Sci., vol. 35, 1913, p. 482.

San Lorenzo, Island, Callao, Peru, November 1, 3, 1926, two specimens.

Antofagasta, Chile, November 15, 1926, one specimen.

The colors of the Peruvian specimens in life were recorded by Doctor Schmitt as: "Above, dark maroon purple with irregular lines and markings of nile blue; under side, glaucous green, tube feet cream buff" (Ridgway's, Nomenclature of Colors, 1886).

PATIRIELLA CALCARATA (Perrier)

Plate 4, Figures 1, 2

Asteriscus calcaratus PERRIER, Ann. Sci. Nat., ser. 5, vol. 12, 1869, p. 292.
Asterina calcarata, PERRIER, Rév. des Stellèrides, 1875, p. 302.—H. L. CLARK, Bull. Mus. Comp. Zoöl., vol. 52, 1910, p. 333.—LIEBERKIND, Nat. Hist. Juan Fernandez and Easter Island, edited by Dr. Carl Skottsberg, vol. 3, Asteroidea, 1920, p. 383.

Asterina calcarata var. *selkirki* MEISSNER, Archiv f. Naturgesch., 1896, p. 97, pl. 6, fig. 3.

Patiriella calcarata VERRILL, Amer. Journ. Sci., vol. 35, 1913, p. 484.

Juan Fernandez, six specimens; one from 15 to 18 meters. Bahia de Padre, December 15, 1926.

Doctor Lieberkind, in the citation above, has given a critical review of this species.

PATIRIELLA FIMBRIATA (Perrier)

Plate 5, Figures 1, 2

Asterina fimbriata PERRIER, Rév. des Stellérides. 1875. p. 307; Miss. sci. du Cap Horn, 1891, p. 111, pl. 12, figs. 5, 5*b*.—KOEHLER, Astéries et Ophiures, Further Zoological Results of the Swedish Antarctic Expedition 1901–1903, vol. 1, No. 1, 1923, p. 55, pl. 9, figs. 2, 5–8. Literature.

Patiriella fimbriata VERRILL, Amer. Journ. Sci., vol. 35, 1913, p. 484.

Punta Arenas, Magellan Strait, February 4, 1927, two specimens.

Port Stanley, Falkland Islands, March 11 and 27, 1927, five specimens (R, 5.5 to 8 mm.).

Near Teal Inlet, April 3, 1927, two specimens (R, 8 to 11 mm.).

Koehler (1923) has given critical notes and excellent figures of this species. His largest specimen had R 16 mm. In alcoholic specimens the delicate abactinal spinelets are more or less obscured by a soft skin, traversed by fine channels. It is relatively thicker in the smaller than in the largest specimens and disappears on drying.

PORANIA ANTARCTICA Smith

Porania antarctica SMITH, Ann. and Mag. Nat. Hist., ser. 4, vol. 17, 1876, p. 108.—SLADEN, *Challenger* Asteroidea, 1889, p. 360, pl. 59, fig. 3.—KOEHLER, Deuxième Exp. Ant. Française, Échinodermes, 1912, p. 66.—LUDWIG, Exped. Ant. Belge, Seesterne, 1903, p. 22, pl. 2, figs. 18–20.

Porania magellanica STUDER, Monatsber. preuss. Akad. Wiss. Berlin, July 1876, p. 459.—SLADEN, *Challenger* Asteroidea, 1889, p. 363, pl. 59, fig. 5.

Glabraster magellanica A. H. CLARK, Journ. Wash. Acad. Sci., vol. 6, 1916, p. 122.

Glabraster antarctica A. H. CLARK, Journ. Wash. Acad. Sci., vol. 6, 1916, p. 122.

Punta Arenas, Chile, February 1, 1927, one specimen.

For a critical discussion see Koehler, 1912, above. Sladen gives excellent figures of the entire animal, and Ludwig, details of skeleton.

HELIASTER HELIANTHUS (Lamarck)

Asterias helianthus LAMARCK, Animaux sans vertèbres, 1816, vol. 3, p. 245.

Heliaster helianthus DUJARDIN and HUPÉ, 1862, p. 343.—H. L. CLARK, Bull. Mus. Comp. Zoöl., vol. 51, 1907, p. 42, pl. 3, fig. 1; pl. 7, figs. 1–7.

Tocopilla, Chile, November 14, 1926, one specimen.

Salaverry, Peru, October 18, 1926, three specimens.

Clark gives a full description and figures. These specimens were taken well within the known range.

HELIASTER CANOPUS Perrier

Heliaster canopus PERRIER, Rév. des Stellèrides, 1875, p. 88.—H. L. CLARK, Bull. Mus. Comp. Zoöl., vol. 51, 1907, p. 45, pl. 3, fig. 2; pl. 8, fig. 7.

Juan Fernandez, December 8, 1926, eight specimens.

The largest example has R, 72 millimeters and 21 rays. Clark, who gives a full description and figures, records 60 millimeters as being the maximum among his 27 specimens.

HELIASTER POLYBRACHIUS Clark

Heliaster polybrachius H. L. CLARK, Bull. Mus. Comp. Zoöl., vol. 51, 1907, p. 54, pl. 2, fig. 2; pl. 7, fig. 12; pl. 8, fig. 8.

Talara, Peru, August 29, 1926, two specimens.

As Clark points out, this is the mainland form of *H. cumingii* (Galápagos Islands). Reference should be made to Clark's paper for description and figures.

ASTROSTOLE PLATEI (Meissner)

Text Figures 2, 2*a*

Asterias (*Coscinasterias*) *platei* MEISSNER, Archiv f. Naturgesch., 1896, p. 103, pl. 6, fig. 2.

Astrostole platei FISHER, Bull. U. S. Nat. Mus. 76, part 2, 1928, p. 130.

Seven rays, some incomplete; no label, but in container with four specimens of *Heliaster canopus;* hence from Juan Fernandez. Material in poor condition.

Meissner has given a good figure of this species which is a typical *Astrostole.* The type is eight-rayed. Inner furrow-spine tapered, shorter and slenderer than outer, which is slender with truncate tip, but not tapered. Three series of prominent ventro-lateral spines, longer than adambulacrals and with flattened, rounded or truncate tips, often shallowly gouge-shape. Inner of these three series are actinals, the other two inferomarginals. They form also oblique transverse combs, the base of outer spine carrying prominent bouquet of crossed pedicellariæ.

Superomarginal spines about the same length, usually on alternate plates; a very irregular series of acicular carinal spines between which and superomarginals are irregularly spaced similar dorsolaterals corresponding to about two series on either side—all with conspicuous wreaths of crossed pedicellariæ, about 0.4 millimeter in length (figs. 2, 2*a*). Straight pedicellariae slender-lanceolate, rare except on furrow face of adambulacrals. Superomarginals with conspicuous area of tiny hyaline bosses.

This species is very nearly related to *Astrostole paschae* (H. L. Clark) of Easter Island. The general appearance of the two forms, and the details of the crossed pedicellariae are closely similar. The crossed pedicellariae of *paschae*[1] average about 0.35 millimeter in length (profile view) while those of *platei* are around 0.4 millimeter. Some reach 0.45 millimeter. Only one specimen of each species has

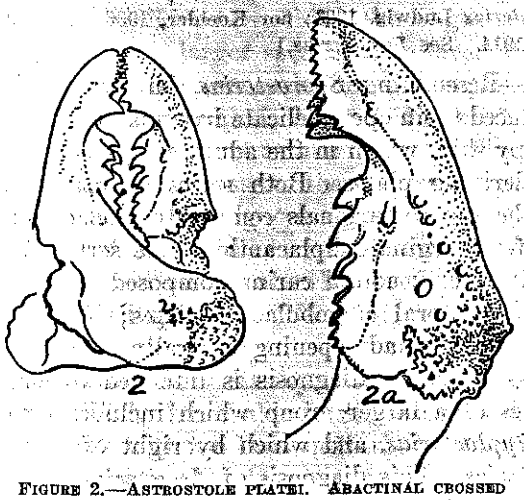


FIGURE 2.—ASTROSTOLE PLATEI. ABACTINAL CROSSED PEDICELLARIA, 0.42 MILLIMETERS LONG, X100, *2a*. A SINGLE JAW, X200

been examined; in fact, no specimens of *paschae* other than the type are known.

MEYENASTER GELATINOSUS (Meyen)

Asterias gelatinosa MEYEN, Reise um die Erde, vol. 1, 1834, p. 222.—CLARK, Bull. Mus. Comp. Zoöl., vol. 52, 1910, p. 337, pl. 6, fig. 2.

Meyenaster gelatinosus VERRILL, Amer. Journ. Sci., vol. 35, 1913, p. 485.—FISHER, Bull. U. S. Nat. Mus. 76, part 2, 1928, p. 131, pl. 42, figs. 9, 9*a*; pl. 43, fig. 7.

Antofagasta, Chile, November 15, 1926, one specimen.

For a discussion of this genus see Fisher, citation above.

COSMASTERIAS LURIDA (Philippi)

Asteracanthion luridum PHILIPPI, Archiv f. Naturgesch., vol. 24, 1858, p. 265.

Cosmasterias lurida LUDWIG, Exped. Antarct. Belge, 1903, p. 40.—KOEHLER, Deux. Exp. Antarct. Française, Échinodèrmes, 1912, p. 23, pl. 2, figs. 1–7; pl. 5, fig. 8.

Punta Arenas, Strait of Magellan, February 5, 1927, one specimen (R., 29 mm.).

This species, of many aliases, is characteristic of the region of the Strait of Magellan and adjacent coasts of both Atlantic and Pacific sides; Tierra de Fuego; South Georgia; low tide to 348 fathoms.

[1] For figures see Fisher, Bull. U. S. Nat. Mus. 76, part 2, plate 42, figures 7, 7*a*.

Genus ANASTERIAS Perrier

Anasterias PERRIER, Rév. Stell., 1875, p. 81; 1891, p. 91. Type *Anasterias minuta* Perrier.—FISHER, Smithsonian Misc Coll, vol. 52, 1908, p 52; Zool. Anz., vol. 33, 1908, p. 356; Ann. Mag. Nat. Hist., ser. 9, vol. 10, 1922, p. 592; vol. 18, 1926, p. 197; Bull. U. S. Nat. Mus. 76, part 3, 1930, p. 221.

Asteroderma PERRIER, Comptes-rend., vol. 106, No. 11, 1888, p. 763; Mission sci. Cap Horn, 1891, p. 96. Type, *Asteroderma papillosum* Perrier.

[Not *Anasterias* Ludwig, 1903; nor Koehler, 1906, 1908, 1912, 1920, 1923; nor Verrill, 1914. See *Lysasterias*.]

Diagnosis.—Resembling *Sporasterias*, but the abactinal skeleton typically reduced to an open, delicate irregular mesh, entirely hidden by thick pulpy skin, which in the adult, even when dried, may conceal the underlying plates. Both series of marginal plates well developed; the superomarginals commonly monacanthid (or spineless), the inferomarginals diplacanthid; one series of actinals, sporadically spiniferous; adoral carina composed of about three pairs of contiguous postoral adambulacral plates; interbrachial septum strongly calcified; gonads opening ventrally—paedophoric.

Remarks.—The above diagnosis is intended to characterize two known species of a larger group which includes *Sporasterias* and possibly *Kalyptasterias*, and which by right of priority would be called *Anasterias*. This diagnosis of *Anasterias* is therefore of the subgenus *Anasterias*.

Notes on the history of this group will be found in Asteroidea of the North Pacific and Adjacent Waters, Part 3.[2] As there noted, the group is given generic rank in order to direct attention to the peculiar characters of *Anasterias*, ss. There seems to be no clear line of demarcation between *Anasterias* and *Sporasterias*.

ANASTERIAS MINUTA Perrier

Plate 6; Plate 7, Figures 1, 2; Plate 8

Anasterias minuta PERRIER, Rév. Stell., 1875, p. 81; Mission sci. Cap Horn, 1891, p. 93 (part).—FISHER, Bull. U. S. Nat. Mus. 76, part 3, 1930, p. 223.

? *Asteroderma papillosum* PERRIER, Comptes-rend, vol. 106, No. 11, 1888, p. 765; Mission sci. Cap Horn, 1891, p. 96.

? *Anasterias minuta* var *Asteroderma papillosum* PERRIER, 1891, pl. 10, fig. 3*a*–3*c*.

The type of this species is in the Muséum d'Histoire Naturelle (E, 792, Hombron et Jacquinot, 1847, alcohol). Perrier considered the type locality to be Port Famine, Magellan Strait.

In addition to Doctor Schmitt's material, I have two dried specimens from Darwin Harbor, Choiseul Sound, Falkland Islands (No. 2623 Mus. Comp. Zoöl.). The smaller measures R, 18 millimeters, r, 6 millimeters; the larger R, 48 millimeters, r, 13 millimeters. In

[2] Bull. U. S. Nat. Mus. 76, part 3, 1930, p. 221.

the smaller example the abactinal skeleton is clearly visible and consists of a weak, irregular reticulum resembling the condition in *A. pedicellaris* as figured by Koehler [3] and closely similar to that of the type specimen of *minuta*. Most of the superomarginals carry one spinelet and the inferomarginals two, while scattered along the intermarginal channel and inside the furrow margin are rather numerous, lanceolate, straight pedicellariae two-thirds the length of the superomarginal spinelets. In the larger specimen, however, the abactinal integument has thickened and conceals the skeleton, which is quite weak and irregular as in Koehler's Plate 5, Figure 1, alluded to above. The proportions are about as in Figure 4. There are a few actinal plates and spines at the base of the ray and the adoral carina is composed of three pairs of contiguous adambulacrals, the first pair larger than second, and the second larger than third. The superomarginal spines have been mostly absorbed; pedicellariae as in the small example. A third specimen (No. 2624) carries a cluster of young.

Sixteen specimens from Port Stanley, Falkland Islands, collected February to April, 1927, by Dr. Waldo L. Schmitt (pls. 6, 7). These are evidently conspecific with the Darwin Harbor examples. A well-hardened alcoholic example (R., 48 mm.) resembles the *Kalyptasterias conferta* figured by Koehler.[4] The abactinal plates are slender, delicate, and form an irregular reticulum, with very large meshes, and are entirely hidden until dried by the soft pulpy integument. Dorsal spinelets few and widely scattered; only a few abactinal crossed and straight pedicellariae. Superomarginal plates normal, not massive, each with one blunt, terete, slender spinelet, 1 to 1.5 millimeters long; inferomarginals with two decidedly stouter and longer spines; actinal plates with one spine, slightly smaller, the series extending two-thirds length of ray, each spine forming with the inferomarginal spines a transverse series of three. Numerous, rather thickly lanceolate, subobtuse straight pedicellariae, decidedly longer than broad, are scattered on the marginal and actinal plates in the intermarginal channel and along edge of furrow. *No associated cross pedicellariae*, except near the end of the ray, and there only a few. [In *Sporasterias antarctica* the superomarginals are normally surrounded by crossed pedicellariae, and the inferomarginal plates carry at least a few on the intermarginal side of the spines.]

Another lot of nine from Port Stanley (April 16, 1927) differs in having numerous small capitate abactinal spinelets and fairly numerous abactinal (but not marginal) crossed pedicellariae; straight pedicellariae scattered over abactinal surface and distributed later-

[3] Swed. Antarctic Exp., vol. 1, no. 1, 1923, pl. 5, figs. 1 and 4.
[4] Idem, pl. 4, figs. 3 and 4.

EXPLANATION OF PLATES

PLATE 1

Ophidiaster agassizii, Juan Fernandez; abactinal surface, ×3.5.

PLATE 2

Ophidiaster agassizii; actinal surface of specimen figured in plate 1, ×4.

PLATE 3

FIGURE 1. *Patiria chilensis;* abactinal surface, ×2.
2. Same specimen; actinal surface, ×2.

PLATE 4

FIGURE 1. *Patiriella calcarata*, Juan Fernandez; abactinal surface, ×2.8.
2. Same specimen; actinal surface, ×2.8.

PLATE 5

FIGURE 1. *Patiriella fimbriata*, Port Stanley, Falkland Islands; abactinal surface, ×4.
2. Same specimen; actinal surface, ×4.

PLATE 6

Anasterias minuta, Port Stanley, Falkland Islands; abactinal aspect of a dried specimen of typical form, ×2.

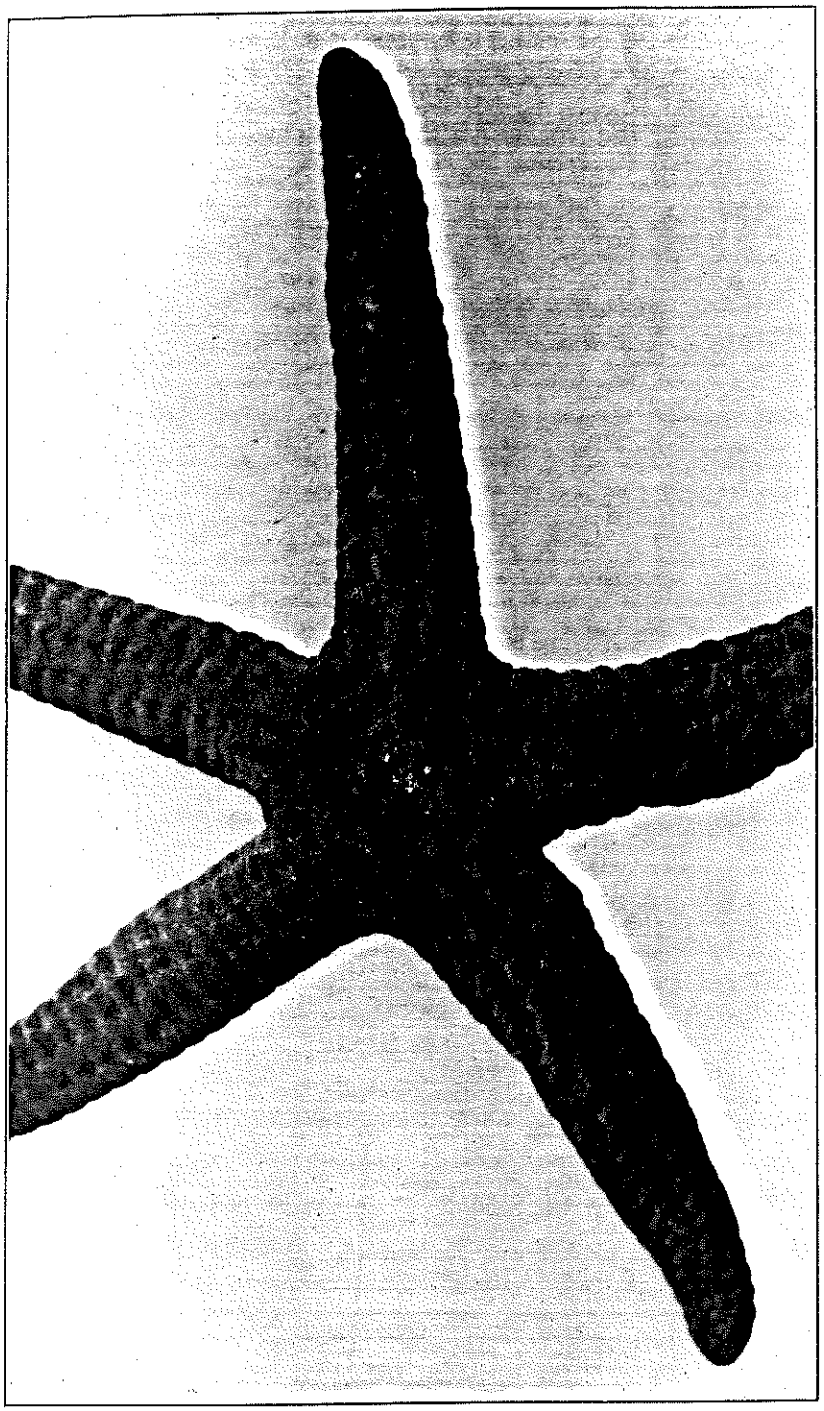
PLATE 7

FIGURE 1. *Anasterias minuta;* actinal surface of specimen shown in plate 6, slightly less than twice natural size.
2. *Anasterias minuta;* young specimen from Port Stanley, ×3.5.

PLATE 8

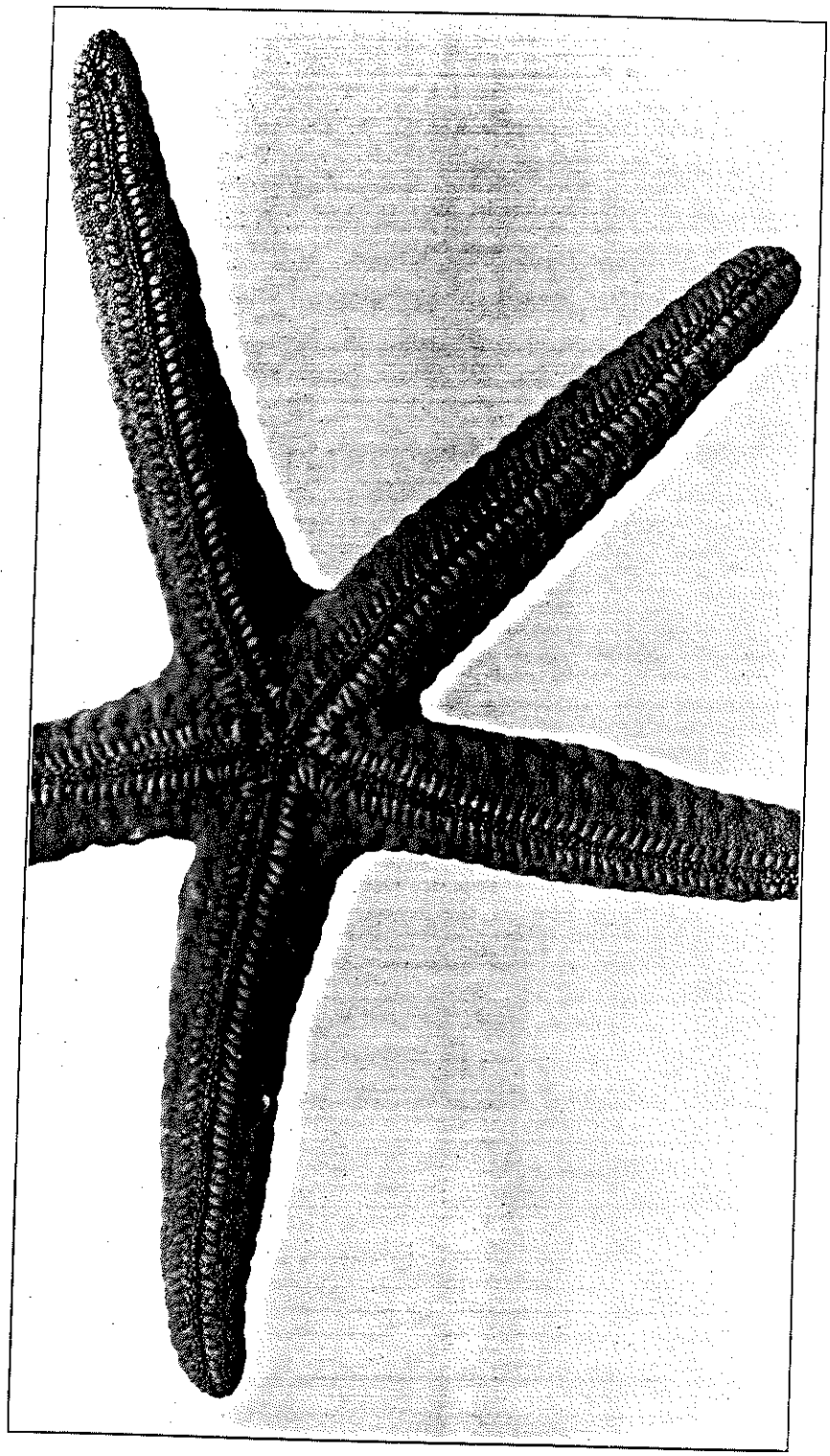
Anasterias from near Teal Inlet, Falkland Islands, mentioned in text, p. 8; ×2.3.

U. S. GOVERNMENT PRINTING OFFICE: 1931



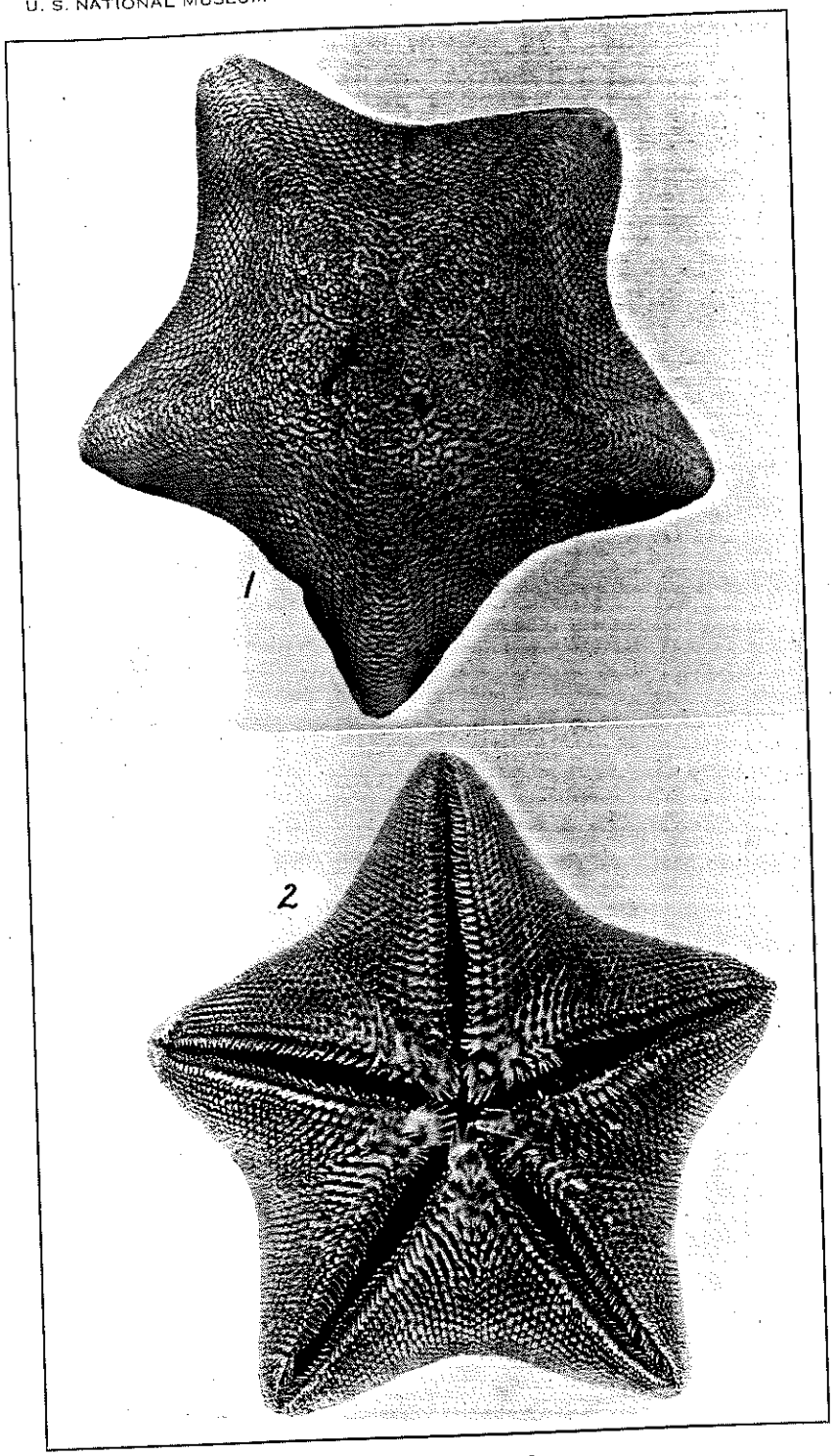
OPHIDIASTER AGASSIZII

FOR EXPLANATION OF PLATE SEE PAGE 10.



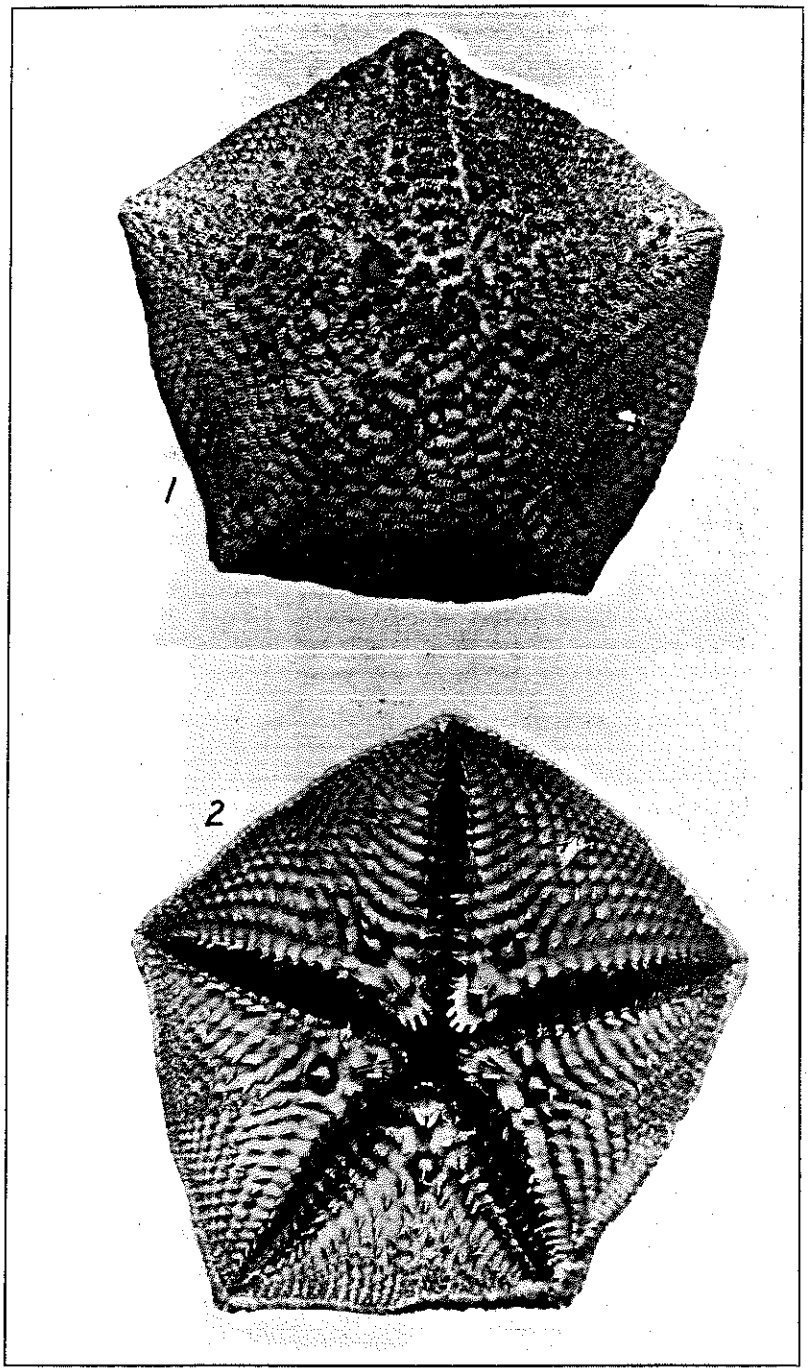
OPHIDIASTER AGASSIZII

FOR EXPLANATION OF PLATE SEE PAGE 10.



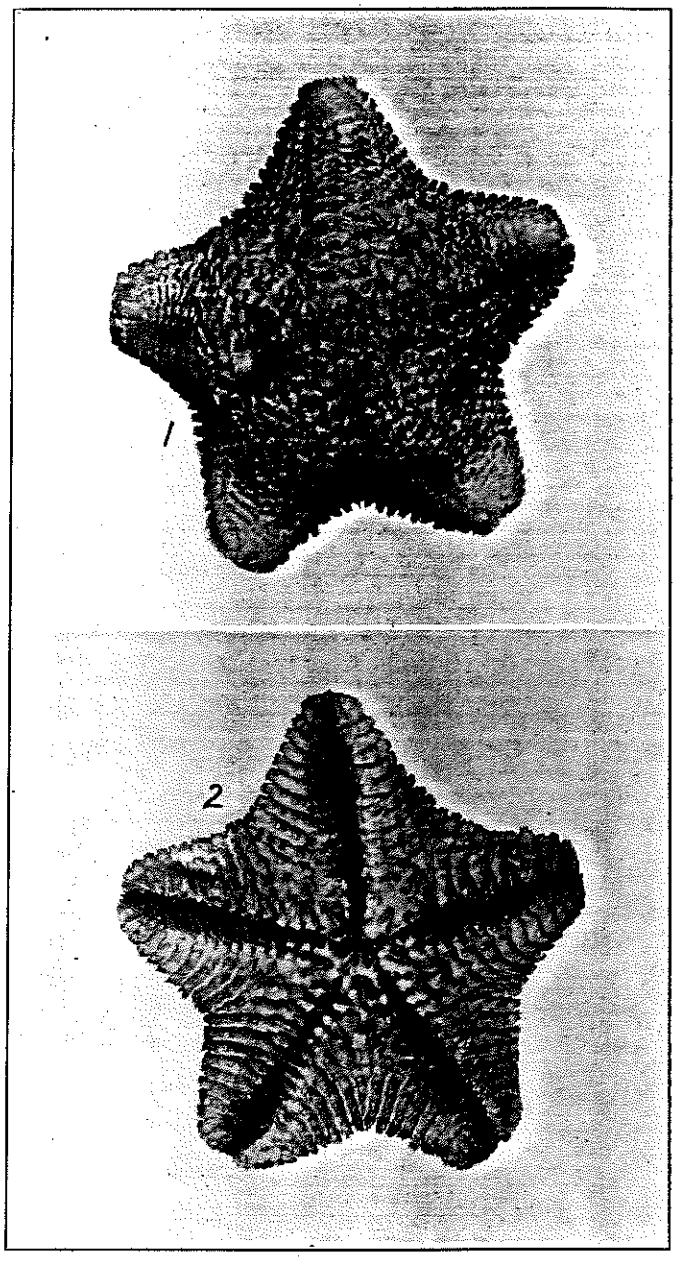
PATIRIA CHILENSIS

FOR EXPLANATION OF PLATE SEE PAGE 10.



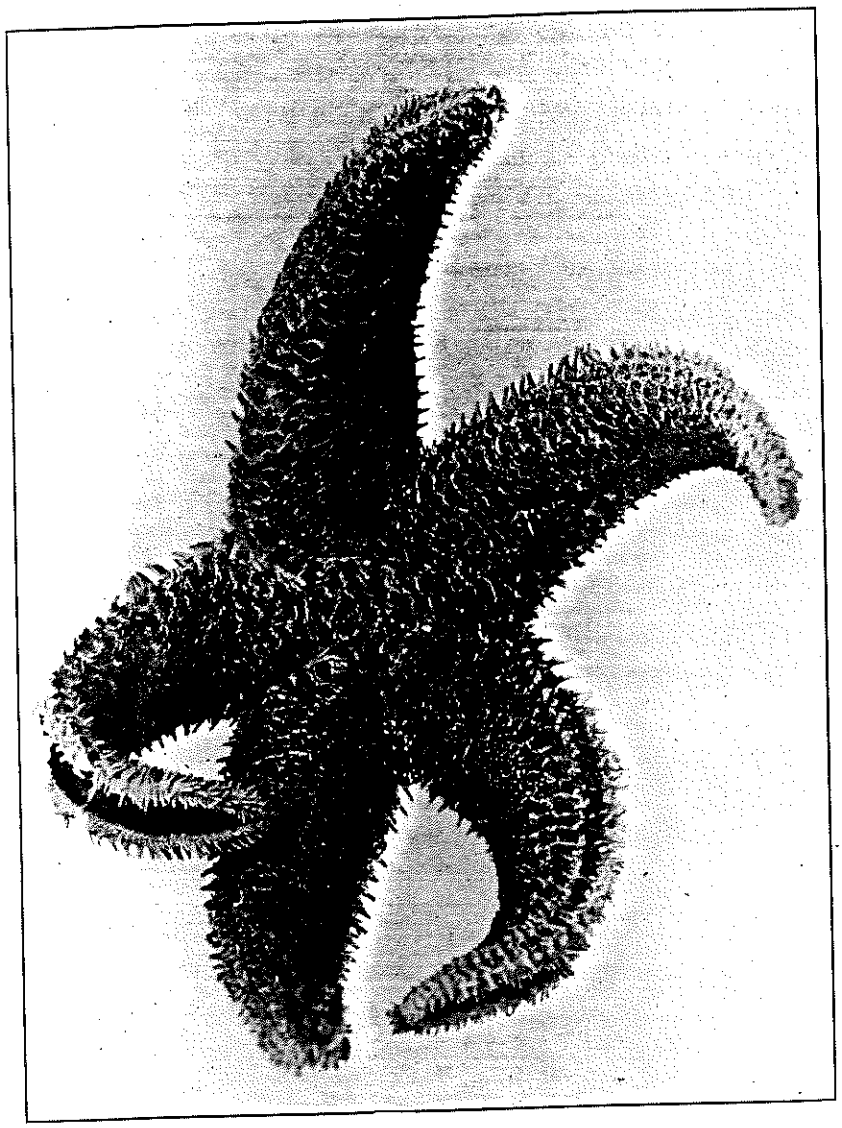
PATIRIELLA CALCARATA

FOR EXPLANATION OF PLATE SEE PAGE 10.



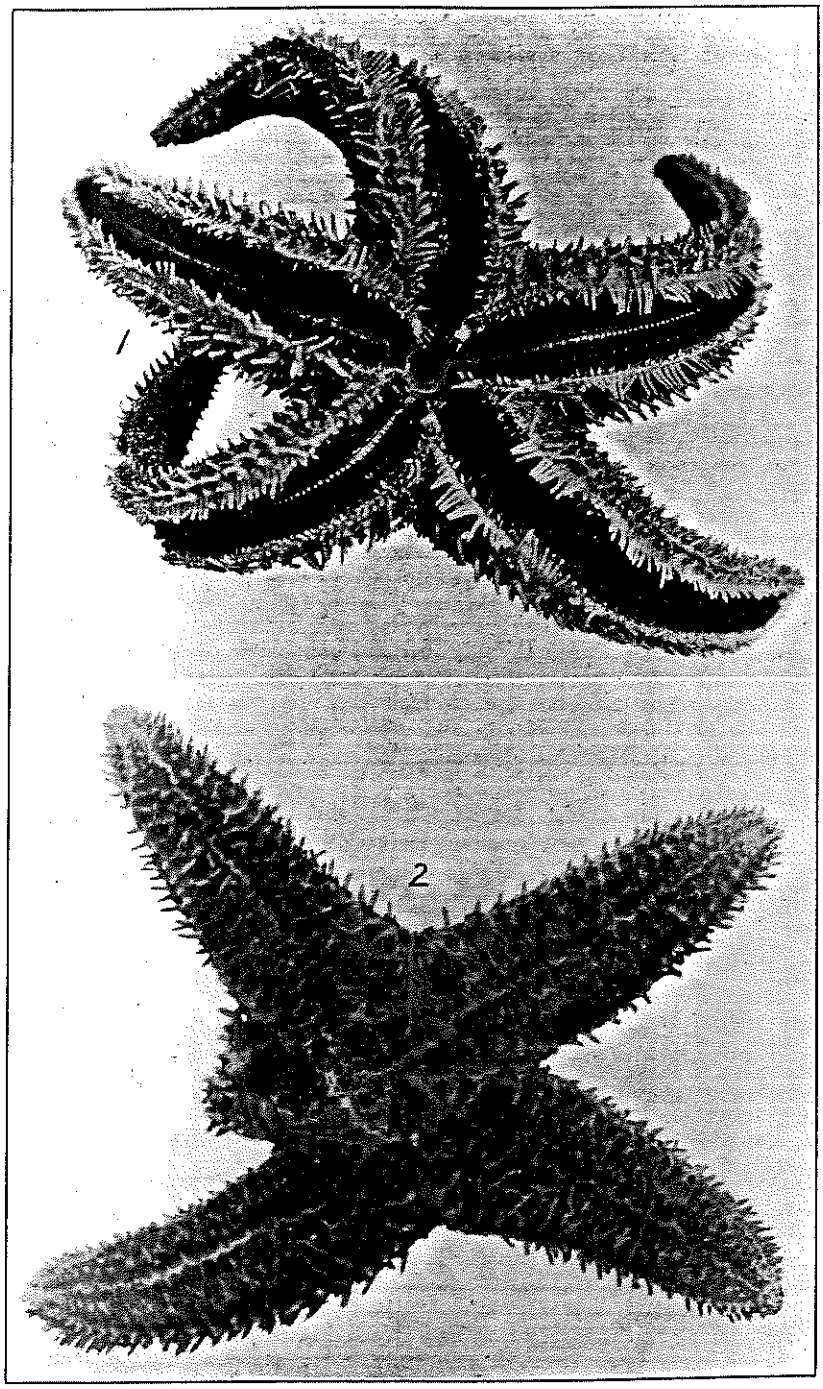
PATIRIELLA FIMBRIATA

FOR EXPLANATION OF PLATE SEE PAGE 10.



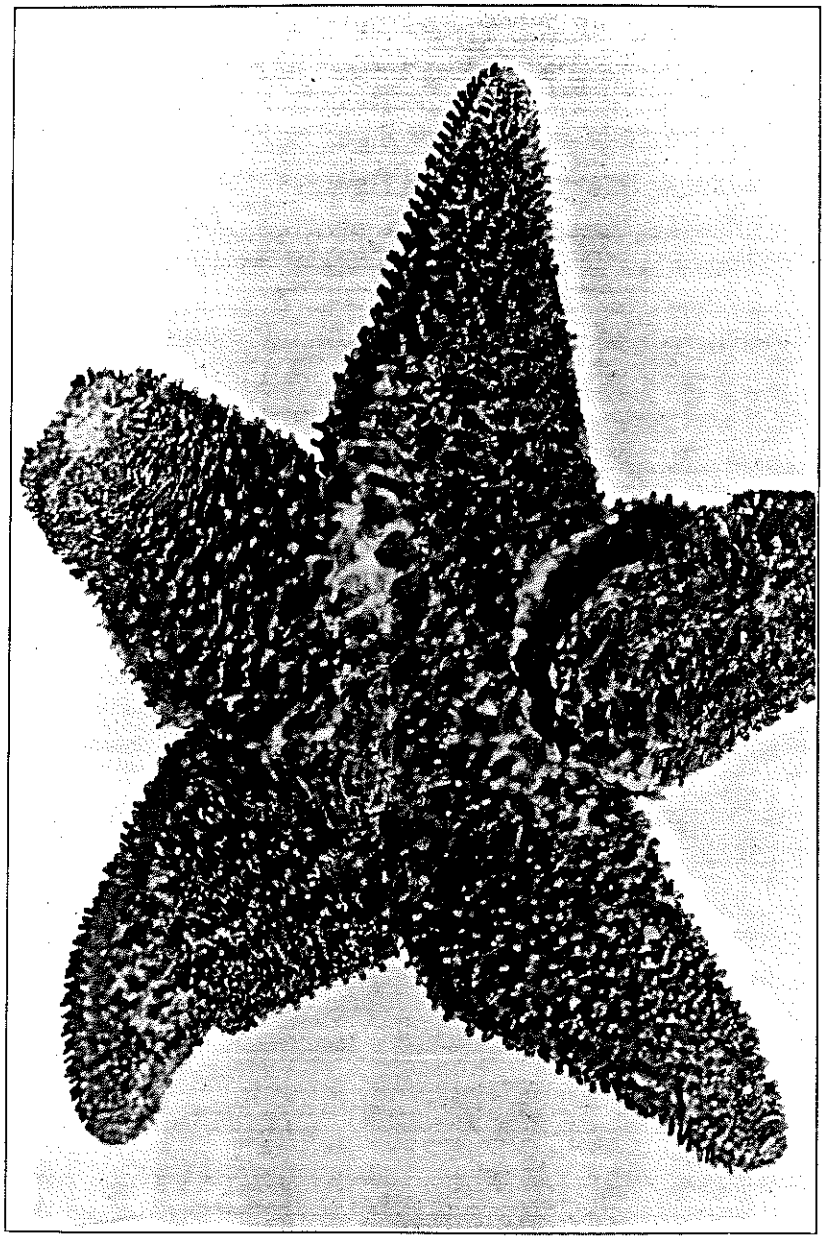
ANASTERIAS MINUTA

FOR EXPLANATION OF PLATE SEE PAGE 10.



ANASTERIAS MINUTA

FOR EXPLANATION OF PLATE SEE PAGE 10.



ANASTERIAS

FOR EXPLANATION OF PLATE SEE PAGE 10.