

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS: No. 69.

ASTEROIDS FROM THE NETHERLANDS ANTILLES
AND OTHER CARIBBEAN LOCALITIES

(Oreasteridae, Ophidiasteridae, Asterinidae, Luidiidae)

by

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The material brought back by Dr. P. WAGENAAR HUMMELINCK from his various trips to the West Indies includes a number of starfish, which – with exception of the specimens belonging to Astropectinidae, Echinasteridae and Goniasteridae – were given to the present author as a subject for taxonomic examination. This resulting contribution to science is the outcome of no more than a few months of practical work under the direction of Dr. HUMMELINCK, and can therefore not be other than a rather superficial study, in which only additional material from the museums in Amsterdam and Leiden has been considered.

The material covered in this paper comprises:

Oreaster reticulatus (L.), from BIMINI, NEW PROVIDENCE, CUBA, JAMAICA, HISPANIOLA, ST. MARTIN, LOS TESTIGOS, MARGARITA, BONAIRE, ARUBA, and BRAZIL. — Plates III–VI.

Linckia guildingii Gray, from BIMINI, NEW PROVIDENCE, ST. KITTS, BONAIRE, KLEIN BONAIRE, CURAÇAO, ARUBA, and BRAZIL. — Plate VII.

Ophidiaster guildingii Gray, from CURAÇAO. — Plate VIII.

Asterina folium (Lütken), from COLOMBIA (Santa Marta). — Plate IX.

Asterina hartmeyeri Döderlein, from ST. JOHN, ST. MARTIN, BONAIRE, and ARUBA. — Plate IX.

Asterina marginata (Perrier), from BRAZIL. — Plate IX.

- Luidia senegalensis* (Lam.), from ANTIGUA, COCHE, VENEZUELA mainland, COLOMBIA (Río Hacha), and BRASIL: — Plates X–XI.
Luidia clathrata (Say), from “WEST INDIES”. — Plates X–XI.
Luidia alternata (Say), from COLOMBIA (Río Hacha). — Plates VIII, X.

As a rule, HUMMELINCK's material has been preserved in alcohol, with the exception of the greater part of the large *Oreaster* specimens, which were dried, after being injected with a mixture of formalin and alcohol, and kept moist with formalin for several hours. — The specimens which were trawled north of Margarita Island were kept on ice for several days before being dried.

The specimens collected are now in the Rijksmuseum van Natuurlijke Historie at Leiden (L), the Zoölogisch Museum of Amsterdam (A), the Zoölogisch Laboratorium at Utrecht (U), and the British Museum (Natural History), London (BM).

The writer is indebted to Dr. HUMMELINCK and Mr. H. VAN KOOTEN for their expert aid in making the photographs.

Oreaster reticulatus (Linné, 1758) Plates III–VI

- Asterias gigas* LINNÉ, 1753, p. 114, pl. 9 fig. 1 [“*Asterias radiata*, centro dorsali nodis 5 circumvallato. Tab. IX fig. 1. locus: India. /*Stella haec marina in suo genere maxima, diametro sesquipedali. Radii 5, versus basin dilatati, convexi scabri, porosi adpersi. Aculeis conicis, solidis, laevibus, distantibus, obtusiusculis, sparsis; gibbositates, totidem centrum circumstant. Subtus cruce quinquefida exarata, similiter aculeata, margine aculeis validioribus horrente.*”].
- Asterias reticulata* LINNÉ, 1758, p. 661 [“*A. stellata radiis reticulato-aculeatis. Mus. Tess. 114 t. 9 f. 1 Asterias radiata, centro dorsali nodis 5 circumvallato . . . Habitat in M. Indico.*”].
- Pentaceros reticulatus*, GRAY, 1840, p. 276 [“Inhab. West Indies, Barbadoes.”]
- Asterias reticulata*, LAMARCK, 1840, p. 243 [Habite l'Océan des Grandes Indes. -Uncertain!].
- Oreaster reticulatus*, MÜLLER & TROSCHEL, 1842, p. 45.
- Oreaster gigas* Linné, LÜTKEN, 1859, p. 64–75 [St. Thomas; records from Curaçao, Jamaica, St. Vincent, Barbados].
- Pentaceros reticulatus*, GRAY, 1866, p. 6 [Barbados].
- Oreaster gigas* Lütke, VERRILL, 1867–1868, p. 278–279, 343, 367 [Florida! Hayti! St. Thomas (Ltk.), Curaçao, Barbados, *Abrolhos, Brazil!* (p. 343); Florida, Bahamas, St. Thomas, Hayti, Barbadoes, and throughout the West Indies. The Brazilian specimens agree perfectly with those from Florida and St. Thomas. (p. 367)].
- Pentaceros reticulatus* Link, A. AGASSIZ, 1877, p. 108–112, fig. 6–11, pl. 16 [“both sides of the Atlantic, at Cape Verde Islands, and in the West Indies, extending north to South Carolina.”].

- Pentaceros reticulatus*, PERRIER, 1878, p. 21, 52, 83 ["Floride, Bahama, récifs d'Abrolhos, Barbades, Antilles, Brésil"].
- Pentaceros reticulatus*, LINCK, SLADEN, 1889, p. 344, 762 ["Florida; Bahamas; Barbados; Antilles; Brazil; Abrolhos reefs; Freemantle (West Australia)" - Loc. Freemantle in errore!].
- Pentaceros reticulatus*, CLARK, H. L., 1898, p. 5, 6 [Jamaica].
- Oreaster reticulatus*, DÖDERLEIN & HARTMEYER, 1910, p. 151-152 [St. Thomas, St. Croix, Jamaica].
- Oreaster reticulatus*, CLARK, H. L., 1919, p. 53-55, 71 [Bahamas, Florida, Tortugas, Cuba, Jamaica, Hispaniola, Puerto Rico, St. Thomas, N. coast of S. America; records from U.S. north of Florida, Antigua, Dominica, Trinidad, Brazil, eastern Atlantic.].
- Oreaster reticulatus* (L.), CLARK, H. L., 1933, p. 22-23 ["from South Carolina and the Bahamas on the north (it is not known at Bermuda), and the Tortugas on the west, to the Abrolhos Reefs, Brazil, on the south, and the Cape Verde Islands on the east."].
- Oreaster reticulatus* (L.) Müll. & Tr., BOONE, 1933, p. 80-82, pl. 41-42 [Bury Island Flats. "South Carolina southward throughout the West Indies, Gulf of Mexico and Caribbean Sea, as far as Abrolhos Reefs, Brazil, and is also found in the Cape Verde Islands."].
- Pentaceros reticulatus*, HUMMELINCK, 1933, p. 304 [Aruba, Bonaire].
- Oreaster reticulatus* (L.), DÖDERLEIN, 1936, p. 319-320, pl. 31 fig. 3-3a ["auf die tropischen Teile der atlantischen Küsten von Amerika beschränkt . . . von Süd-Carolina und den Bahamas bis zu den Abrolhos-Riffen und Victoria, Braziliën und soll auch bei den Cap Verde-Inseln vorkommen (fide Verrill)."].
- Oreaster reticulatus* Linn., ENGEL, 1939, p. 3, 7 [Aruba, Bonaire].
- Oreaster reticulatus* (L.), CLARK, A. H., 1939, p. 442 [St. John].
- Oreaster reticulatus* (Linn.), CASO, 1944, p. 248-253, 2 figs. [Isla Blanca, Quintana Roo. "desde Carolina Sur, hasta las islas Abrolhos . . . Mar Caribe, Islas del Cabo Verde; Pernambuco e Islas Abrolhos, Brasil; Islas Freemantle, Oeste de Australia."].
- Oreaster reticulatus* (Linn.), TOMMASI, 1958, p. 16-17, 32-33, pl. 3 fig. 2 [Ihla de S. Sebastião, SP., Brazil. "Mar Indico. Cabo Verde. Indias Ocidentais. Carolina do Sul aos recifes Abrolhos. Bahia. Pernambuco. Estado Rio de Janeiro. Utatuba, São Sebastião, SP."].
- Oreaster reticulatus* (Linn.), THOMAS, 1960, p. 167-168 [Florida].
- Oreaster reticulatus* (Linn.), CASO, 1961, p. 59-62, fig. 20-21 [Campeche, Quintana Roo].

BIMINI (Bahamas): North Bimini, sta. 1151, Laboratory Dock, among scanty eelgrass on sandy mud, 1½ m, 20.VIII.1949 (2 specimens on alcohol; R = 59-66 mm). Bimini, Ivor Cornman coll., 1949 (1 spec., dry; R = 71 mm; not studied).

NEW PROVIDENCE (Bahamas): Between Hog Island and Athol Island, sta. 1149, sand with Thalassia, 3 m, 16.VIII.1949 (1 spec., dry; R = 198.5 mm).

BAHAMAS: Dr. de Haas coll. (42 spec., dry, L cat. nrs. 1332, 1594; R = 151-177.5 mm).

CUBA: Agassiz leg. (1 spec., dry, L 587; R = 157 mm).

JAMAICA: Kingston; Exped. Chazalie, 2 m J. Versluys leg. (1 spec., alc., A; R = 81 mm).

HISPANIOLA: St. Domingo (9 spec., dry, A; R = 99-249.5 mm).

ST. MARTIN: Great Bay, sta. 1128B, at Pasanggrahan, on sand, 1½ m, 26.VI.1949 (24 spec., dry; R = 103.5–171 mm); 1128C, sand with very little *Thalassia*, 2 m, 14.VI.1949 (22 spec., dry; R = 110–164.5 mm); same locality, 1½–3 m, VI.1955 (16 spec., dry; R = 133–154 mm); 3 & 7.VI.1955 (2 spec., alc.; R = 134–153 mm). Little Bay, 1 m, J. H. Stock coll., 7.II.1959 (1 spec., alc., A; R = 116 mm).

LOS TESTIGOS (Venezuela): Exped. Chazalie, 11 m, J. Versluys leg., 20.I.1896, (1 spec., alc., A; R = 65 mm).

MARGARITA: 25 miles N of Margarita, 20 fms., Teun Blok coll., trawl, II.1955 (2 spec., dry; R = 170–217.5 mm).

BONAIRE: Lac, sandy shore of Cay, 1 m, 25.XI.1930 (2 spec., alc.; R = 176–188.5 mm).

ARUBA: Near Oranjestad, 1930 (1 spec., dry; R = 136 mm). Malmok, 2 m, J. H. Stock coll., 18.I.1959 (2 spec., alc., A; R = 97–109.5 mm).

WEST INDIES: M. D. Horst leg., 1907 (2 spec., dry, L; not studied); (1 spec., dry, A; R = 225 mm).

BRAZIL: Frank leg. (1 spec., L 585; R = 177.5 mm).

Diagnosis

Distinctly and regularly stellate, R as a rule 2.1–2.4 r, with a high, convex central disc and a distinct reticulum on the aboral side. Number of arms 5, rarely 4 or 6. On the aboral side there is a very distinct circular or pentagonal figure, formed by the apical and interradial plates and their spines. The carinal plates do not form a keel, and bear only one spine. Superomarginal plates bear larger and fewer spines than the inferomarginal plates. Ambulacral furrow bordered by two series of spines, inserted on the adambulacral plates. The inner series consists of 3–5 thin spines; the outer one of 1 (rarely 2) rather flat spines without rounded tips. The adambulacralia bear no alveoles for pedicellaria; all pedicellaria have saucer-shaped basal parts. Both oral and aboral sides are covered with polygonal granules, but the granules on the oral side are coarser.

[Characters of *Oreaster clavatus* (DÖDERLEIN 1936, p. 321): Central disc and arms rather flat. Arms have a distinct keel. Carinal plates bear 2–3 acute granular spines. Adambulacralia have an alveole for pedicellaria; all other pedicellaria have a basal part. Two series of spines: the inner one consists of 5–6 relatively large and flat spines; the outer one consists of one pencil-like spine, about equal in size to the neighbouring interradial spine. Granulation smoother than in *O. reticulatus*.]

Description of the material

GENERAL FORM. Distinctly stellate, with a high, convex central disc. The aboral reticulum is very distinct. The number of arms is 5, rarely 4 or 6. The tube feet are

well developed, and are clearly visible, especially in alcohol specimens. — Ratio R/r as a rule 2.1–2.4 (see Table 6, Fig. 15).

ORAL SIDE. Ambulacral furrow and adambulacral spines (Pl. IV–VI). Round the mouth there are 5 acute, spine-bearing mouth plates. On each side of the ambulacral furrow there are two series of spines, inserted on the adambulacral plates. The inner series, inserted on the lateral side of the plates, consists of 3–5 smaller spines; the middle one is larger than the others. The outer series, inserted on the oral side of the plates, consists of larger, conical spines, which are more or less acute. Many specimens have two spines on this outer series of spines, instead of one; however, the second spine is not as large as the other spine, and is not present along the whole length of the furrow. — Of the 46 *Oreaster* collected on St. Martin in 1949, 10 specimens show a second spine which is more than half the size of the largest main spine; in 26 specimens, the second spine is less than half the size of the largest main spine, but bigger than granular size; and 10 specimens have a second spine of about granular size only. The 18 specimens collected in 1955 on the same spot show about the same variation in the case of 4, 11 and 3 specimens respectively. — All specimens from other stations exhibit the same variability.

Sculpture of oral interradius (Pl. V–VI). The oral interradial plates and their spines are situated in very regular rows, originating perpendicularly and parallel to the ambulacral furrow. The oral surface is flattened, owing to the weakly concave shape of the plates. The plates usually bear a group of 2–4 smaller spines, surrounded by coarse granules, one spine being generally larger than the others. The row of spines near the outer series of adambulacral spines is larger than the neighbouring spines; furthermore the spines grow larger from the margin towards the mouth. The whole oral surface is covered with coarse polygonal granules. All the pedicellariae between have saucer-shaped basal parts. The specimens from the other stations do not differ from these of St. Martin.

Marginal plates and spines (Pl. V). There are two rows of marginal plates: one limiting the oral surface, the inferomarginal plates; and one limiting the aboral surface, the superomarginal plates. Usually there are more inferomarginal plates than superomarginal. — The inferomarginal plates are weakly concave and not clearly distinguishable from each other, since they are covered with a layer of coarse, polygonal granules. For the purpose of describing the spines, the distance between two neighbouring arm tips is here divided into three parts: a middle part, the length of which is half the whole length between the arm tips, and two apical parts, the length of each of which is one quarter of this whole length. In the apical parts there is generally one spine per plate, but sometimes there is no spine. When present, the spines are conical and acute in form; in larger specimens they are often worn off. In the middle part it is usual to find 2–5 spines per plate; however sometimes there are no distinct spines, but only a number of granules. When a group of spines is present, one is generally larger than the others. The fewer the number of spines, the larger they are, but they are always smaller than those of the superomarginal plates. As a rule, they are as large as, or a little larger than, the oral interradial spines. Their shape is conical and more or less acute, and they are all surrounded by coarse polygonal granules. — The superomarginal plates are strongly concave, their edges hidden by small granules, which are far less coarse than those on the inferomarginal plates. Near the arm tip the plates are less distinct than in the middle part. To describe the spines, the division mentioned above is used. In the apical part, one spine per plate is usually seen, conical and more or less acute in shape. Sometimes no

spine is present, and on larger specimens they are worn off. — In the middle part, fewer spines per plate are found than on the inferomarginal plates — mostly 1 or 2-3; in rare cases, no spine is observed at all. These spines are big, solid, mostly conical in form, and more or less acute; sometimes they are chisel-shaped. Instead of two spines per plate, one more or less cleft spine is occasionally seen. — No difference is to be found between the specimens from St. Martin and those from the other localities.

ABORAL SIDE. Reticulum, plates and spines (Pl. III, VI). The aboral surface is characterized by a distinct reticulum, formed by the aboral plates and the reticularia — small calcareous rods uniting the plates. The attention is immediately struck by the very distinct circular or pentagonal figure, formed by the apical and interradial spines, their reticularia and their spines, limiting the highest part of the central disc. The meshes in this reticulum are formed by the papular areas. — Plates and reticularia both bear spines, but the spines on the plates are larger than the others. All aboral spines are conical in shape and more or less acute; being only 1-1½ times as high as they are thick; they are also relatively low. As a rule the apical and central spines are a little larger. The plates generally have only one spine, but in one specimen the apical plates had three small blunt spinelets. [According to DÖDERLEIN this also occurs in the carinal spines of *O. clavatus*.] The whole aboral surface is covered with small polygonal granules, which are far less coarse than those on the oral side. — It is striking that in smaller specimens the reticular parts and the spines are relatively more strongly developed than in larger specimens.

Anal aperture and madreporite (Pl. VI). The anal aperture is always situated in the centre of the aboral circular or pentagonal figure, close to the central spine and surrounded by a number of larger and smaller spines. As seen from the madreporite it is a little to the left of a line madreporite — central spine. — The madreporite, elliptical to circular in form, is surrounded by some spines, and eccentrically situated exactly on or closely to the margin of the circular or pentagonal figure.

Colour of aboral side (cf. Pl. III, Table 5). At first sight there seems to be no regularity in the many variations in colour. Most variations are found on the aboral side, the oral side being uniformly coloured in tints of yellowish brown to brown. All gradations of colour are to be found in the key below. The most important parts are: *Spines*; *papular Areas*; *Reticular parts*.

1a Spines, Areas & Reticular parts of the same colour	Type A
b Spines, Areas & Reticular parts of different colour	2
2a Spines & Reticular parts of the same colour	3
b Spines & Reticular parts of different colour	4
3a Spines & Reticular parts darker than Areas	Type B
b Spines & Reticular parts lighter than Areas	Type C
4a Reticular parts & Areas of the same colour	5
b Spines & Areas of the same colour	6
5a Reticular parts & Areas darker than Spines	Type D
b Reticular parts & Areas lighter than Spines	Type E
6a Spines & Areas darker than Reticular parts	Type F
b Spines & Areas lighter than Reticular parts	Type G

The occurrence of these colour types in the populations of Great Bay (St. Martin) — and in the material studied from elsewhere — which was probably not sampled at random — may be noted from Table 5.

MEASUREMENTS. See Table 6, and Figs. 14-15.

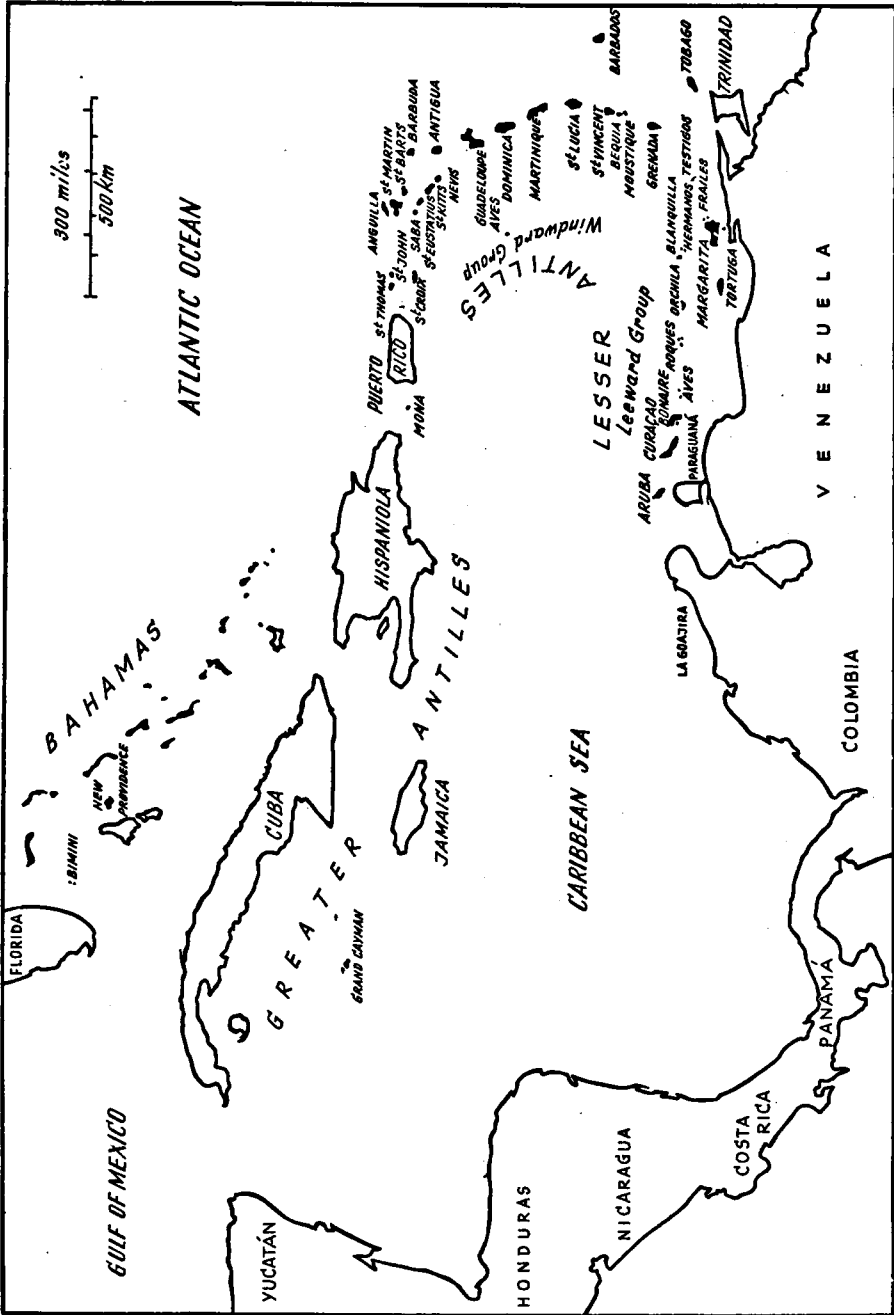


Fig. 13. Sketch map of the Caribbean, showing localities of West Indian sea stars treated in this paper.

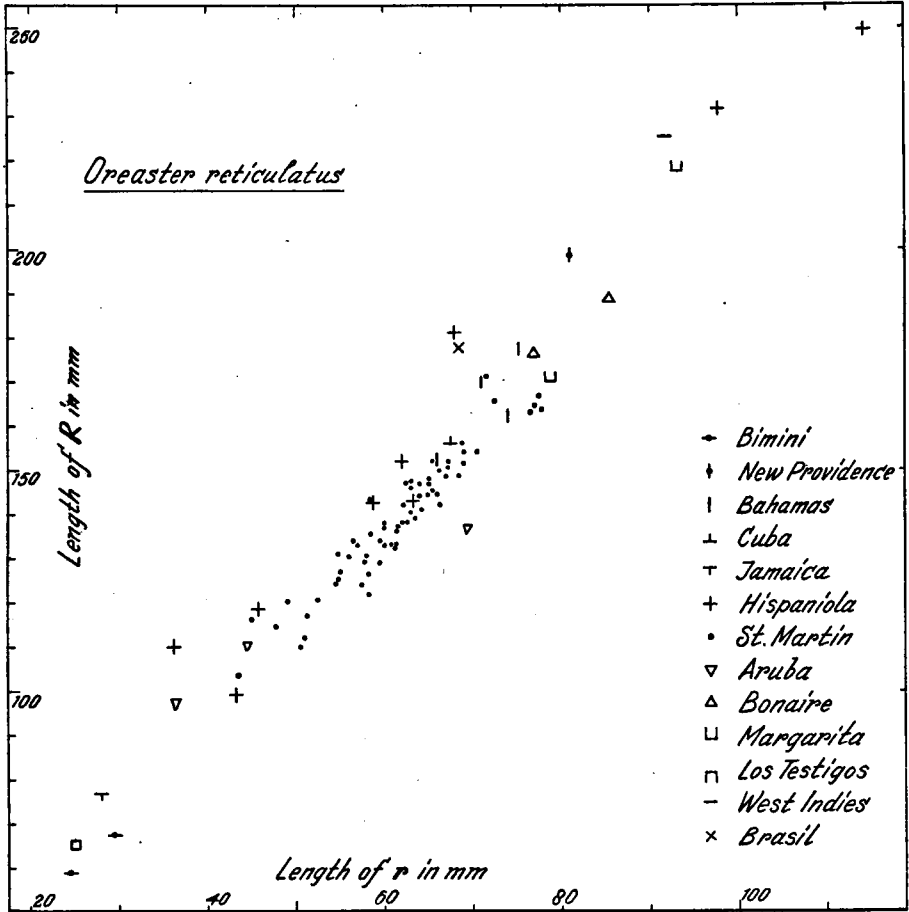


Fig. 14. Measurements in *Oreaster reticulatus*: distance from centre of disc to tip of arm (= R) plotted against distance from centre of disc to interradial margin (= r).

Distribution. Throughout the Caribbean region, from South Carolina to Trinidad, and Brazil; according to old records also occurring at the Cape Verde Islands, and erroneously mentioned from western Australia.

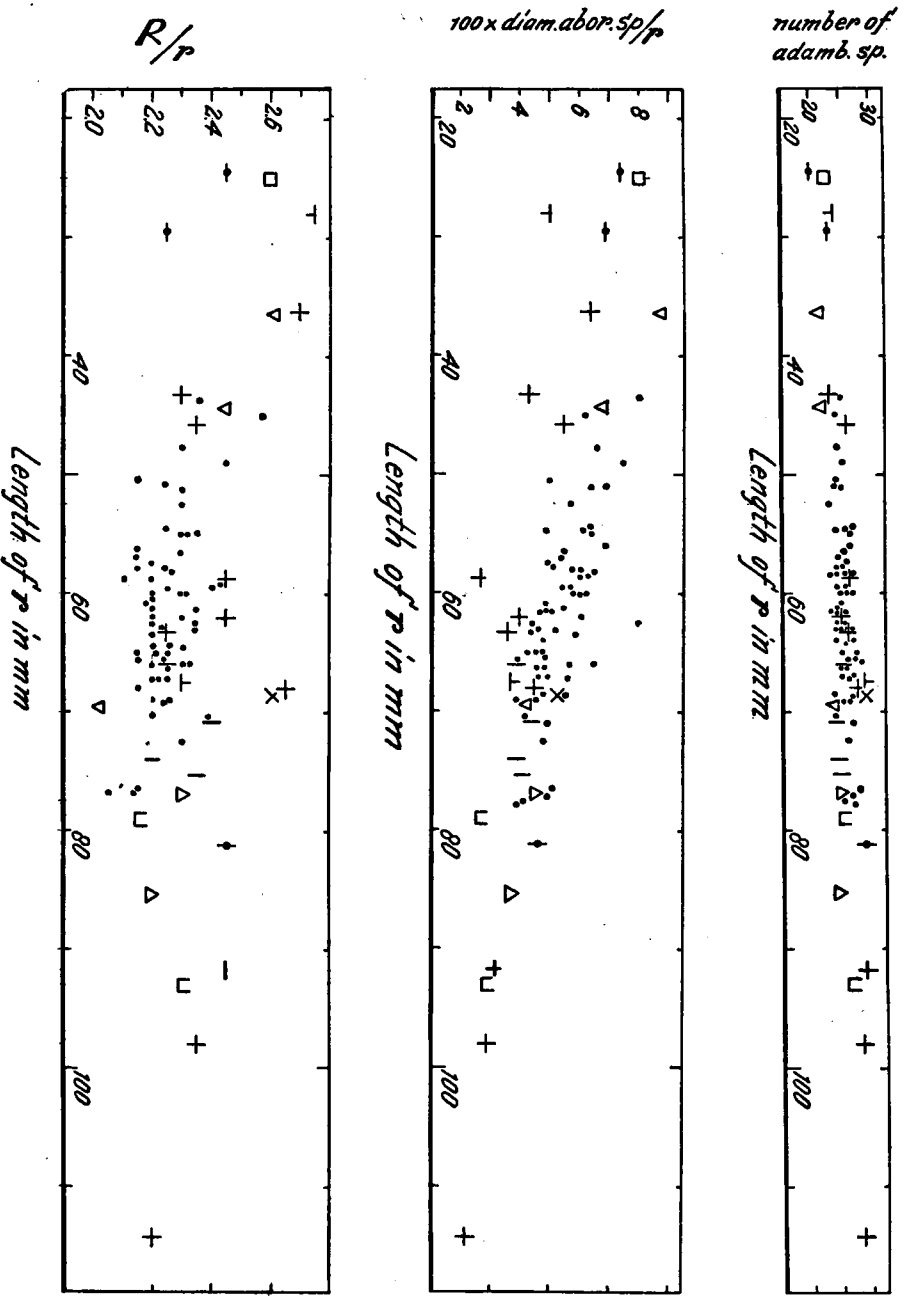


Fig. 15. Measurements in *Oreaster reticulatus*: ratio R/r , maximum diameter of aboral spines expressed in percentages of r , and numbers of ambulacral spines on middle part of the ambulacral furrow, plotted against r .

TABLE 5

Distribution of Colour types in the material of *Oreaster reticulatus* studied.

Colour Type	Bahamas	Cuba	Jamaica	Hispaniola	St. Martin	Los Testigos	Margarita	Bonaire	Aruba	"West Indies"	Brazil	Total number of specimens	ST. MARTIN, Great Bay		
													Total	1949	1955
A	5	1	1	6	4	.	1	2	1	.	.	21 (22½%)	4 (6%)	3 (7%)	1 (6%)
B	.	.	.	.	9	.	.	.	1	.	.	10 (11%)	9 (14%)	8 (17%)	1 (6%)
C	2	.	.	.	14	1	.	.	.	.	3	20 (21½%)	13 (20%)	8 (17%)	5 (27%)
D	.	.	.	.	2	.	.	.	.	.	.	2 (3%)	2 (5%)	1 (4%)	1 (6%)
E	.	.	.	1	26	.	1	.	.	.	.	28 (27%)	26 (39%)	17 (35%)	9 (49%)
F	.	.	.	2	10	.	.	.	1	.	1	14 (15%)	10 (16%)	9 (20%)	1 (6%)
G	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0
	7	1	1	9	65	1	2	2	3	3	1	95 (100%)	64 (100%)	46 (100%)	18 (100%)

Linckia guildingii Gray

Plate VII

Linckia Guildingii GRAY, 1840, p. 285 ["Brown, olive varied; rays slender, elongate, cylindrical, nearly equal, largely granular; back and sides with groups of 3 or 4 holes between the interspaces of the tubercles, apical tubercles large and convex. Monstrosity 6-rayed. Inhab. St Vincent's Rev. *L. Guilding*. Differs from *L. Typus* principally in being much smaller and slenderer."].

Ophidiaster ornithopus MÜLLER & TROSCHER, 1842, p. 31 [Vera Cruz].

Linckia Guildingii, MÜLLER & TROSCHER, 1842, Syst. Aster., p. 33.

Ophidiaster ornithopus, LÜTKEN, 1859, p. 80-86 ["Arten er samlet af Hr. Riise ved Vieques (Crabben-Island), ved St. Thomas paa 1-2 Fod Vand og af Ørsted ved St. Jan paa 4 Favnes Dybde." Vieques, St Thomas, St. John (Virgen I.)].

Linckia Guildingii, GRAY, 1866, p. 14 [see Gray, 1840].

(?)*Linckia Guildingii*, VERRILL, 1867-68, p. 344, 367 [in syn. with *L. ornithopus*].

Linckia ornithopus, VERRILL, 1867-68, p. 344, 367 [p. 367: Abrolhos Reefs, Bermuda].

Linckia guildingii, PERRIER, 1875, p. 408-413 [Vera-Cruz, Bahia, Crabb-Island, Guadeloupe, Iles du Cap-Vert].

Linckia Guildingii, A. AGASSIZ, 1877, p. 105, pl. 14 fig. 1-6 ["specially a West-Indian and a Florida species"].

Linckia guildingii, PERRIER, 1878, p. 16, 47, 66, 67, 79, 96 ["Iles du Cap-Vert, Bermudes, récifs d'Abrolhos, Antilles, la Vera-Cruz, Bahia."].

TABLE 6

Measurements in *Oreaster reticulatus*.

(Averages of five counts per specimen)

R = distance from centre of disc to tip of arm in mm.

r = distance from centre of disc to interradial margin in mm.

R/r = ratio between R and r.

 $\frac{100 d}{r}$ = maximum diameter (d) of aboral spines expressed in percentages of r.adam.sp. = number of adambulacral spines on the first half (0- $\frac{1}{2}$), the middle part ($\frac{1}{2}$ - $\frac{3}{4}$) and on the whole length of the ambulacral furrow (0-1).

inf.marg. = number of inferomarginal spines between the tips of two neighbouring arms.

sup.marg. = number of superomarginal spines between the tips of two neighbouring arms.

Ty. = Type of colour.

Specimens	R	r	R/r	$\frac{100 d}{r}$	adam. sp.			inf.marg.	sup.marg.	Ty.
					0- $\frac{1}{2}$	$\frac{1}{2}$ - $\frac{3}{4}$	0-1			
Bim., L 1151	59	24 $\frac{1}{2}$	2.45	7.4	18 $\frac{1}{2}$	20	42	24	15 $\frac{1}{2}$	C
Test., A	65	25	2.6	8	21	22 $\frac{1}{2}$	45	30	18	C
Bim., L 1151	67	29 $\frac{1}{2}$	2.25	6.9	20	23	—	27 $\frac{1}{2}$	18 $\frac{1}{2}$	A
Jam., A	77	28	2.75	5	21	24 $\frac{1}{2}$	50	33 $\frac{1}{2}$	—	A
Aruba 1959, A	97	36 $\frac{1}{2}$	2.6	8.7	19 $\frac{1}{2}$	20	43 $\frac{1}{2}$	31	27	F
Hisp., A	99	43 $\frac{1}{2}$	2.3	4.3	22 $\frac{1}{2}$	23	—	33	24	A
St. M. 1128B, L	103 $\frac{1}{2}$	43 $\frac{1}{2}$	2.35	8.0	23	25	50	33	27	F
St. M. 1128B, A	109 $\frac{1}{2}$	48	2.3	6.6	22 $\frac{1}{2}$	24 $\frac{1}{2}$	53 $\frac{1}{2}$	33 $\frac{1}{2}$	26	B
Aruba 1959, A	109 $\frac{1}{2}$	44 $\frac{1}{2}$	2.45	6.7	21	22 $\frac{1}{2}$	45 $\frac{1}{2}$	—	—	B
St. M. 1128C, BM	110	50 $\frac{1}{2}$	2.15	5	23	24	52 $\frac{1}{2}$	31	24	C
Hisp., A	110	37 $\frac{1}{2}$	2.7	6.3	—	—	—	—	—	F
St. M. 1128C, BM	114	51	2.25	6.9	22	24 $\frac{1}{2}$	52	34	28	E
St. M. 1959, A	116	45	2.6	6.2	23	24	50	34	27 $\frac{1}{2}$	C
St. M. 1128B, L	117	51	2.3	6.4	23 $\frac{1}{2}$	25	53	34 $\frac{1}{2}$	24	E
Hisp., A	118 $\frac{1}{2}$	46	2.35	5.4	22	26	52 $\frac{1}{2}$	38	31	A
St. M. 1128B, A	120	49	2.45	7.5	24 $\frac{1}{2}$	25	56	35 $\frac{1}{2}$	31	E
St. M. VI-1955, L	120 $\frac{1}{2}$	52 $\frac{1}{2}$	2.3	5.7	21 $\frac{1}{2}$	23	51	33 $\frac{1}{2}$	28	D
St. M. 1128C, A	121 $\frac{1}{2}$	56	2.15	6.1	23	25 $\frac{1}{2}$	54	34	24 $\frac{1}{2}$	E
St. M. 1128C, L	124	54 $\frac{1}{2}$	2.25	6.4	23	27	55 $\frac{1}{2}$	36 $\frac{1}{2}$	26 $\frac{1}{2}$	F
St. M. 1128C, U	124	57 $\frac{1}{2}$	2.15	5.0	24	26	54 $\frac{1}{2}$	35 $\frac{1}{2}$	23	E
St. M. 1128C, A	125	55	2.3	4.9	23	26	53	34 $\frac{1}{2}$	26	E
St. M. 1128C, A	126 $\frac{1}{2}$	58	2.15	6.5	22	24	54	32	26 $\frac{1}{2}$	F
St. M. 1128B, L	127	55	2.3	6.5	24	26	54	35	25 $\frac{1}{2}$	C
St. M. 1128C, L	128	57	2.2	5.4	23 $\frac{1}{2}$	24 $\frac{1}{2}$	53 $\frac{1}{2}$	36	28	E

Table 6 (continued)

Specimens	R	r	R/r	$\frac{100 d}{r}$	adam. sp.			inf.marg.	sup. marg.	Ty
					0- $\frac{1}{2}$	$\frac{1}{2}$ - $\frac{3}{4}$	0-1			
St. M. 1128B, L	129	59 $\frac{1}{2}$	2.1	5.7	22 $\frac{1}{2}$	25	51	35	27 $\frac{1}{2}$	C
St. M. 1128B, A	129	58	2.25	5.1	23 $\frac{1}{2}$	25 $\frac{1}{2}$	54 $\frac{1}{2}$	34	25	C
St. M. 1128C, L	130	56	2.3	6.9	24	26 $\frac{1}{2}$	56	36	32	B
St. M. 1128B, BM	130 $\frac{1}{2}$	58	2.25	5.8	23 $\frac{1}{2}$	25	55	34 $\frac{1}{2}$	30	C
St. M. 1128B, A	133	61	2.2	4.9	22 $\frac{1}{2}$	25	53 $\frac{1}{2}$	38	28	B
St. M. VI-1955, A	133	60	2.2	5.8	23	25 $\frac{1}{2}$	54	37 $\frac{1}{2}$	30	F
St. M. 1128C, L	134	59 $\frac{1}{2}$	2.25	5.5	23 $\frac{1}{2}$	26	57	37	28	F
St. M. 7-VI-1955, A	134	56 $\frac{1}{2}$	2.35	5.5	24	25	56	37 $\frac{1}{2}$	32	C
St. M. VI-1955, L	134	61 $\frac{1}{2}$	2.2	4.9	23	25 $\frac{1}{2}$	54	37	29	E
St. M. 1128B, A	135	58 $\frac{1}{2}$	2.3	6.1	23	26	56	37	27	B
St. M. VI-1955, L	135 $\frac{1}{2}$	61 $\frac{1}{2}$	2.2	5	22 $\frac{1}{2}$	23 $\frac{1}{2}$	55 $\frac{1}{2}$	39	29 $\frac{1}{2}$	C
Aruba 1930, A	136	69 $\frac{1}{2}$	2	4.3	21	23	—	32	29	A
St. M. 1128B, L	136	62 $\frac{1}{2}$	2.2	4.4	23	25 $\frac{1}{2}$	53 $\frac{1}{2}$	37	30	F
St. M. 1128B, BM	137	61 $\frac{1}{2}$	2.35	4.7	23 $\frac{1}{2}$	25	56 $\frac{1}{2}$	36	29	F
St. M. 1128B, L	137 $\frac{1}{2}$	60	2.3	6.1	24 $\frac{1}{2}$	26	56 $\frac{1}{2}$	37	29 $\frac{1}{2}$	C
St. M. 1128C, U	138	60	2.3	6	24	27	57	39 $\frac{1}{2}$	29	C
St. M. VI-1955, A	138	62	2.2	6.1	23 $\frac{1}{2}$	25 $\frac{1}{2}$	56	35 $\frac{1}{2}$	29	E
St. M. 1128C, U	139	63 $\frac{1}{2}$	2.2	5.9	22 $\frac{1}{2}$	24 $\frac{1}{2}$	53	36 $\frac{1}{2}$	27	B
St. M. 1128C, U	140 $\frac{1}{2}$	63	2.25	4.6	23 $\frac{1}{2}$	25	57	39	29	F
St. M. VI-1955, A	141	64	2.2	—	23	26	53 $\frac{1}{2}$	38	30	C
St. M. 1128B, A	142	66 $\frac{1}{2}$	2.1	4.8	23	25	54	34	27	D
St. M. VI-1955, A	142 $\frac{1}{2}$	62	2.3	—	23 $\frac{1}{2}$	25 $\frac{1}{2}$	53	36	30	B
Hisp., A	143	63	2.25	3.6	23	25	51 $\frac{1}{2}$	37 $\frac{1}{2}$	32	E
St. M. VI-1955, U	143	58 $\frac{1}{2}$	2.45	6.3	23	23 $\frac{1}{2}$	48	34 $\frac{1}{2}$	33	E
Hisp., A	143 $\frac{1}{2}$	58 $\frac{1}{2}$	2.45	2.7	24 $\frac{1}{2}$	26	—	39	36	A
St. M. VI-1955, H	144	64	2.25	—	23	24	54	37	29	C
St. M. VI-1955, L	144 $\frac{1}{2}$	65 $\frac{1}{2}$	2.2	3.9	24	28 $\frac{1}{2}$	55	37	35	E
St. M. 1128B, L	144 $\frac{1}{2}$	66	2.2	6.5	23	26	57	38	29 $\frac{1}{2}$	A
St. M. VI-1955, L	145	65 $\frac{1}{2}$	2.2	4.9	24 $\frac{1}{2}$	27 $\frac{1}{2}$	57 $\frac{1}{2}$	37 $\frac{1}{2}$	30 $\frac{1}{2}$	E
St. M. 1128B, A	146 $\frac{1}{2}$	63	2.3	4.4	23 $\frac{1}{2}$	25	57	37 $\frac{1}{2}$	29	E
St. M. VI-1955, L	147	64	2.3	4.8	24	27	56 $\frac{1}{2}$	40	30 $\frac{1}{2}$	E
St. M. 1128B, L	147	62 $\frac{1}{2}$	2.35	8.0	23	25	56	35 $\frac{1}{2}$	29	E
St. M. 1128B, L	147	65	2.15	4.6	24	25 $\frac{1}{2}$	57 $\frac{1}{2}$	39	31	F
St. M. VI-1955, A	147 $\frac{1}{2}$	65	2.25	4.3	25	27 $\frac{1}{2}$	59	41	33	A
St. M. 1128B, L	147 $\frac{1}{2}$	63	2.35	5.2	24	26	56	41	28	E
St. M. 1128B, L	148 $\frac{1}{2}$	68 $\frac{1}{2}$	2.15	4.8	22 $\frac{1}{2}$	24	54	37 $\frac{1}{2}$	27	E
St. M. 1128B, A	148 $\frac{1}{2}$	67	2.2	4.9	23	25	52	34	29	E
St. M. 1128C, L	150	66 $\frac{1}{2}$	2.25	4.6	23 $\frac{1}{2}$	25	54	35 $\frac{1}{2}$	27	B
St. M. 1128C, L	151	67	2.25	4.6	24	27	58	39	33	B
Bah., 1594 L	151	66 $\frac{1}{2}$	2.25	4.9	22 $\frac{1}{2}$	25 $\frac{1}{2}$	—	36	32	A
St. M. VI-1955, L	151 $\frac{1}{2}$	69	2.2	3.9	23	25	51	34	32	E
St. M. 1128C, A	152	67	2.25	5.6	24	26 $\frac{1}{2}$	55 $\frac{1}{2}$	40 $\frac{1}{2}$	34 $\frac{1}{2}$	E

Table 6 (continued)

Specimens	R	r	R/r	100 d r	adam. sp.		inf.marg. sup.marg. Ty.			
					0- $\frac{1}{2}$	$\frac{1}{2}$ - $\frac{3}{4}$	0-1			
Hisp. A	152	62	2.45	4.0	21	25			32	F
St. M. 3-VI-1955, A	153	66	2.3	5.7	23 $\frac{1}{2}$	26	56 $\frac{1}{2}$	37 $\frac{1}{2}$	31	C
St. M. VI-1955, A	154	69	2.25	4.5	23	25 $\frac{1}{2}$	54	39	36	E
St. M. VI-1955, U	154	70 $\frac{1}{2}$	2.2	4.2	—	—	—	35	25 $\frac{1}{2}$	E
St. M. 1128C, L	156	69	2.25	5.5	23 $\frac{1}{2}$	27	61 $\frac{1}{2}$	39 $\frac{1}{2}$	34 $\frac{1}{2}$	F
Cuba, 587 L	157	67 $\frac{1}{2}$	2.3	3.7	23 $\frac{1}{2}$	28	—	41	32	A
St. M. 1128C, L	158 $\frac{1}{2}$	77 $\frac{1}{2}$	2.05	3.9	23 $\frac{1}{2}$	28	61	40	30 $\frac{1}{2}$	E
Bah., 1594 L	162 $\frac{1}{2}$	74	2.2	3.9	23	25	—	36 $\frac{1}{2}$	33	A
St. M. 1128C, BM	163	76 $\frac{1}{2}$	2.1	5.1	25 $\frac{1}{2}$	28	59	39	32 $\frac{1}{2}$	E
St. M. 1128C, U	164 $\frac{1}{2}$	77	2.15	4.8	25	26 $\frac{1}{2}$	60	41	32	E
St. M. 1128B, BM	165	72 $\frac{1}{2}$	2.3	4.8	23 $\frac{1}{2}$	26	54 $\frac{1}{2}$	36	32	A
St. M. 1128B, BM	166 $\frac{1}{2}$	77 $\frac{1}{2}$	2.15	4.1	23 $\frac{1}{2}$	25	60	41	36 $\frac{1}{2}$	C
Marg. 1955, L	170	79	2.15	2.6	23	25	50	36 $\frac{1}{2}$	32	E
Bah., 1332 L	170	71	2.4	4.5	22 $\frac{1}{2}$	24	—	38	34 $\frac{1}{2}$	A
St. M. 1128B, L	171	71	2.4	4.9	24 $\frac{1}{2}$	27	60 $\frac{1}{2}$	40 $\frac{1}{2}$	34	E
Bon. 1930, A	176	77	2.3	4.5	23	25	52 $\frac{1}{2}$	36	32 $\frac{1}{2}$	A
Brasil 585, L	177 $\frac{1}{2}$	68 $\frac{1}{2}$	2.6	5.3	25	28	—	36 $\frac{1}{2}$	30	F
Bah., 1332, L	177 $\frac{1}{2}$	75 $\frac{1}{2}$	2.35	4.1	23	25	—	40	38 $\frac{1}{2}$	A
Hisp., A	181	68	2.65	4.5	25 $\frac{1}{2}$	28 $\frac{1}{2}$	—	—	39	A
Bon. 1930, A	188 $\frac{1}{2}$	85 $\frac{1}{2}$	2.2	3.7	23	25	53	37	35	A
N. Prov. 1149, U	198 $\frac{1}{2}$	81	2.45	4.6	26	29	60	—	—	C
Marg. 1955, L	217 $\frac{1}{2}$	93	2.3	3.0	24	26 $\frac{1}{2}$	53	40	37 $\frac{1}{2}$	A
W., I. A	225	92	2.45	3.2	26	29	58 $\frac{1}{2}$	42 $\frac{1}{2}$	40 $\frac{1}{2}$	C
Hisp., A	231 $\frac{1}{2}$	98	2.35	2.9	26 $\frac{1}{2}$	28 $\frac{1}{2}$	57 $\frac{1}{2}$	47	39	A
Hisp., A	249 $\frac{1}{2}$	114	2.2	2.2	25 $\frac{1}{2}$	28 $\frac{1}{2}$	58	43 $\frac{1}{2}$	40 $\frac{1}{2}$	A

Linckia guildingii, SLADEN, 1889, p. 409, 410, 655, 748 ["Cape-Verde Islands; Bermuda; Antilles; Abrolhos reefs; Vera Cruz; Bahia."].

Linckia guildingii, CLARK, H. L., 1898, p. 6 [Jamaica].

Linckia guildingii, CLARK, H. L., 1901, p. 340, 344 [Bermuda].

Linckia guildingi, DÖDERLEIN & HARTMEYER, 1910, p. 152 [Tortugas, St. Thomas, St. John, Barbados.].

Linckia guildingii, FISHER, 1911, p. 242-245.

Linckia guildingii, CLARK, H. L., 1919, p. 54, 71 [Bermuda, Bahamas, Florida, Tortugas, Cuba, Jamaica, St. Christopher, Tobago, Brazil, Indo-Pacific; records from Puerto-Rico, St. Thomas, Guadeloupe, Barbados, St. Vincent, E. coast of C. A. and Mexico, eastern Atlantic.].

Linckia guildingii, VAN DER HORST, 1927, p. 163 [Curaçao].

Linckia guildingii, CLARK, H. L., 1933, p. 24-25 [Puerto Rico].

Linckia guildingii, ENGEL, 1939, p. 4, 7 [Aruba, Curaçao].

- Linckia guildingii*, CLARK, A. H., 1939, p. 442 [Hispaniola, St. Thomas. St. John, Barbados.].
- Linckia guildingii*, CASO, 1941, p. 155-160, 6 figs. [Pacific coast of Mexico.].
- Linckia guildingii*, CASO, 1943, p. 87-91, pl. 32 fig. 1-2, pl. 33 fig. 1-2.
- Linckia guildingii*, TOMMASI, 1958, p. 17-18, pl. 3 fig. 3 [... Bahia, Pernambuco, Abrolhos. Angra dos Reis, R. J. Ubatuba, S. P.].
- Linckia guildingii*, CASO, 1961, p. 70-72 [Veracruz].

BIMINI: North Bimini, Ivor Cornman coll., 1949 (2 specimens, dry; R = about 100 mm, arms 5, yellowish brown and purplish in colour; not studied).

NEW PROVIDENCE: Between Hog Island and Athol I., sta. 1149, sand with *Thalassia*, 3 m, 16.VIII.1949 (1 spec., alc.).

St. KITTS: Frigate Bay beach, 20.VII.1955 (1 spec., dry); Frigate Bay, sta. 1397, on top of boulder among algae, $\frac{1}{2}$ m, 20.VII.1955 (1 spec., alc.).

BONAIRE: Kralendijk, X.1954, Heitkönig coll. (1 spec., dry).

KLEIN BONAIRE: East coast at landing place, sta. 1049B, among reef debris on sandy beach, 1 m, 13.IX.1948 (1 spec., alc.).

CURAÇAO: Wharf at Bullenbaai, sta. 1331, among flat pebbles in tidal zone, J. S. Zaneveld coll., 6.I.1955 (1 spec., alc.); Bullenbaai, in fish pot, 7 m, J. S. Zaneveld coll., 14.II.1955 (1 spec., dry); Caracasbaai, 19.IV.1920, C. J. van der Horst coll. (5 spec., alc., A).

ARUBA: North of Punta Braboe, W of Oranjestad, sta. 1001, among sandy reef debris, $\frac{1}{2}$ m, 18.VI.1930 (4 spec., dry); Reef Bucuti, sea side, sta. 1006, among sandy reef debris, $\frac{1}{2}$ m, 25.VI.1930 (6 spec., alc.); sta. 1006b, among *Porites*, $\frac{1}{2}$ m, 6.V.1955 (2 spec., alc. and dry); Palm Beach, 1948 (1 spec., dry); Aruba, A. J. van Koolwijk, 1880 (1 spec., dry, L); Aruba, J. R. H. Neervoort van de Poll, 1885 (1 spec., dry, L).

WEST INDIES: Eyken-Sluiters (1 ex., dry, A.); Antilles (2 spec., dry, A).

BRAZIL: Bahia, F. Krauss (2 ex., dry, L).

Diagnosis

Distinctly, but very irregularly stellate, R usually 9-10 in regular forms [attaining a larger size than *Ophidiaster guildingii*]. Arms 4-6 in number, subcylindrical, flattened on oral side, laterally bearing 3 regular longitudinal rows of plates [in *Linckia columbiae*, only two]. Papular areas between aboral plates equal or larger in size than the plates, with 40 pores. Papular areas not distinct. Number of plates on a line across dorsum at least seven, usually about ten. Average number of adambulacral plates at arm base over a distance equal to twice maximum arm width 20.

Description of the material

GENERAL FORM. Distinctly stellate, central disc clearly delimited from the arm base. Arms 4-6 in number, subcylindrical in shape and flattened on the oral side; their maximum width is to be found in the middle part or at the arm base. Most

specimens are irregular and asymmetrical, the result of autotomy; comet forms are not uncommon. — The ratio R/r differs very strongly, but is usually about 9–10; in comets, especially, this ratio reaches extremely high values, while it is not possible to get exact values of r .

ORAL SIDE (Pl. VIIb). The ambulacral furrow is bordered at each side by two series of granular spines and one adjacent series of very large and rounded granules. The spines of the outer series are relatively large and rounded. The inner series consists of two types of spines; the larger type, with rounded tips, alternate with the spines of the outer series; the smaller, conical type are opposite the spines of the outer series. The number of adambulacral plates at arm base over a distance equal to twice the arm width varies strongly. The oral surface is covered with rounded granules, which become smaller near the margin.

ABORAL SIDE (Pl. VIIa). Laterally across each arm are three rather regular longitudinal rows of plates. No other aboral plates are situated in regular rows. The number of plates on a line straight across an arm, from margin to margin, is at least seven, but mostly ten. The papular areas between are equal or larger in size. The number of pores per papular area in the specimens ranges from 3–10 in smaller specimens to 10–40 in the larger ones. The whole aboral surface is covered with small rounded granules, concealing the definite shape of the plates; however, the granules on the plates are larger than those on the areas. The anal aperture is situated in the centre, but is rather indistinct because of the granulation. The circular madreporite is situated eccentrically, mostly in an interradius. In many specimens there are two madreporites. The colour in dried specimens is whitish; whitish with dots of pink; uniformly brown or light brown; or uniformly yellowish; more rarely purplish. The colour in alcohol specimens is brownish or various tints of green.

MEASUREMENTS see Table 7.

Distribution. Throughout the Caribbean region and Brazil; according to literature also: Bermuda and Cape Verde Islands; Pacific coast of Mexico, and Indo-Pacific region.

Ophidiaster guildingii Gray

Plate VIII

Ophidiaster Guildingii GRAY, 1840, p. 284 ["Pale brown (dry), rays cylindrical, 4 times as long as the width of the body, with 7 series of moderate tubercles; the spines near the ambulacra compressed, thin ovate. *Var.* 1. female? Rays thick, spaces between the tubercles large with numerous dots. *Var.* 2. male? Rays thin, spaces between the tubercles small, with 4 or 6 dots."]

Ophidiaster flaccidus LÜTKEN, 1859, p. 86–87 [St. Thomas].

Ophidiaster Guildingii, GRAY, 1866, p. 13 [see GRAY, 1840].

Ophidiaster flaccidus, VERRILL, 1867, p. 344 [St. Thomas].

Ophidiaster Guildingii, PERRIER, 1875, p. 387–388 [St. Thomas].

Ophidiaster Guildingii, PERRIER, 1878, p. 16, 47, 80, 96 [St. Thomas].

Ophidiaster guildingii, SLADEN, 1889, p. 402, 782.

Ophidiaster guildingii, CLARK, H. L., 1898, p. 6 [Jamaica].

Ophidiaster guildingii, DÖDERLEIN & HARTMEYER, 1910, p. 152 [Barbados, Tortugas.].

TABLE 7

Measurements in *Linckia guildingii*

(Averages of five counts per specimen)

R = distance from mouth to arm tip in mm.

r = distance from mouth to interradial margin in mm.

br = width of arm at arm base in mm.

R/r = ratio between R and r.

R/br = ratio between R and br.

adam = number of adambulacral plates on a distance equal to 2 br, on each side of the furrow.

A = number of arms.

lr = number of lateral regular rows on each side of an arm.

tot = total number of plates on a line transverse about an arm.

pp = number of papular pores in a papular area.

mp = number of madreporites.

c = comet form.

Specimens	R	r	br	R/r	R/br	adam	A	lr	tot	pp	mp
Aruba, 18.VI.1930 c	19	2	2.5	9.5	7.6	15	6	3	9	3-4	1
Antilles	25	3	3	8.3	8.3	15	6	3	8	3	1
Aruba, 18.VI.1930	27	3	3	9	9	18	-	3	9	4-5	2
Aruba, 25.VI.1930	27	3	3.5	9	7.7	20	5	3	12	3-5	2
Aruba, 25.VI.1930	27	2½	3.5	10.8	7.7	20	5	3	9	5-6	2
Aruba, 25.VI.1930 c	29	1	3.5	?	7.7	18	5	3	10	4-5	?
Aruba, 25.VI.1930	29	3	3.2	9.9	9	16	5	3	12	4-6	2
West Indies	30	3½	3.5	8.6	8.6	17	6	3	9	3-5	1
Curaçao, 19.IV.1920	30	2½	3.2	12	9.4	15	6	3	10	9-10	2
Aruba, 25.VI.1930	32	3½	4	9.1	8	16	5	3	12	4-6	2
Aruba, 6.V.1955	32	3½	3.5	9.1	9.1	18	5	3	9	5	2
Aruba, 18.VI.1930	35	2½	3	14	12	16	5	3	9	6	2
Antilles	38	4½	5	9	7.6	23	5	3	9	7	2
Curaçao, 19.IV.1920	40	4½	4.5	8.9	8.9	19	6	3	11	4-5	2
Curaçao, 19.IV.1920	40	4	4.3	10	9.3	16	5	3	10	5-7	2
Curaçao, 19.IV.1920	41	4	4	10.2	10.2	20	6	3	9	5-7	2
Aruba, 25.VI.1930	44	5½	6	8	7.3	23	5	3	10	9-10	2
Aruba, 18.VI.1930	46	3½	3.5	14.4	13.3	18	5	3	8	4-6	2
St. Kitts, 20.VII.1955	46	4½	5	10.2	9.2	20	4	3	12	8-9	2
New Providence, 1149	47½	7	7	6.8	6.8	27	6	3	12	10-12	2
Curaçao, 1331 c	50	5	6	10	8.3	22	6	3	11	7	?
Kl. Bonaire, 1049B c	56	3½	5	16	11.2	20	6	3	11	10-15	1
Curaçao, 19.IV.1920	65	5½	6	11.9	10.8	21	5	3	12	10-15	2
St. Kitts, 1397	66	6½	7	10	9.5	20	5	3	11	9-11	2
Bonaire, X.1954	67	7½	7.2	9.3	9.3	20	6	3	11	10-17	1
Aruba, 1880	73	6	6	12	12	20	5	3	16	10-13	1
Aruba, 1948	84	9	8	9.3	10.5	25	6	3	16	20	2
Brazil	88	10	11	8.8	8	20	5	3	16	25-35	1
Aruba, 1885	96	8	8	12	12	23	6	3	18	13-19	2
Brazil	125	10	11	12.5	11	24	5	3	15	15	2
Aruba, 8.V.1955	141	11½	14	12.2	10	29	6	3	12	40	1
Curaçao, 14.II.1955	160	16	15	10	10.7	30	6	3	14	35-40	2

- Ophidiaster guildingii*, CLARK, H. L., 1919, p. 71, 54 [Florida, Tortugas, Jamaica, Tobago; records from Puerto Rico, St. Thomas, Antigua, Barbados].
- Ophidiaster guildingii*, VAN DER HORST, 1927, p. 163 [Curaçao, Caracasbaai, Spaansche Baai].
- Ophidiaster guildingii*, CLARK, H. L., 1933, p. 23, pl. 2 [Puerto Rico; "characteristic of the West Indian region from the Tortugas to Barbados. It is not yet known from Bermuda or the Bahamas, nor does it seem to occur on the Gulf coast of America nor on the shores of South America."].
- Ophidiaster guildingii*, CLARK, A. H., 1939, p. 442 [St. John].
- Ophidiaster guildingii*, ENGEL, 1939, p. 4 [Curaçao].

CURAÇAO: Caracasbaai, under pieces of rock near shore, 3.V.1920 (1 specimen); 5.V.1920, among corals (2 spec.); 18.V.1920, under pieces of rock (3 spec.); Spaansche Baai, among pieces of rock in surf, 11.V.1920 (2 spec.); all C. J. van der Horst coll. (alc., A). Santa Marta Baai, 1-4 m deep, 4.VII.1954, member Neth. Ant. Natural History Study Group leg. (2 spec., dry, U).

Diagnosis. Distinctly and regularly stellate [and not becoming larger than *Linckia guildingii*]; number of arms 5; $R = 8-11 r$ in larger specimens (in which $R = 30-50$ mm). Arms more or less cylindrical, with distinct tubercles situated in 7 longitudinal regular rows. Average number of adambulacral plates 12-15-20 near arm base, over a distance equal to twice maximum width of arm. Number of papular pores 5-10 in larger specimens (in which $R = 30-50$ mm). Papular areas distinct.

Description of the material

GENERAL FORM. Central disc not clearly delimited from the arm base. Arms 5 in number, cylindrical in form, their maximum width is usually in the middle parts. Ratio R/r in smaller specimens 3-5, in larger specimens 7-11 (see Table 8); the arms in the larger specimens are also relatively longer.

ORAL SIDE (Pl. VIII top right). The few interradial plates are covered with polygonal granules. The ambulacral furrow is bordered by two series of spines: an inner series consisting of smaller spines, all united by an elastic membrane enclosing their lower half; an outer series consisting of larger spines, not united by any membrane. The number of plates on each side of the furrow greatly differs.

ABORAL SIDE (Pl. VIII top left). The tubercles on each arm are situated in seven regular longitudinal rows; the papular areas between are distinct. The number of papular pores increases in larger specimens. The surface is covered with polygonal granules. The anal aperture is situated in the centre and surrounded by 6-9 papillae. The circular madreporite is eccentric. The colour is whitish in specimens which have been preserved in alcohol for a long time, and pink in the other material, the papular areas being of a duller shade.

MEASUREMENTS. See Table 8.

TABLE 8

Measurements in *Ophidiaster guildingii*

(Averages of 5 counts per specimen)

R = distance from mouth to arm tip in mm.

r = distance from mouth to interradial margin in mm.

R/r = ratio between R and r.

brb = width of arm at arm base in mm.

brm = maximum arm width in mm.

R/brb = ratio between R and brb.

R/brm = ratio between R and brm.

adam = number of adambulacral plates on a distance equal to 2 times max. arm width.

rw = number of regular rows on arm.

pp = number of papular pores in the papular area.

Specimens	R	r	brb	brm	R/r	R/brb	R/brm	adam	rw	pp
Curaçao, 5.V.1920	6	1.8	2	2	3.3	3	3	12	7	1
Curaçao, 11.V.1920	6.4	1.5	2	2	4.25	3.2	3.2	12	7	1-2
Curaçao, 3.V.1920	7.5	2	2.6	2.5	3.75	3	3	15	7	1-2
Curaçao, 5.V.1920	8.2	1.7	2	2	4.9	4.1	4.1	13	7	1-2
Curaçao, 18.V.1920	27.5	3.7	4.8	5	7.4	5.7	5.5	20	7	3-5
Curaçao, 18.V.1920	35.4	4.1	4.8	6.7	8.6	7.4	5.3	17	7	6-8
Curaçao, 18.V.1920	38.6	4.8	5.1	6.7	8	7.6	5.75	17	7	6-9
Curaçao, 4.VII.1954	41	4.8	5.6	5.5	8.5	7.3	7.5	14	7	6-8
Curaçao, 4.VII.1954	43.4	4	4	5	10.9	10.9	8.7	13	7	6-9
Curaçao, 11.V.1920	50	5.6	5.5	7.5	9	9	6.6	16	7	7-10

Distribution. Florida, Jamaica, Puerto Rico, St. Thomas, St. John, Antigua, Barbados, Tobago (according to literature), and Curaçao (own record).

Asterina folium (Lütken)**Plate IX***Asterina minuta* Var. 1, GRAY, 1840, p. 284 [St. Vincent].*Asteriscus folium* LÜTKEN, 1859, p. 60-61 [St. Thomas].*Asterina minuta* Var. 1, GRAY, 1866, p. 16 ["Var. 1 Larger; each of the ossicula of the oral surface with three spines." St. Vincent].*Asterina folium* (Lütken) AGASSIZ, 1877, p. 106, pl. 14 fig. 7-9 [West Indies, Florida].

- Asterina minuta*, PERRIER, 1878, p. 28, 86, 96 ["Antilles"].
Asterina folium, SLADEN, 1889, p. 393, 774 ["Antilles; Bermuda."].
Asterina folium, CLARK, H. L., 1898, p. 6 [Jamaica].
Asterina folium, CLARK, H. L., 1901, p. 340, 344 [Bermuda].
Asterina minuta Gray, DÖDERLEIN & HARTMEYER, 1910, p. 152-154 [Barbados, Jamaica, Tortugas].
Asterina folium, CLARK, H. L., 1919, p. 54, 71 [Bermuda, Florida, Tortugas, Jamaica, Tobago; records from Bahamas, Puerto Rico, St. Thomas, Antigua, Guadeloupe, Barbados, N. coast of S. America].
Asterina folium, CLARK, H. L., 1933, p. 26 [Puerto Rico; in addition Old Providence, Curaçao records].
non *Asterina folium*, ENGEL, 1939, p. 7 [Aruba, Bonaire].

COLOMBIA: Santa Marta, Gairaca, Exp. Chazalie Sta. 50, 5-15 m, J. Versluys leg., 29.II.1896 (11 specimens, alc., A).

Diagnosis. Distinctly pentagonal and larger than *A. hartmeyeri*; R about 1.2-1.3 r; interradial margin only slightly concave. Oral interradial plates each bear 3-4 small, acute, fragile spinelets, and there is a distinctly granulated surface between the plates. All adambulacral spines at each side of the furrow united by a rather stiff membrane. Surface of inferomarginal plates crowded with minute spines. Aboral plates with granular spinelets.

Description of the material

ORAL SIDE (Pl. IX bottom right). The interradial plates each bear 3-4 small, acute, fragile spinelets, and have a distinct granular area between. The plates are situated in almost regular rows, originating almost perpendicularly to the ambulacral furrow; near the marginal plates the rows run nearly parallel with the interradial margin. There are 14-20-25 marginal plates between two neighbouring arm tips. — The adambulacral spines are united by a rather stiff membrane, and thus form a border on each side of the ambulacral furrow. These spines are enclosed completely, or, generally, for the greater part. There are 11-15-20 adambulacral plates at each side of the furrow. — The jaw-shaped mouth plates are distinct and acute, bearing small spines.

ABORAL SIDE (Pl. IX top right). The lozenge-shaped plates are imbricated and covered with minute spines or granules. The anal aperture is in the centre of the disc; the madreporite is eccentric. — The colour of the specimens studied is uniformly white, probably due to conservation in alcohol.

MEASUREMENTS see Table 9.

From a study of HUMMELINCK's specimens from Aruba and Bonaire, which were mentioned by ENGEL (1937, p. 7) as *Asterina folium*, it appeared that this material belonged to *A. hartmeyeri*.

TABLE 9

Measurements in *Asterina folium*, *A. hartmeyeri* and *A. marginata*.

(Averages from five counts per specimen)

R = distance from centre of disc to tip of arm in mm.

r = distance from centre of disc to interradial margin in mm.

R/r = ratio between R and r.

sp = number of spines on oral interradial plates.

marg = number of marginal plates between two neighbouring arm tips.

adam = number of adambulacral plates on each side of the ambulacral furrow.

Specimens	R	r	R/r	sp	adam	marg
<i>Asterina folium</i>						
Santa Marta 29.II.1896	3	2.5	1.25	3-4	11-13	14-18
"	3.5	3	1.15	3-4	11-13	14-16
"	4.2	3.4	1.25	3-4	11-13	14-17
"	5	4	1.25	3-4	12-14	18-20
"	5.3	4	1.23	3-4	12-14	16-18
"	5.5	4.5	1.2	3-4	14-15	17-19
"	5.9	4.8	1.23	3-4	13-16	19-20
"	6.6	5.7	1.15	3-4	14-16	20
"	9.1	6.8	1.33	3-4	17-19	23-25
"	11	9	1.22	3-4	17-19	22-24
"	12.9	9.8	1.31	3-4	19-20	24-26
<i>Asterina hartmeyeri</i>						
Bonaire, 1058a	4	2.5	1.6	1-2	13-15	19-20
Aruba, 1006	5	4	1.25	1	15-16	19-21
St. John, 1407	5.3	4	1.3	1	14-16	20-21
St. Martin, 1126	5.5	3.5	1.5	1	16-18	20-21
<i>Asterina marginata</i>						
Braziliën	15.5	8	1.9	2-3	20-21	30-32
"	17	8	2.1	2-3	19-20	30-32

Distribution. Bermuda, Bahamas, Florida, Tortugas, Jamaica, Puerto Rico, St. Thomas, Antigua, Guadeloupe, Barbados and Tobago (according to CLARK, H. L., 1933); St. Vincent (GRAY, 1840, 1866) and N. coast of S. America (CLARK, H. L., 1919). N. coast of Colombia (own record). - In shallow coastal waters, down to 15 m.

Asterina hartmeyeri Döderlein**Plate IX**

Asterina minuta Var. 2, GRAY, 1840, p. 284 [see GRAY 1866].

Asterina minuta Var. 2, GRAY, 1866, p. 16 ["Var. 2. Smaller; each of the ossicula with one, rarely with two spines." St. Vincent].

Asterina minuta, CLARK, H. L., 1898, p. 6 [Jamaica].

Asterina hartmeyeri Döderlein, DÖDERLEIN & HARTMEYER, 1910, p. 154-155 [Barbados].

Asterina minuta Gray, CLARK, H. L., 1919, p. 54, 71 [Jamaica, Tobago; record from Barbados].

Asterina hartmeyeri, CLARK, H. L., 1933, p. 27-28, pl. 3 [Puerto Rico].

Asterina folium, ENGEL, 1939, p. 7 [Aruba, Bonaire].

ST. JOHN: Turner Bay, Sta. 1407, between debris, $\frac{1}{2}$ m, 18.VI.1955 (1 specimen, alc., L).

ST. MARTIN: Great Bay, Sta. 1126, among debris on rocky beach with eelgrass, $\frac{1}{2}$ m, 11.VI.1949 (1 spec., alc., U).

BONAIRE: South of Kralendijk, De Hoop, Sta. 1058a, among rock debris at sandy reef, 1 m, 31.X.1930 (1 spec., whitish when alive, alc., A).

ARUBA: Bucuti reef, northern sea side, Sta. 1006, Porites reef-flat with tide pools, $\frac{1}{2}$ m, 25.VI.1930 (1 spec., alc., A).

Diagnosis. Pentagonal to shortly stellate and smaller than *A. folium*; R about 1.3-1.5 r; interradial margin distinctly concave. Oral interradial plates each with 1, rarely 2, slender spinelets, and with no granulated surface between. Adambulacral spines not united by any membrane. Inferomarginal plates crowded with bundled needle-shaped spines, one bundle on each plate. Aboral plates with minute granules and tufts.

Description of the material

ORAL SIDE (Pl. IX bottom right). The interradial plates each bear 1, rarely 2, slender spinelets, and have no distinct granular area between. The plates are situated in almost regular rows, originating almost perpendicularly to the ambulacral furrow; near the marginal plates they run almost parallel with the interradial margin. The adambulacral spines are not united by any membrane; 2 or 3 on each plate. Number of adambulacral plates at each side of the furrow: 13-15-18. — The jaw-shaped mouth plates are not acute but rounded, and bear small spines. The inferomarginal plates are crowded with bundles of needle-shaped spines, one bundle on each plate. Number of marginal plates between two neighbouring arm tips: 19-21.

ABORAL SIDE (Pl. IX top right). The lozenge-shaped plates are imbricated and covered with minute granules and small tufts. The anal aperture is in the centre of the disc; the madreporite is eccentric. — The colour of the specimens studied is light brownish; the aboral side is darker than the oral side.

MEASUREMENTS see Table 9.

Distribution. Jamaica, Puerto Rico, Barbados and Tobago (according to CLARK, 1933). St. John, St. Martin, Bonaire and Aruba (own material).

***Asterina marginata* (Perrier)**

Plate IX

Asteriscus minutus MÜLLER & TROSCHER, 1842, p. 41 [Brazil].

? *Asteriscus brasiliensis* LÜTKEN, 1859, p. 57–59 [Brazil, Rio de Janeiro].

Asterina marginata Valenciennes, PERRIER, 1878, p. 86, 96, 97. [“Brésil (Rio Janeiro), Sénégal.”].

Asterina marginata (Val.), PERRIER, SLADEN, 1889, p. 390, 774 [“Rio Janeiro; Sénégal; (?) Canary Islands.”].

BRAZIL: “Brazilien” (2 specimens, alc., A).

Diagnosis. Distinctly stellate and larger than *A. folium*; R about 2r; interradial margin strongly concave. Oral interradial plates each have 2–3 short, conical, acute spines and no distinct areas between. Only spines on each adambulacral plate united by an elastic membrane. Surface of inferomarginal plates covered by a group of 5–6 short, conical, blunt spines. Aboral plates each have 5–8 short blunt spinelets.

Description of the material

ORAL SIDE (Pl. IX bottom left). The interradial plates each bear 2–3 short, conical and acute spines, and have no distinct granular area between. The plates are situated as in *A. folium* and *A. hartmeyeri*. The adambulacral plates bear a group of 3 spines, which are united by an elastic membrane. Number of adambulacral plates at each side of the furrow: 19–21. The jaw-shaped mouth plates are rounded and bear small spines (about 8). Surface of the inferomarginal plates covered by a group of 5–6 short, conical, blunt spines. Number of marginal plates between two neighbouring arm tips: 30–32.

ABORAL SIDE (Pl. IX top left). The lozenge-shaped plates are covered by 5–8 short, blunt spinelets, much more distinctly developed than in *A. folium* and *A. hartmeyeri*. The anal aperture is in the centre of the disc; the madreporite is situated somewhat eccentrically. — The colour of the alcohol specimens is a uniform light grey, the oral side almost whitish.

MEASUREMENTS see Table 9.

Miss A. M. CLARK kindly informed me that the name *Asterina marginata* is incorrect, this being a synonym of *Asteriscus stellifer* Möbius 1859, as MADSEN (1950, Atlantide Report) has pointed out. The best generic name is also controversial.

Distribution. Brazil (Rio de Janeiro), Senegal and ?Canary Islands (according to SLADEN, 1889).

Luidia senegalensis (Lamarck, 1816) Plates X-XI

- Asterias Senegalensis*, LAMARCK, 1840, p. 255 [Habite l'Océan d'Afrique, les côtes du Sénégal."].
- Luidia senegalensis*, MÜLLER & TROSCHEL, 1842, p. 78, pl. 5 fig. 4 ["Africanische Küste, Brasilien."].
- Luidia Marcgravii* LÜTKEN, 1859, p. 43-46 [Brazil, Hispaniola.].
- Luidia Marcgravii*, VERRILL, 1867, p. 343 ["Brazil! Jamaica (Browne), Cotin-
quiba."].
- Luidia senegalensis*, FERRIER, 1878, p. 34, 66-67, 91, 96-97 ["Sénégal, Antilles,
Brésil."].
- Luidia senegalensis*, SLADEN, 1889, p. 246, 742 ["Senegal; Guadeloupe; Jamaica;
Brazil; Cotinquiba."].
- Luidia senegalensis*, CLARK, H. L., 1898, p. 5 [Jamaica].
- Luidia senegalensis*, DÖDERLEIN & HARTMEYER, 1910, p. 151. [Jamaica].
- Luidia senegalensis*, CLARK, H. L., 1919, p. 54, 71 [Florida, Jamaica, Hispaniola,
Brazil; records from Puerto Rico, Guadeloupe, Trinidad, eastern Atlantic.].
- Luidia senegalensis*, DÖDERLEIN, 1920, p. 238, 249-250, fig. 9, 20 [Desterro, Sta
Catarina and Bahia; Puerto Rico, Jamaica.].
- Luidia senegalensis*, CLARK, H. L., 1933, p. 20-22 [Puerto Rico].
- Luidia marcgravii*, BOONE, 1933, p. 76-77, pl. 33-36 [Cuba].
- Luidia senegalensis*, CLARK, A. H., 1939, p. 442 [Puerto Rico].
- Luidia senegalensis*, ENGEL, 1939, p. 3, 7 [Coche].
- Luidia senegalensis*, BERNASCONI, 1943, p. 5-6 [... Bahia, Desterro, Isla San
Sebastián.].
- Luidia senegalensis*, TOMMASI, 1958, p. 9-11, pl. 2 fig. 2 [Brazil].
- Luidia senegalensis*, CHERBONNIER, 1959, p. 170 [Cayenne].
- Luidia senegalensis*, DURAND, 1959, p. 21-22 etc., fig. 2 [Cayenne, cf. CHERBONNIER].
- Luidia senegalensis*, ENGEL & SCHROEVERS, 1960, p. 5 [Margarita].

ANTIGUA: St. Johns Harbour, from fishermen's garbage, 1.VII.1955 (10 spec.,
dry, most specimens only fragmentary).

COCHE (S. of Margarita): 25.VI.1936 (1 spec., dry).

VENEZUELA: coast of Venezuela, P. Buitendijk, 19.XI.1905 (1 spec., alc., L).

COLOMBIA: Río Hacha, Exp. Chazalie, J. Versluys (1 spec., alc., A).

BRAZIL: Brazilië (1 spec., alc., L).

Diagnosis. Distinctly and regularly stellate, number of arms usually 9. R = 6-8 r; R = 9-11 br. Inferomarginal plates with acute conical spines. Paxillae square or rectangular, close to each other and closely set with granular spinelets. Marginal paxillae distinctly larger than the other paxillae. Lateral paxillae without large spines. Ventrolateral plates form rows in the angle between two arms. No pedicellaria. Madreporite not completely hidden by the paxillae.

Description of the material

GENERAL FORM. Distinctly and regularly stellate, with a clearly defined central disc from which 9 long and slender arms originate, narrowing gradually from the base to the more or less acute apex. R = 6–8 r; R = 9–11 br.

ORAL SIDE. On each adambulacral plate there are 4 spines, which are arranged in the following way. 1) An inner series consisting of one slender, acute, slightly curved and sabre-shaped spine per plate. 2) A middle series consisting of one spine per plate, almost identical in appearance with the above, but a little stronger and with a rounded tip. 3) An outer series consisting of two flattened spines per plate, about equal in size and with more or less rounded tips. — In the free parts of the arms we find only one ventrolateral plate between an adambulacral and an inferomarginal plate; in the angle between two arm tips the number of these plates gradually increases. In this way the ventrolateral plates form more or less regular rows between an adambulacral and an inferomarginal plate. These plates bear small acute spinelets. — The oral surface of the inferomarginal plates is covered with a number of scale-shaped acute spinelets. On their outer side we find two acute conical spines one above the other, the upper one being slightly smaller than the lower one. The lateral margins are covered with small bristly spinelets. There are no pedicellaria.

ABORAL SIDE (Pl. X top left, XI top). The superomarginal plates are not clearly distinguishable; they are represented by the marginal row of paxillae, according to DÖDERLEIN, 1920. All paxillae fit closely together. The rectangular marginal paxillae form regular longitudinal and transverse rows with the smaller lateral paxillae. The paxillae of the middle part are polygonal in shape and irregularly arranged. The tabulae of all paxillae are closely set with acute spinelets at their margins and with granular spinelets on their middle parts. — The madreporite is polygonal in shape and not completely hidden by the paxillae. There are no pedicellaria.

MEASUREMENTS see Table 10.

Distribution. Caribbean area and Brazil; according to literature also Florida, French Guiana, and (?) Senegal.

Luidia clathrata (Say, 1825) Plates X–XI

Asterias clathrata SAY, 1825, p. 142 ["Inhabits the coast of Georgia and East Florida"].

Luidia clathrata, LÜTKEN, 1859, p. 37–39 [St. Thomas].

Luidia clathrata, VERRILL, 1867, p. 343 ["S. Carolina! Florida! St. Thomas (Ltk.)"].

Luidia clathrata, AGASSIZ, 1877, p. 116, 117–119, pl. 20 [From New Jersey to the West Indies.].

Luidia clathrata, PERRIER, 1878, p. 34, 91, 95, 96 ["Beaufort, Charleston Cayfort (40 pieds), Antilles (Haïti), Rio Janeiro"].

Luidia clathrata, SLADEN, 1889, p. 253, 742 ["Carolina; Florida; Hayti; Martinique; St. Thomas; Bahia; Rio Janeiro."].

Luidia clathrata, CLARK, H. L., 1898, p. 5 [Jamaica].

Luidia clathrata, CLARK, H. L., 1901, p. 339, 343 [Bermuda].

- Luidia clathrata*, DÖDERLEIN & HARTMEYER, 1910, p. 150–151 [St. Thomas].
- Luidia clathrata*, CLARK, H. L., 1919, p. 54, 55, 71 [Bermuda, U.S. Coast north of Florida, Gulf Coast of U.S., Jamaica, Brazil; records from Hispaniola, Puerto Rico and St. Thomas.].
- Luidia clathrata*, DÖDERLEIN, 1920, p. 238, 239, 251–252, fig. 1, 21 [Florida North and South Carolina, St. Thomas, Brazil.].
- Luidia clathrata*, CLARK, H. L., 1933, p. 19–20 [Puerto Rico].
- Luidia clathrata*, CLARK, A. H., 1939, p. 442 [Puerto Rico, Virginia, Texas.].
- Luidia clathrata*, CASO, 1943, p. 46–50, pl. 12 fig. 1–2, pl. 13 fig. 1–2 [Tampico].
- Luidia clathrata*, BERNASCONI, 1943, p. 6–7, pl. 2 fig. 1 [From Charleston and the Bermudas to Bahia, Rio de Janeiro, Santa Catalina, etc.].
- Luidia clathrata*, TOMMASI, 1958, p. 9, pl. 2 fig. 1 [Brazil].
- Luidia clathrata*, CHERBONNIER, 1959, p. 170 [Cayenne].
- Luidia clathrata*, DURAND, 1959, p. 21–23, phot. 3 [Cayenne, cf. CHERBONNIER].
- Luidia clathrata*, ENGEL & SCHROEVERS, 1960, p. 5 [Florida, Margarita, Tortugillas, Cabo la Vela (Col.)].
- Luidia clathrata*, CASO, 1961, p. 39–41 [Tampico].

WEST INDIES: West-Indië, Coll. Boeke (1 specimen, alc., A).

Diagnosis. Distinctly and regularly stellate, arms 5 in number. $R = 5.75 r$; $R = 4.5 br$. Inferomarginal plates with more or less acute slender spines. The square or rectangular paxillae are very near to each other and closely set with granular spinelets. Marginal paxillae distinctly larger than other paxillae. Lateral paxillae without larger spines. No pedicellaria. Madreporite is completely hidden by the paxillae.

Description of the material

GENERAL FORM. Distinctly and regularly stellate and flattened, with a clearly defined central disc from which 5 slender arms originate, narrowing from the base to the apex. $R = 5.75 r$; $R = 4.5 br$.

ORAL SIDE. On each of the adambulacral plates the spines are arranged in the following way. 1) An inner series consisting of one slightly curved, laterally flattened, acute spine per plate. 2) A middle series consisting of one bigger spine per plate, of about the same shape as those in (1), but slightly conical and with a rounded tip. 3) An outer series consisting of two flattened spines per plate, about equal in size and with rounded tips. 4) In front of this series is another one, consisting of 3–5 small and acute spinelets per plate. — In the free parts of the arms there is only one ventrolateral plate between the adambulacral and the inferomarginal plates; in the angle between two arms, this number increases slightly. The ventrolateral plates bear tufts of small acute spinelets. — The inferomarginal plates have at their tips a long and slender acute spine, gradually narrowing from the base to the apex. Dorsally from this spine is a smaller spine of similar shape. The oral (ventral) part of the plates is occupied by a transverse series of small flattened acute spinelets, adoral to which occurs another, far less distinct, row of similar but smaller spinelets. The

lateral margins of the plates are set with acute spinelets, which are smaller than the spinelets described above. There are no pedicellaria.

ABORAL SIDE (Pl. X top right, XI bottom). There are no clearly distinguishable superomarginal plates. These plates are represented by the marginal paxillae, according to DÖDERLEIN, 1920. The marginal paxillae form regular longitudinal and transverse rows with the following 2-3 series of lateral paxillae. The marginal paxillae are distinctly larger than the lateral paxillae. The former are rectangular, the latter more or less square. The paxillae of the middle part are much smaller and have no regular arrangement. The paxillae are not as closely set as in *Luidia senegalensis*. On the margins of the tabulum they bear small flattened spinelets, with rounded tips. The spinelets on the middle part of the tabulum are equal in length, but they are much stouter and rounder. — The colour of the oral side is a faded orange, the aboral colour is a duller tint of beige, but the middle part of the arm shows a band of a darker greenish hue, running from the centre of the disc to every arm tip. — The madreporite is completely hidden by the paxillae. There are no pedicellaria.

MEASUREMENTS see Table 10.

Distribution. According to literature, U. S. coast N of Florida, Gulf coast, Caribbean area, French Guiana and Brazil.

Luidia alternata (Say, 1825) Plates VIII & X

- Asterias alternata* SAY, 1825, p. 144-145 ["Inhabits the coast of Florida"].
Luidia alternata, LÜTKEN, 1859, p. 42-43 [St. Thomas].
Luidia alternata, VERRILL, 1867, p. 343 ["Florida (Say), St. Thomas (Ltk)"].
Luidia alternata, PERRIER, 1878, p. 34, 91, 96 ["Antilles (Saint-Thomas, Tortugas)"].
Luidia alternata, SLADEN, 1889, p. 250, 251, 740 ["E. of North America; Florida; Tortugas; St. Thomas; Bahia."].
Luidia alternata, CLARK, H. L., 1898, p. 5 [Jamaica].
Luidia alternata, DÖDERLEIN & HARTMEYER, 1910, p. 151 [Jamaica].
Luidia alternata, CLARK, H. L., 1919, p. 54, 55, 71 [U.S. Coast, north of Florida, Florida, Tortugas, Cuba, Jamaica, Montserrat, E. Coast of C.A. and Mexico, Brazil; records from Gulf Coast of U.S., Puerto Rico, St. Thomas.].
Luidia alternata, DÖDERLEIN, 1920, p. 241, 267-268, fig. 7, 11 [Florida, West Indies, Brazil.].
Luidia alternata, CLARK, H. L., 1933, p. 20, pl. 1 [Puerto Rico].
Luidia alternata, CASO, 1943, p. 56-57, pl. 16 fig. 1-2, pl. 17 fig. 1-2 ["Veracruz"].
Luidia alternata, ENGEL & SCHROEVERS, 1960, p. 6 [Atlantic coast of Florida.].
Luidia alternata, CASO, 1961, p. 44-47, fig. 11-12 [Veracruz].

COLOMBIA: Río Hacha, Goajira, Exp. Chazalie, 7 m, J. Versluys leg., 1896 (1 specimen, alc., A).

Diagnosis. Distinctly and regularly stellate, arms 5 in number. $R = 7.5 r$; $R = 6 br$. Inferomarginal plates have large conical and acute spines. The roundish paxillae are small (especially the margin-

al paxillae), and not closely set. Lateral paxillae mostly have a large spine, without pedicellaria. Ventrolateral plates with trivalvate pedicellaria. Madreporite completely hidden by paxillae.

Description of the material

GENERAL FORM. Distinctly and regularly stellate, with 5 long and slender arms, gradually narrowing from the base to the apex. $R = 7.5 r$; $R = 6 br$. By comparison with *L. senegalensis* and *L. clathrata*, this specimen has a spiny appearance.

ORAL SIDE. The adambulacral spines are arranged in the following way. 1) An inner series consisting of one slightly curved, sabre-shaped spine per plate, with a rounded tip. 2) A middle series consisting of a larger subconical spine per plate, with a rounded tip. 3) An outer series consisting of two spines per plate, of which the adoral is smaller and more or less acute. The other one is of about the same size and shape as the spine of the middle series. — In the free parts of the arms, two ventrolateral plates are often found between an adambulacral and an inferomarginal plate; in the angle between two arms this number increases to three, but they do not form regular rows between an adambulacral and an inferomarginal plate. The ventrolateral plates bear trivalvate pedicellaria. — On the inferomarginal plates the following arrangement of spines is found: on and along the margins of the plate tufts of needle-shaped spinelets occur; on the middle part of the plate, from furrow to margin, there is a transverse series of conical and acute spines, 5-7 in number, increasing in size, the two outer spines being the largest.

ABORAL SIDE (Pl. VIII bottom, X bottom). The marginal paxillae are roundish and very small. They bear more or less needle-shaped spinelets, all equal in size. The lateral paxillae are a little larger and form 2-3 regular longitudinal and transverse rows. Especially in the second row of lateral paxillae, large conical spines are found on the middle of their tabulum; these spines are not as large as the spines on the inferomarginal plates. The spinelets on the margins of the tabulum are very small, flattened and more or less blunt. The roundish paxillae of the middle part are small and bear small granular spinelets, of which those in the middle of the tabulum are often bigger and rounder. The spinelets on their margins are similar to those of the other paxillae, but smaller. — The specimen described above is of a uniformly green-greyish tint, the spines being whitish. — The madreporite is completely hidden by the paxillae.

MEASUREMENTS see Table 10.

Distribution. According to literature, Atlantic coast north of Florida, Gulf coast, Caribbean area and Brazil.

TABLE 10

Measurements in *Luidia senegalensis*, *L. clathrata* and *L. alternata*.
(Averages from several counts per specimen)

R = distance from mouth to arm tip in mm.

r = distance from mouth to interradial margin in mm.

br = width of arm at arm base.

R/r = ratio between R and r.

R/br = ratio between R and br.

adam = number of adambulacral plates on a distance equal to 2 times arm width at base, on each side of the furrow.

A = number of arms.

Specimens	R	r	br	R/r	R/br	adam	A
<i>Luidia senegalensis</i>							
Coche	87.5	14.5	9.7	6	9	17	9
Venezuela	109	16	10.5	7	10.5	17	9
Colombia	112	15.5	9.7	7	12.5	17	9
Brazil	130	16.3	12.5	8	10.5	17	9
Antigua	134	18	12	7.5	11	—	9
Antigua	140.5	20	14.5	7	10	—	9
<i>Luidia clathrata</i>							
West Indies	54	9.5	11.5	5.75	4.5	24	5
<i>Luidia alternata</i>							
Colombia	67	9	11	7.5	6	20	5

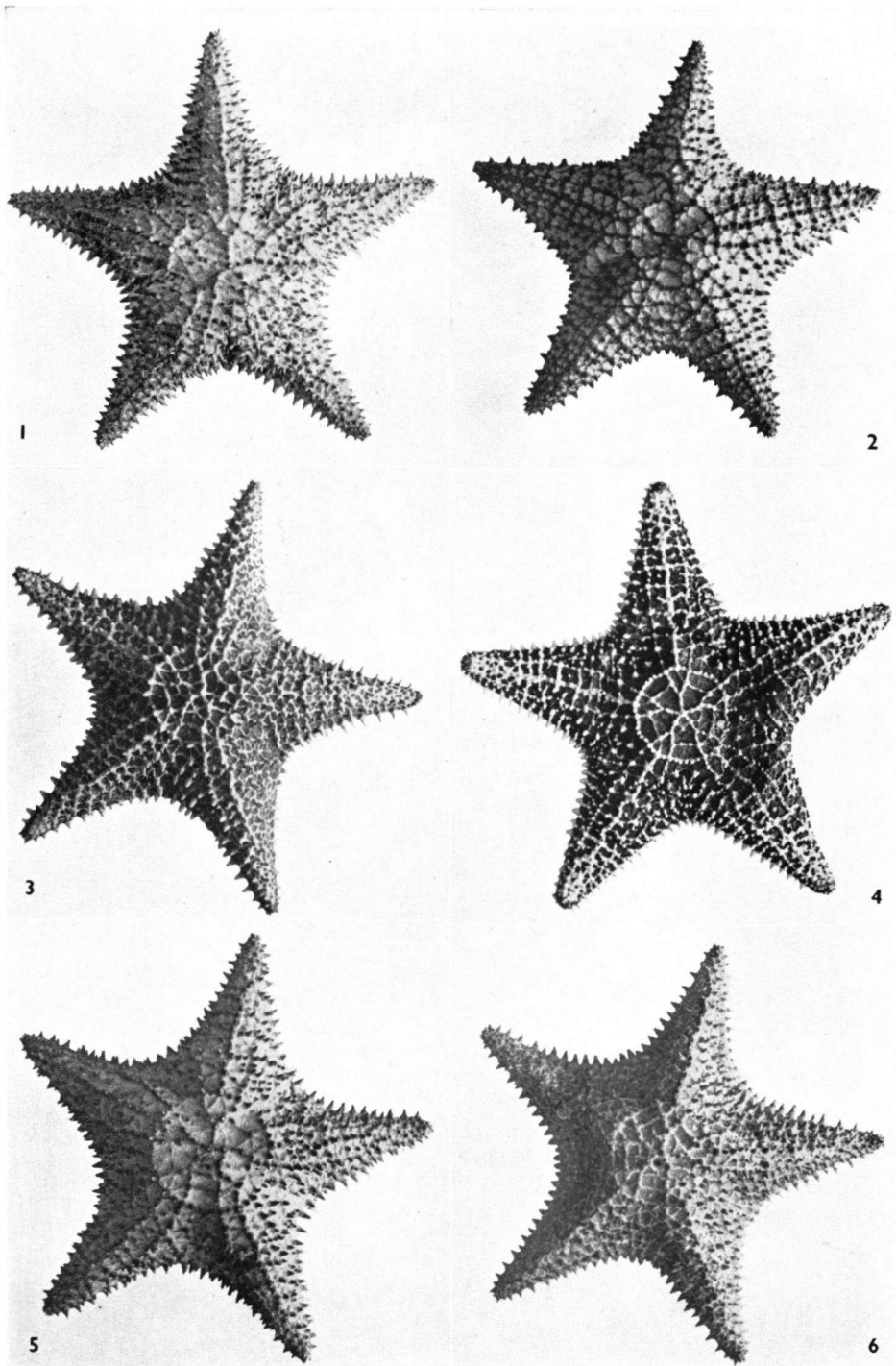
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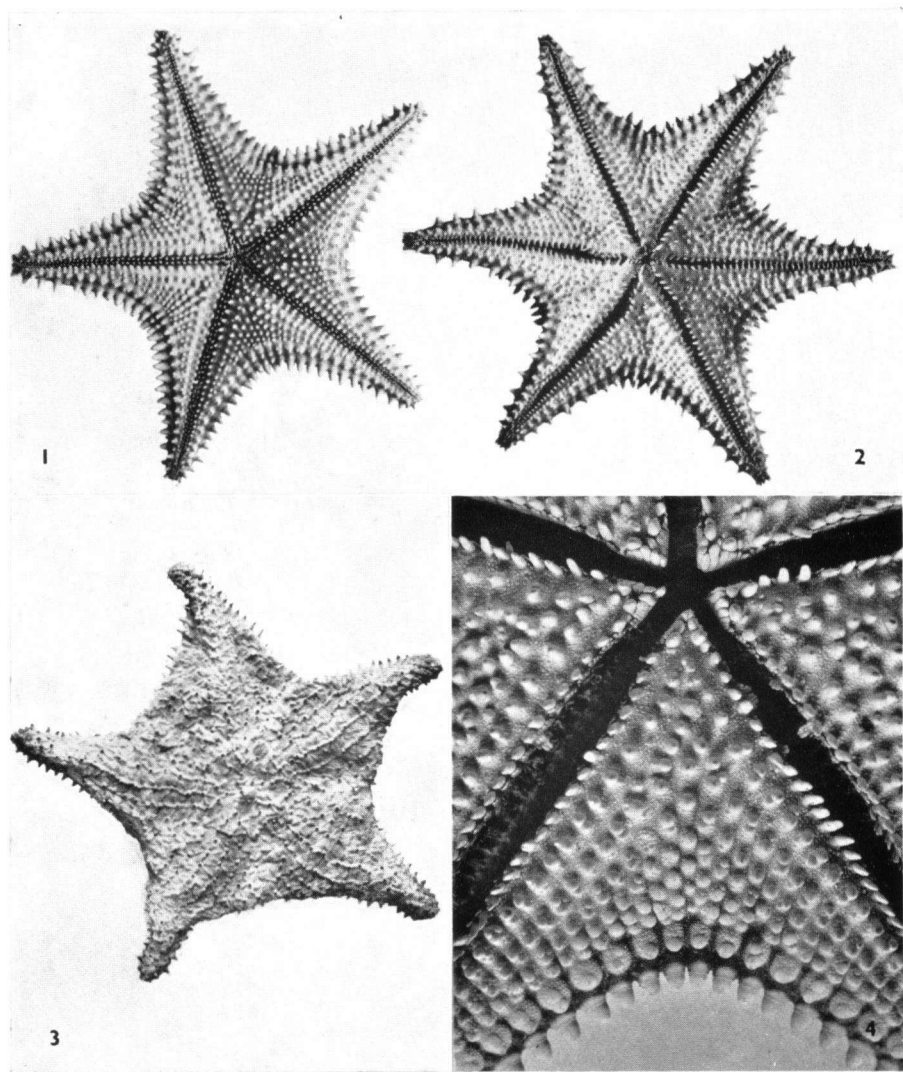
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PLATE III



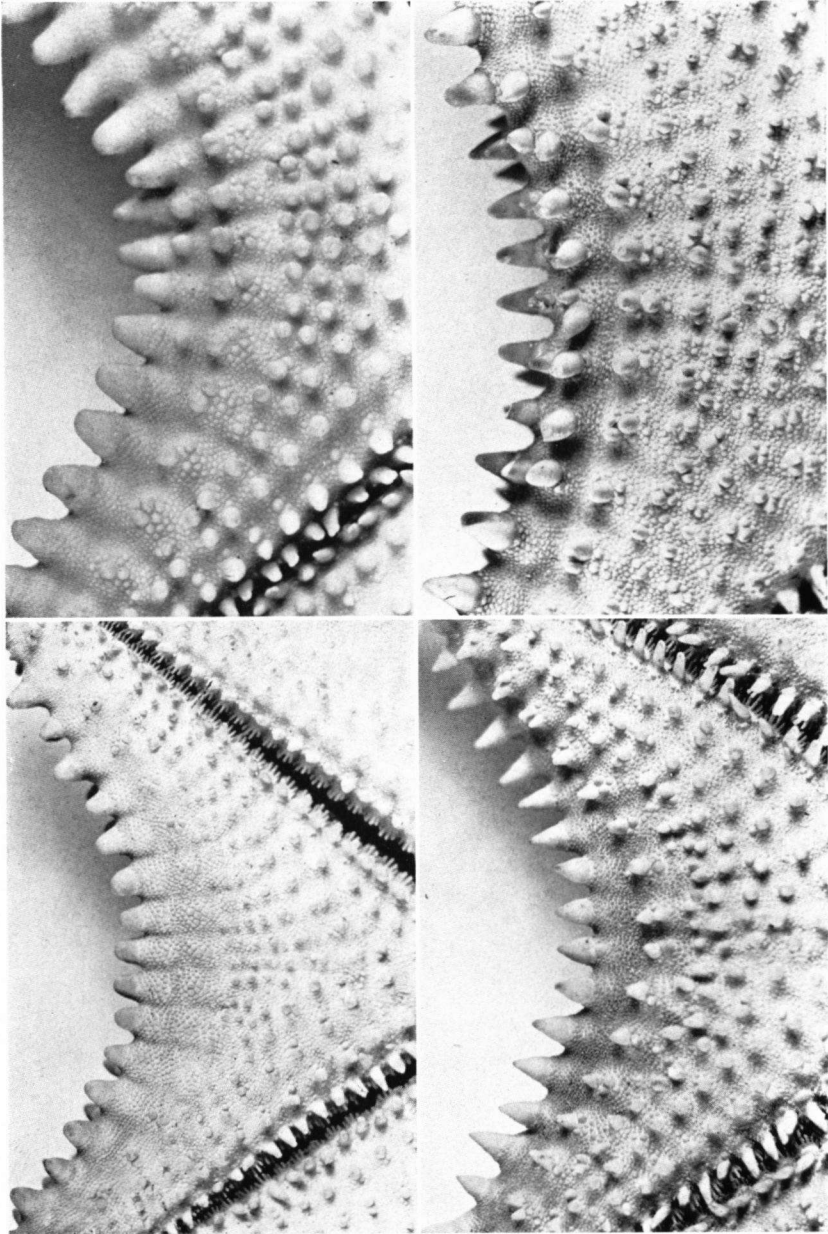
Oreaster reticulatus (L.), from ST. MARTIN (1-3, 5-6) and NEW PROVIDENCE (4), aboral side. — 1: sta. 1128B, R = 165 mm, colour type A. — 2: sta. 1128C, R = 133 mm, colour type B. — 3: sta. 1128C, R = 138 mm, colour type C. — 4: sta. 1149, R = 198.5 mm, colour type C. — 5: sta. 1128B, R = 148.5 mm, colour type E. — 6: sta. 1128B, R = 137 mm, colour type F.

PLATE IV



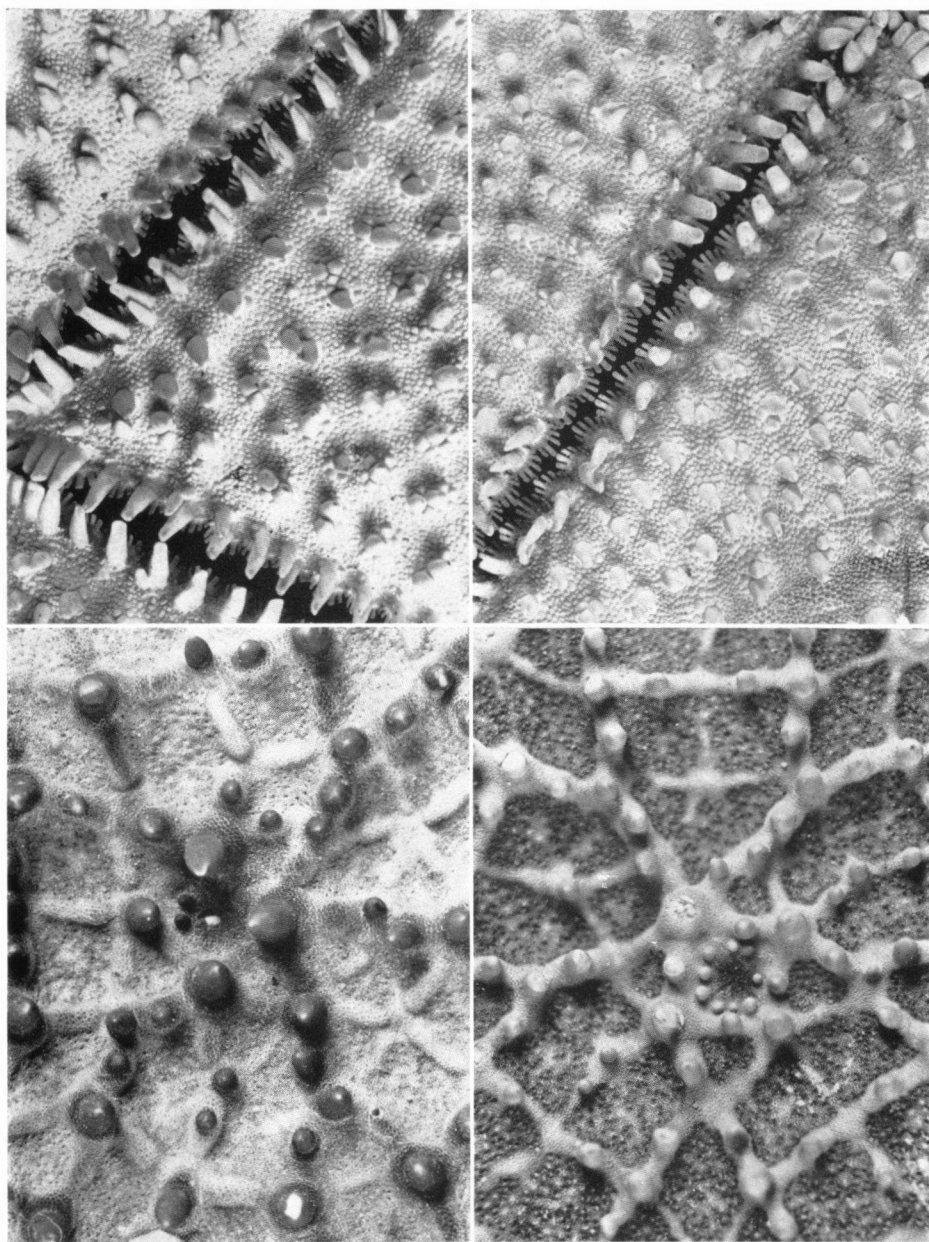
Oreaster reticulatus (L.), from ST. MARTIN (1-2), MARGARITA (3) and NEW PROVIDENCE (4), oral (1-2,4) and aboral (3) sides. — 1: Great Bay, 3.VI.1955, R = 147.5 mm, normal five-rayed specimen. — 2: sta. 1128C, R = 124 mm, six-rayed specimen. — 3: trawled north of Margarita, Feb. 1955, R = 170 mm, colour type E; a collapsed specimen, kept on ice for several days before being dried. — 4: sta. 1145, R = 198.5 mm.

PLATE V



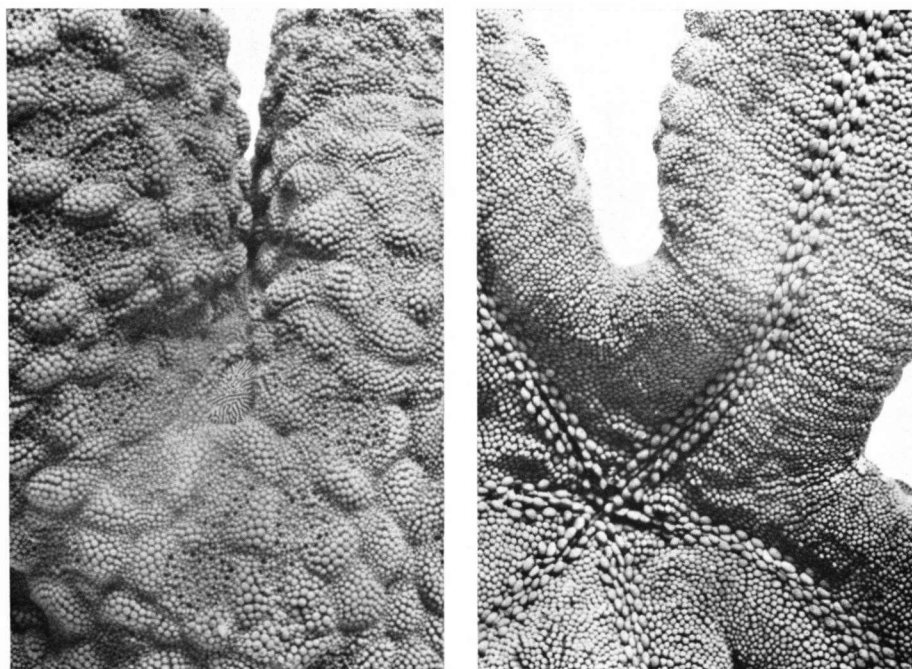
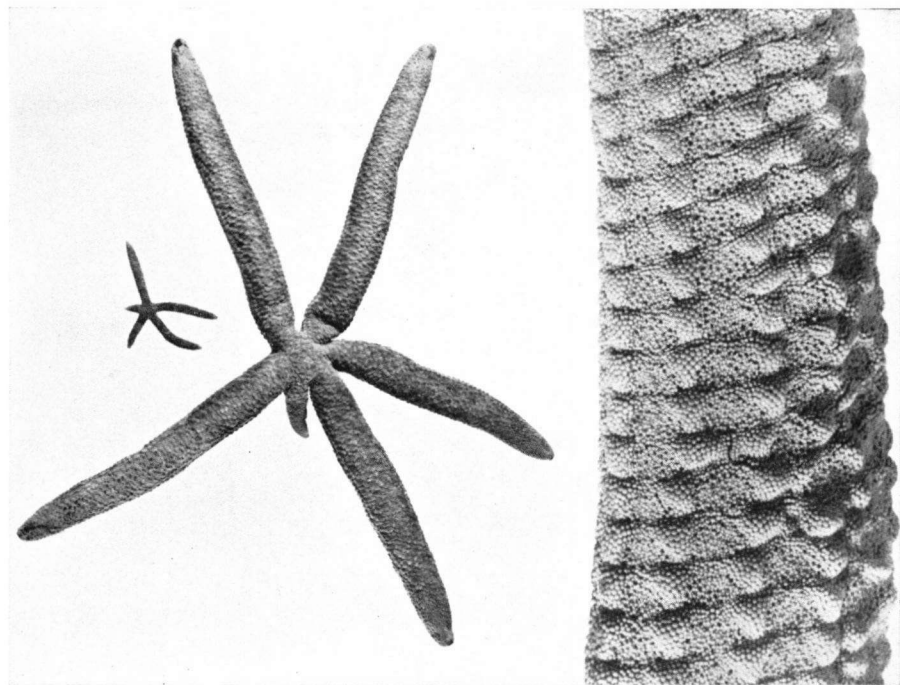
Oreaster reticulatus (L.), from ST. MARTIN, oral side. — Top left: Great Bay, 3.VI. 1955, R = 147.5 mm; superomarginal spines (sometimes two per plate), inferomarginal and interradial spines normally developed. — Top right: sta. 1128C, R = 164.5 mm; superomarginal plates in the middle part bearing three acute spines, inferomarginal spines in the middle part bearing two or three acute spines, interradial spines well developed. — Bottom left: sta. 1128C, R = 114 mm; superomarginal plates bearing one blunt spine, inferomarginal spines not present in the middle part, oral interradial spines weakly developed. — Bottom right: sta. 1128C, R = 140.5 mm; superomarginal spines (acute), inferomarginal and interradial spines normally developed.

PLATE VI



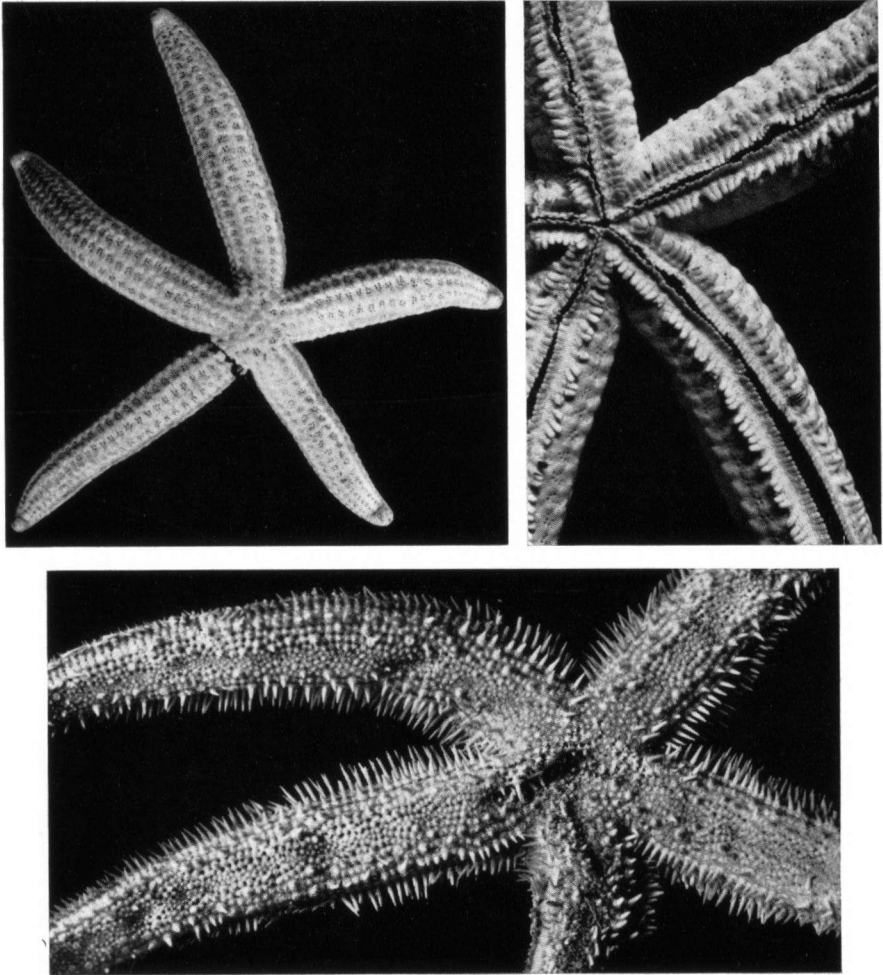
Oreaster reticulatus (L.), from St. MARTIN, oral (upper figures) and aboral sides. — Top left: sta. 1128C, R = 164.5 mm, adambulacral spines with strongly developed second spine in outer series, interradial spines well developed. — Top right: sta. 1128C, R = 140.5 mm, adambulacral spines normally developed. — Bottom left: sta. 1128C, R = 164.5 mm; situation around anal aperture, showing reticularia and aboral spines, papular areas and pores, spines strongly developed (colour type E). — Bottom right: sta. 1128B, R = 166.5 mm; situation around anal aperture, spines and papillae well developed (colour type C).

PLATE VII



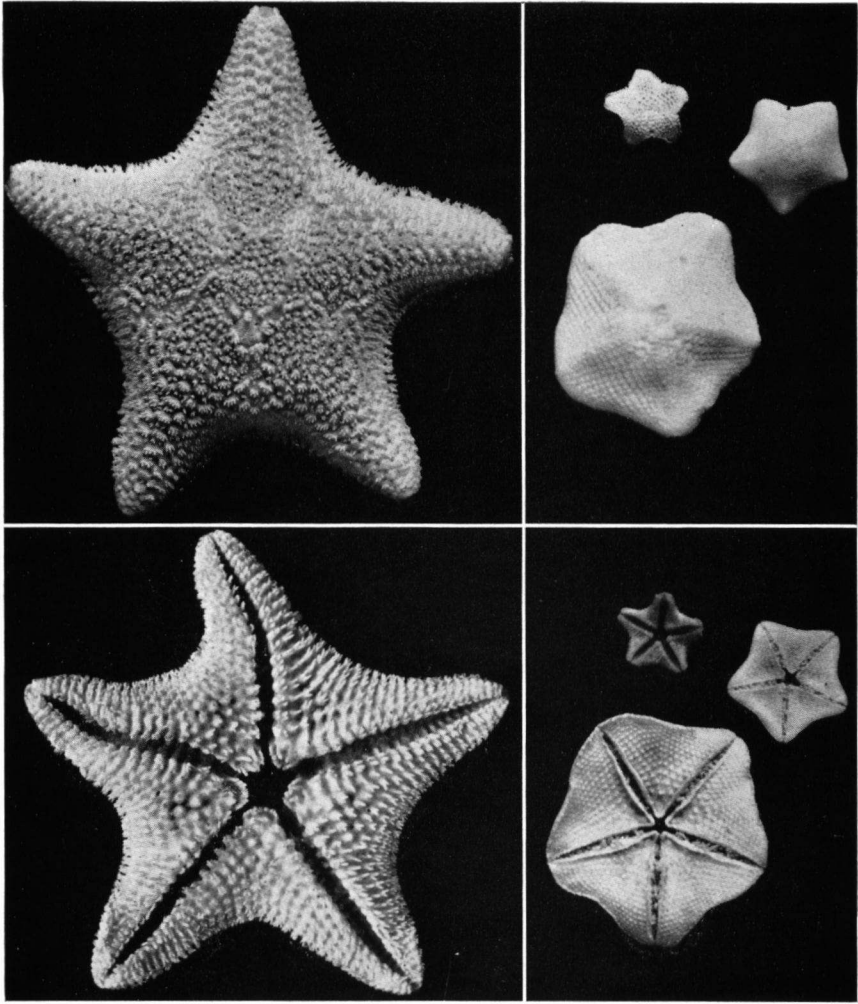
Linckia guildingii Gray, from ARUBA, 1955. — Top left: aboral sides of one small and one large specimen, R = 32 and 141 mm. — Top right: central part of arm of the larger specimen, showing three rather regular longitudinal rows of plates, laterally running across each arm. — Bottom left: situation around madreporite in the same large specimen. — Bottom right: oral side of same specimen.

PLATE VIII



Ophidiaster guildingii Gray, from CURAÇAO, Caracasbaai, 1920. — Upper figures: aboral and oral sides of same specimen, R = 38.6 mm.
Luidia alternata (Say), from COLOMBIA, Rio Hacha (Chazalie Exp.). — Lower figure: aboral side, R = 67 mm.

PLATE IX

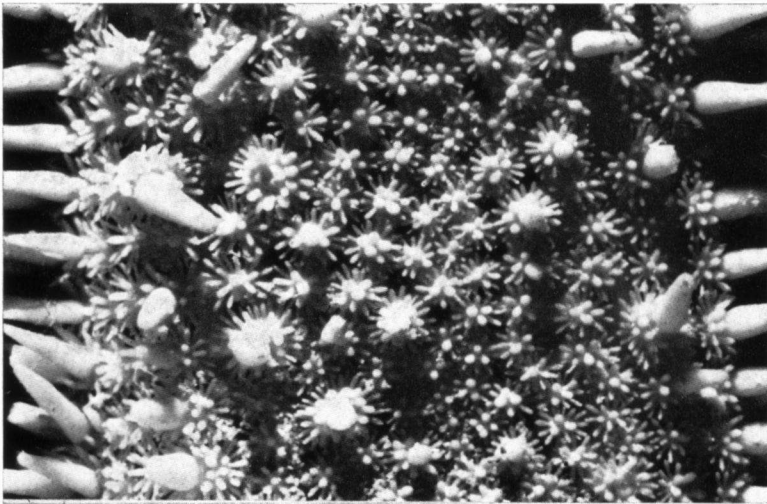
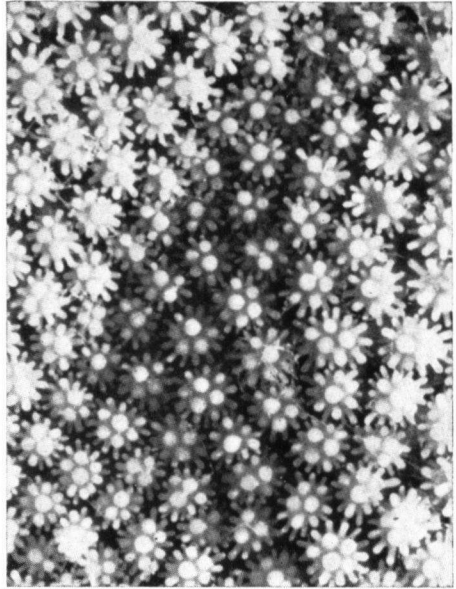
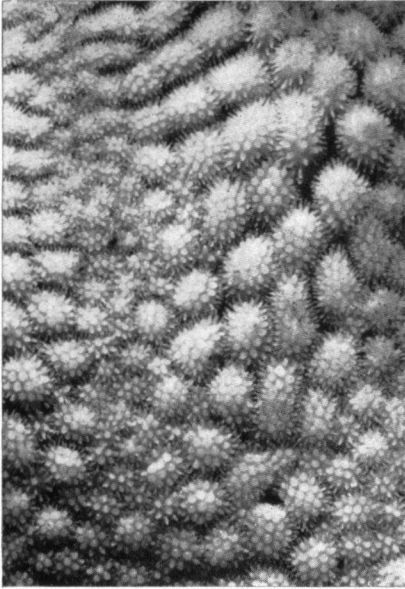


Asterina marginata (Perrier), from BRAZIL. — Top left: aboral side, R = 15.5 mm.

— Bottom left: oral side, R = 17 mm.

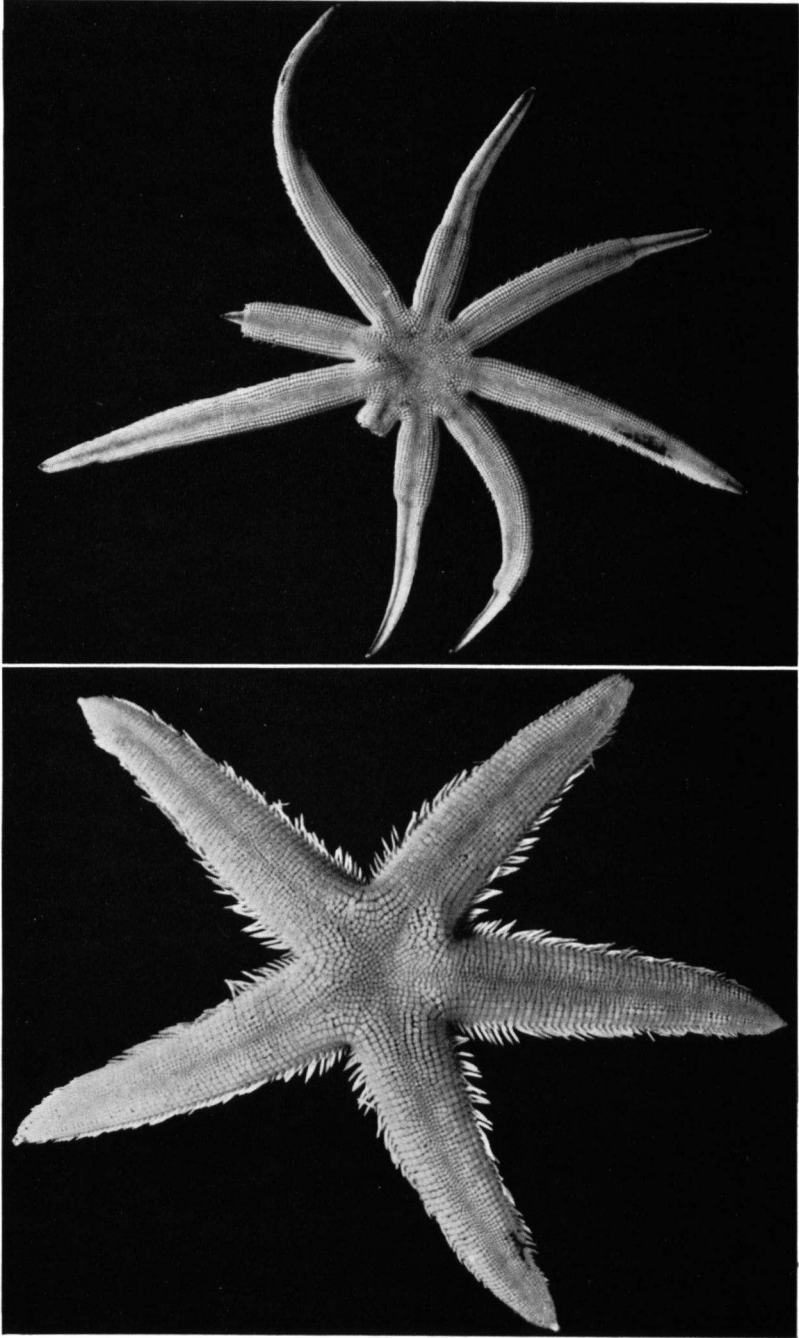
Asterina folium (Lütken), from COLOMBIA, Santa Marta (Chazalie Exp. 1896; 2 larger specimens), and *Asterina hartmeyeri* Döderlein, from BONAIRE, sta. 1058a (smallest specimen). — Aboral and oral sides, R = 12.9, 5.9 and 4 mm.

PLATE X



Paxillae on the aboral sides of: *Luidia senegalensis* (Lamarck) from VENEZUELA (R = 13 mm), $\times 6$; *Luidia clathrata* (Say) from the WEST INDIES (R = 54 mm), $\times 11\frac{1}{2}$; *Luidia alternata* (Say) from COLOMBIA (R = 67 mm), $\times 8\frac{1}{2}$.

PLATE XI



Aboral views of: *Luidia senegalensis* (Lamarck) from VENEZUELA, 1905 (R = 13 mm); *Luidia clathrata* (Say) from the WEST INDIES (R = 54 mm).