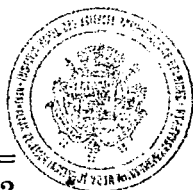


P 857

THE PHILIPPINE JOURNAL OF SCIENCE



VOL. 82

JUNE, 1953

No. 2

LITTORAL HOLOTHURIANS FROM ZAMBOANGA AND VICINITY

BY JOSE S. DOMANTAY
Of the Bureau of Fisheries, Manila

INTRODUCTION

In the early part of the year 1949, when the writer left for Los Angeles, California, with a Travel Grant from the U. S. Educational Foundation in the Philippines under the Fulbright Act, a research fellowship at the Allan Hancock Foundation of the University of Southern California, and under official detail in the United States of America by the Philippine Government, he brought along with him several zoological materials from Zamboanga for scientific study. Among some of the materials were preserved and dried specimens of holothurians collected by the writer. Just before he returned to the Islands in August 1950, he went over the Zamboanga materials after a year and a half studying the tremendous number of holothurian materials in the collections of the Allan Hancock Foundation from the East and West Pacific and from the Atlantic waters around Florida. A few months after his arrival in Zamboanga, when relieved of his administrative work which occupied most of his time, he resumed the study of the local materials which he has been collecting from the marine biological ground of the station and other places. The following represent the few materials collected from Zamboanga and vicinity. Other materials that may be collected later from other places will be reported in another paper.

Order ASPIDOCHIROTA Grube, 1840

Family HOLOTHURIIDÆ Ludwig

Subfamily HOLOTHURIINÆ Ludwig

Genus HOLOTHURIA Linnæus, 1758

1. *Holothuria argus* (Jaeger)
2. *H. atra* Jaeger
3. *H. bivittata* Mitsukuri
4. *H. curiosa* Ludwig
5. *H. impatiens* (Forskål)
6. *H. marmorata* Jaeger
7. *H. paradoxa* Selenka
8. *H. pulla* Selenka
9. *H. scabra* Jaeger
10. *H. sæcularis* Bell
11. *H. sæcularis* Bell var. *forskåli* n. var.
12. *H. vitiensis* Semper

Genus ACTINOPYGA Bronn

13. *Actinopyga echinites* (Jaeger)
14. *A. miliaris* (Quoy and Gaimard)
15. *A. serratidens* Pearson

Genus MICROTHELE Brandt, 1835

15. *Microthele nobilis* (Selenka)

Family STICHOPIDÆ, 1835

Genus STICHOPUS Brandt, 1835

16. *Stichopus variegatus* Semper
17. *S. variegatus* Semper var. *hermanni* Semper
18. *S. horrens* Selenka

Genus THELENOTA Brandt, 1835

19. *Thelenota ananas* (Jaeger)

Order APODA Brandt, 1835

Family SYNAPTIDÆ Ostergren, 1905

Genus SYNAPTA Eschscholtz, 1829

20. *Synapta maculata* (Chamisso and Eysenhardt)

Genus OPHEODESOMA Fisher, 1907

21. *Opheodesoma spectabilis* Fisher var. *puerto-galeræ* Domantay

Genus POLYPLECTANA H. L. Clark, 1907

22. *Polylectana kefersteini* (Selenka)

HOLOTHURIA ARGUS (Jaeger)

Bohadschia argus JAEGER (1833) 19, pl. 2, fig. 1; SELENKA (1867) 320; BELL (1886) 27; PEARSON (1914a) 170.

Holothuria argus SEMPER (1868) 80, 277, *pl. 30, fig. 11*; LUDWIG (1882) 135; (1883) 168; (1889-92) 329; LAMPERT (1885) 87; (1889) 808; THEEL (1886a) 203; BELL (1887c) 653; (1888) 389; SAVILLE-KENT (1893) 56, 237, *pl. 34, fig. 2*; Colored *pl. 12, fig. 7*; STUDER (1893) 234, 248; KOEHLER (1895c) 279; WHITELEGGE (1897) 161; Sluiter (1901) 12; KONINGSBERGER (1904) 45; MITSUKURI (1912) 60, *pl. 3, fig. 30, text-fig. 13*; PEARSON (1913) 56, *pl. 7, fig. 5*; H. L. CLARK (1921) 174; PANNING (1929) 121, *text-fig. 2*; DOMANTAY (1933) 60, *pl. 1, fig. 2*.

Holothuria leopardus SAVILLE-KENT (1890), *pl. 1, fig. 2*.

All dried form made into *trepang* or *beche-de-mer*. Large size. The characteristic color pattern in life is still very evident in the dried form. In life the color is lilac with oval and round golden-brown blotches somewhat arranged in irregular series or rows resembling those of a leopard. Ventral side lighter in color and without golden brown blotches. Mouth ventral and anus terminal. Numerous and crowded pedicels in trivium and papillae irregularly scattered in bivium.

Deposits.—Numerous dichotomous X-shaped bodies forming simple to complete rosettes, few wrench-like supporting rods of various sizes.

Remarks.—Found all over the Philippine Archipelago. The biggest so far encountered measured 450 mm long and 80 mm diameter. Usually found in sandy bottom among corals. One with Acc. No. 1204 is in the collection of the Allan Hancock Foundation.

Specimens examined:

Acc. No.	Locality	Date	Quantity
100-Z	Zamboanga waters	6-4-51	1

HOLOTHURIA ATRA Jaeger

Holothuria radackensis CHAMISSE and EYSENHARDT (1821) 352, *pl. 28*.

Holothuria amboinensis SEMPER (1868) 92, 279.

Holothuria atra JAEGER var. *amboinensis* THEEL (1886a) 214; BEDFORD (1898) 839; (1899) 147.

Holothuria sanguinolenta BELL (1893); DOMANTAY (1933) 73, *pl. 3, fig. 3*.

Holothuria atra JAEGER (1833) 22; SELENKA (1867) 327, *pl. 18, figs. 52-53*; (1868) 250; SEMPER (1868) 88, 250, 278, *pl. 26*; (1869) 120; LUDWIG (1881) 596; (1882) 137; (1883) 170; (1887b) 32; (1887d) 1217; (1887e) 1244; (1899) 559; BELL (1884) 510; (1886) 28; (1887a) 140; (1887c) 654, 657; (1888) 389; LAMPERT (1885) 84; (1896) 55; THEEL (1886a) 181, 213, *pl. 7, fig. 4*; SLUITER (1887) 188; (1894) 103; (1889-92) 329, *pl. 3, fig. 30, pl. 6, fig. 6*; (1895) 78; SAVILLE-KENT (1893) 49, 55, 102, 121, 234, 238, *pl. 33b*; STUDER (1893) 191, 234; KOEHLER (1895a) 382; WHITELEGGE (1897) 161; (1903) 8, 13; HEDLEY (1899) 530; H. L. CLARK (1901a) 495; (1902b) 530; (1920) 148; (1921) 174; (1923) 421; (1925) 102;

(1932) 231; VOLTZKOW (1902) 565; KONINGSBERGER (1904) 47, *pl. 8, fig. 2*; GARDINER (1904) 339; EDWARDS (1905) 383; (1908a) 537-540; (1908b) 236-301, *pls. 1-5*; HERDMAN (1906) 447; FISHER (1907) 657, *pl. 70, fig. 2*; KOEHLER and VANEY (1908) 5; (1910) 101; PEARSON (1910a) 176; (1913) 67, *pl. 9, fig. 11*; MITSUKURI (1912) 64, *text-fig. 14*; ERWE (1913) 374, *pl. 6, fig. 14*; BROOKE (1927) 164; PANNING (1928a) 221; (1935) 30, *text-fig. 22*; T. A. STEPHENSON, et al (1931) 45, 50, 55; BAKER (1929a) 141-143; (1928b) 167-171; ENGEL (1933) 4, *pl. 1, fig. 1, text-figs. 1-6*.

Body cylindrical. Mouth and anus terminal. Twenty stout peltate tentacles. Pedicels and papillæ similar, apparently all pedicels scattered all over the body but most conspicuously and crowded at the ventral side. Body-wall tough and hardy. Color in life purplish black and usually exudes purplish fluid. In preserved state blackish all over the body.

Deposits.—Tables with small perforated disk, four pillars and two cross-beams. Spire terminates in spinous crown with usually 12 spines. Intermixed with the tables are few, sometimes numerous rosettes, some of which are incomplete. Pedicel with well developed end-plate.

Remarks.—Common all over the Islands. Found in sandy bottom among corals. In Puerto Galera Marine Biological Station they were usually found covered with fine sands on the dorsal side forming blotches of white and black. No Cuvierian organs. At the marine biological ground in Zamboanga, because of the strong current, the integument does not accumulate fine sands. The biggest so far encountered measured 500 mm long by 60 mm diameter.

Specimens examined:

Acc. No.	Locality	Date	Quantity
101-Za	Marine Biol. Ground, Zamboanga	6-2-51	2
101-Zb	Zamboanga waters	6-2-51	1

HOLOTHURIA BIVITTATA Mitsukuri

Holothuria bivittata MITSUKURI (1912) 68, *pl. 3, fig. 31, text-fig. 15*.

~~*Holothuria*~~ (*Bohadschia*) *bivittata* PANNING (1929) 123, *text-fig. 4*.

All dried form made into *trepang* or *beche-de-mer*. The biggest among the four examined measured 150 mm long hence in life may be three times as long. Mouth apparently ventral and anus terminal. Body-wall thick and hardy. Both pedicels and papillæ retracted, the former apparently arranged in bands in the trivium and the latter scattered in the bivium. Color in the dried and preserved state on the dorsal side is purplish

brown intermixed with numerous irregular ramifying blotches of lighter brown apparently yellowish in life which gives a semi-variegated appearance. On the ventral side the color is more homogenous, lighter almost white. At both ends particularly in the anal end the same color extends over the dorsal side forming a broad band around it.

Deposits.—Numerous minute bodies from simple granular form to complete rosette. Intermediate forms are regular X-shaped rosettes. The complex rosettes predominate on the dorsal integument.

Specimens examined:

Acc. No.	Locality	Date	Quantity
102-Za	Zamboanga waters	6-6-51	1
102-Zb	Zamboanga waters	6-7-51	2

HOLOTHURIA CURIOSA Ludwig

Holothuria fusco-cinerea JAEGER (1838); SEMPER (1868) 88, pl. 27, 30, fig. 22; LUDWIG (1882) 137; (1887d) 1227; THEEL (1886a) 221; LUDWIG and BARTHELIS (1892) 632; SAVILLE-KENT (1893) 233, 237; H. L. CLARK (1921) 177; (1932) 231; DOMANTAY (1933) 71, pl. 4, fig. 1; MORTENSEN (1934) 6.

Holothuria curiosa LUDWIG (1875) 34, pl. 7, fig. 29; LAMPERT (1885) 64; THEEL (1886a) 181, 220, pl. 8, fig. 9; SLUITER (1901) 10; PEARSON (1910a) 177; (1913) 75-76.

Holothuria (Holothuria) curiosa PANNING (1935) 4-5, text-fig. 107.

Body cylindrical and partly contracted. Mouth slightly ventral and anus terminal. Pedicels and papillæ partly contracted with their tips only exposed, the former somewhat arranged in indistinct rows and so with the latter. The papillæ apparently in the form of warts, hence very conspicuous and others indistinct when contracted. Color in preserved state greenish brown on the dorsal side with the tips of the papillæ very conspicuous appearing like dark spots. In life when not contracted the dark transverse bands are prominent. Ventral side grayish white dotted with the tips of the pedicels. Apparently medium size measuring 50 mm long by 25 mm diameter in its partly contracted condition.

Deposits.—Simple tables and imperfect buttons. Table with simple disk. Spire with four pillars converging distally and in some, united together beyond the crossbeam forming a cone. Imperfect buttons with a pair of elongated holes and in some with extra pairs of small holes. Pedicels with supporting plates in the form of huge irregular buttons.

Specimens examined:

Acc. No.	Locality	Date	Quantity
103-Z	Marine Biological Ground, Zamboanga	6-4-51	1

HOLOTHURIA IMPATIENS (Forskål)

- Fistularia impatiens* FORSKÅL (1775) 121-129, pl. 39, fig. B.
Holothuria aphanes LAMPERT (1885) 242; OSTERGREN (1898) 233; SLUITER (1901) 16.
Holothuria fulva QUOY and GAIMARD (1833) 135.
Holothuria botellus SELENKA (1867) 335, pl. 19, figs. 82-84; (1868) 117; SEMPER (1868) 82, 248; SAVILLE-KENT (1893) 234, 238.
Holothuria impatiens SALENKA (1867) 340; SEMPER (1868) 82, 277; (1869) 120; GRAY (1872) 123; v. MARENZELLER (1874) 320; LUDWIG (1879) 569; (1880) 6; (1882) 126; (1883) 169; (1887c) 31; (1887d) 1226; (1888) 806; (1889-92) 329; (1899) 558; HAACKE (1880) 46; BELL (1894c) 510; (1887a) 510; (1887b) 140; (1887c) 654; (1888) 389; LAMPERT (1885) 65; (1889) 812; (1896) 54; (1889) 312; THEEL (1886) 7; SLUITER (1887) 47; (1895) 78; (1901) 9; HEROURD (1889) 677; (1893) 134; SAVILLE-KENT (1893) 233, 237; KOEHLER (1895b) 282; (1895c) 12, fig. 11; (1921) 173; fig. 129; (1927) 214, pl. 16, fig. 19; BORDAS (1898) 840; (1889a) 187-204; (1899) 16, pl. 1; BEDFORD (1898) 840; (1899) 145; OSTERGREN (1898) 233-237; RISSO (1899) 133-141; (1900) 38-41; H. L. CLARK (1902a) 258; (1902b) 528; (1920) 149; (1921) 178, fig. 2; (1923) 423; (1925) 103; (1926) 192; (1932) 232; KONINGSBERGER (1904) 51, pl. 3, fig. 3; FISHER (1907) 660, pl. 69, fig. 4; KOEHLER and VANEY (1908) 8; PEARSON (1910a) 178; (1910b) 192; (1913) 85, pl. 13, fig. 21; (1914) 171; MITSUKURI (1912) 80, text-fig. 17; ERWE (1913) 369; MORTENSEN (1926) 117; DEICHMANN (1926) fig. 11; (1930) 64, pl. 3, figs. 17-18; SCHMIDT (1929) 1365, 1391, figs. 197-198; (1930) 406-412; 419-423; 459, 483, figs. 36-43, 52, 53, 64, 75, 85, 98; T. A. STEPHENSON, et al. (1931) 55; DOMANTAY (1933) pl. 2, fig. 4; PANNING (1935) 86-88, text-fig. 72.

Body cylindrical, mouth and anus terminal. Medium size with small peltate tentacles. Pedicels scattered all over the body and distinctly papillated, the conical tips with warty bases. Integument rough to the touch and tough. Color in preserved state dark brown mottled with tiny spots. With dark blotches on dorsal side.

Deposits.—Numerous buttons and tables. Tables large with squarish disk and large holes. Spire somewhat massive with a crossbeam and spinous crown. Buttons smooth and regular with three pairs of holes and few with more pairs. Pedicels with end-plate and supporting rods, the latter with dilated central perforated shaft somewhat symmetrical and both ends with small perforations.

Remarks.—The specimen examined is with the collections of the Allan Hancock Foundation donated by the writer.

Acc. No.	Locality	Date	Quantity
1204-AHF	Zamboanga waters	1948	1

HOLOTHURIA MARMORATA (Jaeger)

Bohadschia marmorata JAEGER (1833) 18, pl. 3, figs. 9-10; SELENKA (1867) 339; PEARSON (1914a) 170.

Holothuria marmorata SELENKA (1868) 118; SEMPER (1868) 79, 227, pl. 30, fig. 10, pl. 35, fig. 3, pl. 36, fig. 8, pl. 37, figs. 1-4; LUDWIG (1881) 594; (1882) 135; (1883) 186; (1888) 806; (1889-92) 330; (1894) 7; LUDWIG and BARTHELS (1892) 632; LAMPERT (1885) 86; THEEL (1886a) 202; SLUITER (1887) 185; (1894) 103; (1895) 78; (1901) 12; BELL (1887c) 145; (1888) 385; SAVILLE-KENT (1893) 236; MITSUKURI (1896) 406; (1912) 106, fig. 21; PEARSON (1903) 202; (1910a) 179; (1913) 54, pl. 7, fig. 4; KONINGSBERGER (1904) 44; H. L. CLARK (1921) 180.

Holothuria (Bohadschia) marmorata PANNING (1929) 120-121, text-fig. 1.

Sporadipus (Colpochirota) ualensis BRANDT (1835) 146.

Holothuria ualensis SELENKA (1867) 341.

Holothuria brandti SELENKA (1867) 320.

Holothuria utrimquestigmata HAACKE (1880) 48.

All dried form made into *trepang* or *beche-de-mer*. The biggest measured 140 mm long which apparently in life is three times as long. Mouth ventral and anus terminal. Body wall very thick and hardy. Pedicels and papillæ partly retracted, the former confined in the trivium and the latter scattered all over the bivium. Color in the dried and preserved state is chestnut-brown speckled with numerous tiny spots representing the tips of the papillæ on the dorsal side, lighter in color on the ventral side with brownish violet blotches speckled with purplish spots representing the tips of the pedicels.

Deposits.—Numerous rosettes from simple to complex forms, some of which appear like irregular perforated plate-like buttons. Simple granular bodies are found in the deeper integument.

Specimens examined:

Acc. No.	Locality	Date	Quantity
104-Z	Zamboanga waters	6-9-51	2

HOLOTHURIA PARADOXA Selenka

Holothuria paradoxa SELENKA (1867) 322, pl. 18, fig. 41; SEMPER (1868) 92; LAMPERT (1885) 87; THEEL (1886a) 206; FISHER (1907) 652, pl. 67, figs. 4, 5, pl. 69, fig. 5.

Holothuria (Bohadschia) paradoxa PANNING (1929) 123-124, text-fig. 5.

Bohadschia paradoxa PEARSON (1914a) 170.

Body subcylindrical. Mouth ventral and anus terminal with five groups of papillæ. With 20 light brown peltate tentacles. Pedicels and papillæ almost the same, apparently all pedicels scattered all over the body. Among pedicels on the dorso-lateral sides are somewhat larger and prominent conical appendages which may be regarded as papillæ arranged in irregular rows. Body-wall thick and hardy. Color of dorsal side grayish brown in life and lighter brown in dried form with irregular darker area of different pattern. Ventral side lighter and homogenous, almost white. Medium size, the average in the present collection is 100 mm long by 30 mm diameter, slightly wider than its depth.

Deposits.—Numerous dichotomously branched tiny rods of various forms from simple granular to more complex rosettes, some stout smooth dumb-bell shaped rods, some monkey-wrench shaped rosettes to perfect mosaic. Pedicel with well developed end-plate and few small supporting rods racemose at both ends.

Specimens examined:

Acc. No.	Locality	Date	Quantity
105-Za	Marine Biological Ground, Zamboanga	6-4-51	3
105-Zb	Zamboanga waters	6-4-51	1

HOLOTHURIA PULLA Selenka

Holothuria pulla SELENKA (1867) 326, *pl. 18, fig. 51*; SEMPER (1868) 92, 279; BELL (1884c) 510; THEEL (1886a) 214; PEARSON (1913) 69; PANNING (1934) 34.

Microthele æthiops BRANDT (1835) 55.

Holothuria æthiops SELENKA (1867) 331; SEMPER (1868) 90, 250; LUDWIG (1881) 597; LAMPERT (1885) 84; THEEL (1886a) 214.

Holothuria atra DOMANTAY (1933) 61, *pl. 2, fig. 6*.

Body cylindrical and capable of considerable extension in life. Mouth and anus terminal. With 20 medium size tentacles. Pedicels and papillæ almost similar, apparently all pedicels scattered all over the body and much crowded on the ventral side. Body-wall soft and thin in life although it becomes thicker in contracted form. Color in life is dark chestnut-red, almost black at a distance. In preserved state the color becomes light brown because the dark purplish color is extracted even in formalin. In life it may resemble *Holothuria atra* Jaeger in appearance and color although it differs from the other in the presence of Cuvierian organs and the texture of its body wall. Usually large size, the biggest so far encountered measured 600 mm long although the average length is 300 mm.

Deposits.—Numerous tables and buttons. Short tables with simple to well developed disk, the simpler ones with four smaller

holes, one to each below the pillars while the well developed disk with numerous smaller holes all around the circular margin. Spire low with four pillars united by a cross-beam and terminate in a spinous crown with the spines directed outward. Buttons of two kinds, symmetrical and assymetrical with respect to the pairs of elongated holes, the symmetrical ones with usually three pairs and the asymmetrical with more or less not usually in pair. Pedicels with regular end-plate and medium size supporting rods, some resemble huge button-like plates.

Remarks.—Couple of this species is with the collections of the Allan Hancock Foundation donated by the writer.

Acc. No.	Locality	Date	Quantity
106-Za	Marine Biological Ground, Zamboanga	6-2-51	1
106-Zb	Marine Biological Ground, Zamboanga	6-2-51	2
1204-AHF	Marine Biological Ground, Zamboanga	1948	2

HOLOTHURIA SCABRA Jaeger

Holothuria scabra JAEGER (1833) 23; SELENKA (1867) 341; (1868) 118; SEMPER (1868) 79, 247, 277; LUDWIG (1880) 6; (1881) 559; (1882) 135; (1883) 168; (1887b) 31; (1887d) 1224; (1887e) 1242; (1888) 807; (1889-92) 330; (1899) 557; HAACKE (1880) 46; LAMPERT (1885) 69; THEEL (1886a) 234; SLUITER (1887) 193; (1894) 103; (1895) 78; (1901) 11; LAMPERT (1896) 54; KONINGSBERGER (1904) 52; KOEHLER and VAN EY (1908) 16; PEARSON (1910a) 180; (1910b) 193; (1913) 87, *pl. 13, fig. 22*; MITSUKURI (1912) 135, *text-fig. 24*; H. L. CLARK (1920) 150; (1921) 181; (1923) 424; (1932) 235; SCHMIDT (1930) 415; DOMANTAY (1933) 74, *pl. 2, fig. 3*.

Holothuria tigris SELENKA (1867) 333, *pl. 19, figs. 70-72*.

Holothuria cadelli BELL (1887) 144, *pl. 16, fig. 7*.

Holothuria gallensis PEARSON (1903) 203, *pl. 3, figs. 46-50*.

Body subcylindrical. Mouth ventral with 20 peltate tentacles. Anus terminal with five groups of papillæ around the rim. Minute papillæ apparently pedicels are irregularly scattered all over the body. Papillæ on the dorsal side are grayish encircled by lighter area. In life color varies from olive-green with a shade of white and few black incomplete bands on the dorsal side to almost homogenous grayish green. Ventral side usually whitish-gray with a shade of light yellow. Average size 160 mm long by 45 mm width by 30 mm depth.

Deposits.—Numerous knobbed buttons and low stout tables. Knobbed buttons with three pairs of holes and others with more, the middle ones elongated and large. Margin markedly indented. Disk of table with a large central hole and several smaller peripheral ones. Spire composed of four stout pillars

which terminate distally in a spinous crown. Spire with a cross-beam. Pedicels with small end-plate and supporting rods, the latter slightly spinous, perforated and expanded at middle and at both ends. Huge button-like fenestrated plates also found.

Remarks.—A specimen of this species is with the collection of the Allan Hancock Foundation donated by the writer. Common all over the Islands.

Specimens examined:

Acc. No.	Locality	Date	Quantity
1204-AHF	Marine Biological Ground, Zamboanga	1948	1
107-Z	Zamboanga waters	6-5-51	1

HOLOTHURIA SÆCULARIS Bell

Holothuria sæcularis BELL (1887b) 534, pl. 45, fig. 6.

Holothuria (Holothuria) sæcularis PANNING (1935) 12, text-fig. 120.

All dried form made into *trepang* or *beche-de-mer*. The biggest among the seven specimens examined is 180 mm long which apparently in life measures three times as long. Mouth slightly ventral and anus terminal. Body-wall very thick and hardy. Pedicels and papillæ the same, apparently—all pedicels scattered all over the body. Color in dried or in preserved state is dark brown on the dorsal side and much lighter ventrally. Tips of pedicels much darker and in the retracted condition appearing as spots over the bivium.

Deposits.—Only knobbed buttons, the majority with three pairs of holes. No table.

Specimens examined:

Acc. No.	Locality	Date	Quantity
108-Za	Zamboanga waters	6-5-51	4
108-Zb	Zamboanga waters	6-6-51	2
108-Zc	Zamboanga waters	6-7-51	1

HOLOTHURIA SÆCULARIS Bell var. **FORSKALI** n. var.

From a dried material made into *trepang* or *beche-de-mer*. Resembling the appearance of the straight species externally with lighter color in both dorsal and ventral sides. Mouth ventral and anus terminal. Body-wall thick and hardy.

Deposits.—Knobbed buttons characteristic of the straight species with some irregular perforated plate-like disc with from two to four large holes resembling those of *Holothuria forskåli* Deele Chiaje as illustrated by Panning (1935) 13, text-fig 119. The presence of the latter spicules cannot be due to contamination from other species because none of this

type of spicules has been encountered in any of the other species examined and studied. Hence tentatively considered a new variety.

Further study will be made when more materials will be available. It is expected that some more materials may be encountered later around this place and more detailed description may be given.

Specimen examined:

Acc. No.	Locality	Date	Quantity
109-Z	Zamboanga waters	6-6-51	1

HOLOTHURIA VITIENSIS Semper

Holothuria vitiensis SEMPER (1868) 80, 247, 277, *pl. 30, fig. 12*; LAMPERT (1885) 89; THEEL (1886a) 203; LUDWIG (1889-92) 330; SAVILLE-KENT (1893) 238; SLUITER (1895) 78; (1901) 13; KOEHLER (1895a) 382; PEARSON (1903) 201; (1913) 57, *pl. 7, fig. 6*; KONINGSBERGER (1904) 45; FISHER (1907) 653; MITSUKURI (1912) 146; DOMANTAY (1933) 76-77, *pl. 1, fig. 2*.

Bohadschia vitiensis PEARSON (1914a) 170.

Holothuria tenuissima SEMPER (1868) 85, 248, 277, *pl. 30, fig. 20*; LAMPERT (1885) 88; LUDWIG (1882) 136; THEEL (1886a) 204; SLUITER (1887) 185; (1901) 14; KOEHLER (1895a) 383; PEARSON (1903) 201; KOEHLER and VANEY (1908) 16.

Holothuria clemens LUDWIG (1875) 31, *pl. 7, fig. 49*; LAMPERT (1885) 88; THEEL (1886a) 204; MITSUKURI (1912) 149.

Holothuria similis SEMPER (1886) 85, 277, *pls. 25 and 30, fig. 18*; LAMPERT (1885) 88; THEEL (1886a) 204.

Holothuria kollikeri SEMPER (1868) 86, 277; *pl. 30, fig. 25, pl. 35, fig. 7*; LAMPERT (1885) 87; THEEL (1886a) 204; LUDWIG (1887c) 31; LUDWIG and BARTHELS (1892) 632.

Holothuria (Bohadschia) vitiensis PANNING (1929) 122, *text-fig. 3*.

Body stout cylindrical and blunt at both ends. Mouth slightly ventral and anus terminal. Mouth with 20 short pel-tate tentacles. Anus with five prominent papillæ. Numerous pedicels scattered all over body and when retracted the integument looks smooth. Color in life as well as in dried or preserved state is dark orange dorsally and much lighter ventrally dotted with numerous tiny darker spots representing the tips of the retracted pedicels. Big size measuring around 300 mm long by 100 mm diameter.

Deposits.—Numerous tiny rosettes ranging from simple X-shaped to perfect ones, some resembling the miliary granules of *Synapta maculata* (Chamisso and Eysenhardt). Tip of pedicel with regular end-plate. Pedicel with big rosettes some of which are dichotomous X-shaped bodies.

Remarks.—Common all over the Islands. With numerous thick Cuvierian organs. Body thick and tough.

Specimens examined:

Acc. No.	Locality	Date	Quantity
110-Z	Zamboanga waters	5-31-51	1

Genus *ACTINOPYGA* Bronn*ACTINOPYGA ECHINITES* (Jaeger)

Mulleria echinites JAEGER (1833) 17, 18, pl. 3, fig. 6; SELENKA (1867) 312; SEMPER (1868) 76, 276, pl. 30, fig. 8; LUDWIG (1882) 134; (1887d) 1223; (1889-92) 329; (1899) 557; LAMPERT (1885) 99; (1896) 59; THEEL (1886a) 201; SLUITER (1894) 104; WHITE-LEGGE (1897) 160; (1903) 13; PEARSON (1910b) 191; ERWE (1913) 366, pl. 6, fig. 11; MITSUKURI (1912) 43.

Actinopyga echinites SAVILLE-KENT (1893) 236; BEDFORD (1898) 835-836; PEARSON (1914b) 183, pl. 29, fig. 7; DOMANTAY (1933) 53-54, pl. 4, fig. 5.

Holothuria (Actinopyga) echinites PANNING (1929) 129, text-fig. 12.

Body ovate and subcylindrical. Mouth ventral with 20 peltate tentacles. Anus terminal with five calcareous teeth. In some, anus slightly turned dorsad. Body-wall thick and tough. Papillae very prominent and scattered all over the bivium. Few teat-like protuberances with papilla at tip arranged in two indistinct series on the dorsal side. Pedicels arranged in three bands inter-mixed with few ones in the interambulacral area in the trivium. Color in life grayish-brown to grayish-green with few indistinct darker blotches on the dorsal side and more homogenous lighter ventrally. In dried form the dorsal side is dark brown and grayish-white ventrally. Medium size, the biggest in the present collection is 120 mm long.

Deposits.—Numerous rods from simple slightly spinous to branching ones resembling some of the *Actinopyga mauritiana* (Quoy and Gaimard) and dichotomous X-shaped rosettes. Some of the rods have smooth shaft and racemose ends. Rods and rosettes of various sizes.

Specimens examined:

Acc. No.	Locality	Date	Quantity
111-Za	Marine Biological Ground, Zamboanga	6-1-51	2
111-Zb	Marine Biological Ground, Zamboanga	6-4-51	2

ACTINOPYGA MILIARIS (Quoy and Gaimard)

Holothuria miliaris QUOY and GAIMARD (1833) 137.

Mulleria miliaris BRANDT (1835) 74; SELENKA (1867) 314; (1868) 117; SEMPER (1868) 76, 276; LUDWIG (1880) 7; (1882) 134; (1883) 165; (1887a) 144; (1888) 812; (1889-92) 329; (1899) 557; HAACKE (1880) 46; LAMPERT (1885) 99; THEEL (1886a) 200; SLUITER (1894) 104; (1895) 79; (1901) 23; KOEHLER and VANEY (1908) 22; PEARSON (1910a) 175.

Holothuria lineolata QUOY and GAIMARD (1833) 137-138; BRANDT (1835) 74; SELENKA (1867) 314.

Mulleria plebeja SELENKA (1867) 312.

Actinopyga miliaris BELL (1887e) 653, *pl. 40, fig. 1*; (1888) 389; PEARSON (1914b) 181, *pl. 29, fig. 6*; DOMANTAY (1933) 53, *pl. 4, fig. 6*.

Body subcylindrical with bivium and trivium marked off distinctly. Mouth ventral with 20 short peltate tentacles. Anus terminal with five calcareous teeth. Body-wall thick and hardy. Papillæ scattered irregularly on bivium and pedicels somewhat arranged in three distinct bands on the trivium. Color in preserved state orange-brown usually with a large chestnut-brown blotch on the dorso-posterior part. Medium size.

Deposits.—Numerous minute rosettes which are dichotomously branched, X-shaped with dichotomous bifurcation and few spinous rods.

Remarks.—Five specimens in the collections of the Allan Hancock Foundation donated by the writer.

Specimens examined:

Acc. No.	Locality	Date	Quantity
12004-AHF	Zamboanga waters	1948	3

ACTINOPYGA SERRATIDENS Pearson

Actinopyga serratidens PEARSON (1903) 199, *pl. 3, figs. 26-41*; (1914b) 179, *pl. 29, fig. 5*.

Holothuria (Actinopyga) serratidens PANNING (1929) 126, *text-fig. 8*.

Body subcylindrical with the bivium and trivium well marked. Mouth ventral with 20 peltate tentacles. Anus terminal with five calcereous teeth. Body-wall thick and hardy. Papillæ scattered irregularly over the bivium and pedicels in three distinct bands on the trivium. Color in life as well as in preserved state dark purple almost black all over the body. Somewhat corrugated at the bivium in one specimen apparently due to contraction. In one eviscerated specimen with the body-wall relaxed the color is lighter and uniformly dark-brown.

Deposits.—Numerous rods dichotomously branched at both ends, some with racemose ends, few with dichotomous side branches from the middle of the shaft and at both ends giving the appearance of a perfect rosette. Spicules not so thickly found unlike the other species. Shapes of the spicules agree exactly with the illustrations given by Pearson.

Specimens examined:

Acc. No.	Locality	Date	Quantity
112-Z	Marine Biological Ground, Zamboanga	6-16-51	3

Genus *MICROTHELE* Brandt, 1835*MICROTHELE NOBILIS* (Selenka)

- Mulleria nobilis* SELENKA (1867) 313, pl. 17, figs. 13-15; SEMPER (1868) 76, 276, pl. 37, figs. 9-12; (1869) 120; THEEL (1886) 198.
Actinopyga nobilis FISHER (1907) 647.
Holothuria maculata BRANDT (1835) 54; SELENKA (1867) 331; SEMPER (1868) 92, 279.
Mulleria maculata LUDWIG (1881) 593; (1889-92) 329; (1899) 557; LAMPERT (1885) 97; MITSUKURI (1912) 48, pl. 3, figs. 23-24, text-fig. 10; ERWE (1913) 368, pl. 6, fig. 12.
Actinopyga maculata BEDFORD (1899) 150.
Argiodia maculata PEARSON (1914a) 170; (1914b) 174, pls. 27-28, fig. 2; DOMANTAY (1933) 55-56, pl. 1, fig. 1.
Mulleria hadra SELENKA (1867) 313, pl. 17, fig. 16; LAMPERT (1885) 97; THEEL (1886a) 198.
Argiodia flavo-castanea PEARSON (1914b) 176, pl. 23, fig. 3.
Holothuria (Microthele) nobilis PANNING (1929) 131-132, text-fig. 15.

Body subcylindrical with the bivium and trivium well marked off and rounded at both ends, with five large conical protuberances along each ventro-lateral ambulacrum. Body-wall very thick and tough. Mouth ventral and anus terminal with five small calcareous teeth surrounded by groups of papillæ. Few papillæ sparsely scattered on the bivium and numerous pedicels arranged in three indistinct bands on the anterior trivium and crowded posteriorly. Color in life dark brownish-gray to almost black and much lighter ventrally. In dried or preserved state the color is lighter.

Deposits.—Few tables, hollow fenestrated ellipsoids and numerous knobbed buttons. Disk of table irregular with smooth undulated margin and a large central hole surrounded by several smaller ones. Spire short with stout pillars and terminate in a spinous tuft crown. With a cross-beam. The ellipsoids and knobbed buttons numerous. Pedicles with regular end-plate and supporting plates.

Remarks.—Most of the specimens examined were in dried form *trepang* taken from the Chinese dealers in Zamboanga. Six of the specimens are in the collections of the Allan Hancock Foundation donated by the writer. One of them is labeled *Argiodia maculata* (Brandt) var. *thelenotæ*, a new variety. The presence of the characteristic spicules of *Thelenota ananas* (Jaeger) mixed with that of *Argiodia maculata* (Brandt) found

in the integument of the latter confused the writer. Upon further study it was found that spicules of other species may contaminate others when placed together in the same container. The new variety mentioned above is therefore discarded. The two different species were placed together in one container for some time before they were examined and studied by the writer.

Specimens examined:

Acc. No.	Locality	Date	Quantity
1204-AHF	Zamboanga waters	1950	6
113-Z	Zamboanga waters	6-2-51	5

Family STICHOPIDÆ Brandt, 1835

Genus STICHOPUS Brandt, 1835

STICHOPUS VARIEGATUS Semper

Stichopus variegatus SEMPER (1868) 72; H. L. CLARK (1921); DOMANTAY (1933) 79-80, pl. 2, fig. 1.

Body quadrangular and elongated. Mouth ventral and anus terminal. With 20 peltate tentacles. Papillæ of two sizes on the bivium, those of the dorso- and ventro-lateral ambulacra large and prominent, and those of the interambulacral area small and oftentimes inconspicuous in contracted condition. Pedicels arranged in three distinct bands on trivium with the median band much wider than the laterals. Body-wall thick but not hardy, easily disintegrate even if just taken from the water when mechanically abraded. Color in life olive-gray with different shades of green and yellow and fine black transverse striations running irregularly over the bivium. The ground color appears variegated with the dark pink tips of the papillæ.

Deposits.—Numerous tables, dichotomously X-shaped rosettes and C-shaped bodies. Tables generally small compared with other species of the genus *Holothuria*. Disk of table with four large and few small holes, the spire with four pillars and two cross-beams. Rosettes and C-shaped bodies typical. Pedicels with regular end-plate and supporting rods, the latter with partly spinous ends and mid-shaft dilated into asymmetrical perforated plates.

Remarks.—Apparently found in many places in the Islands although not in abundance as the *Stichopus variegatus* Semper var. *hermanni* Semper. One specimen of this species is with the collection of the Allan Hancock Foundation donated by the writer.

Specimens examined:

Acc. No.	Locality	Date	Quantity
1204-AHF	Zamboanga waters	1950	1

STICHOPUS VARIEGATUS Semper var. **HERMANNI** Semper

Stichopus variegatus SEMPER var. *Hermani* SEMPER (1868) 73, pls. 17, 30, fig. 2; H. L. CLARK (1922) 68; DOMANTAY (1933) 80-81, pl. 2, fig. 2.

Body quadrangular and elongated. Mouth ventral and anus terminal. With 20 peltate tentacles. Papillæ scattered all over dorsal and lateral sides with those of the dorso- and ventro-lateral ambulacra very prominent in life. Pedicels numerous arranged in three distinct bands on trivium with the medium band much wider than the laterals. Body-wall thick but not hardy, easily disintegrate after removal from the water when mechanically abraded. Color in life greenish-brown or greenish-orange with shades of brown and many fine incomplete dark green striations on dorsal interambulacrum. Tip of papillæ bright scarlet red. Younger specimens show more shades of green giving a dark-green appearance and the tips of the papillæ are not conspicuously colored.

Deposits.—Numerous tables and C-shaped bodies like those found in *Stichopus variegatus* Semper without any difference. The dichotomously X-shaped rosettes are oftenly missed in large specimens, hence apparently found only in smaller younger materials. Pedicels with regular end-plate, and together with the papillæ are the large supporting rods of different forms, one of which is not found in the straight species which is a large partly spinous branching supporting rod.

Remarks.—Practically found in many places in the Islands and more abundant than the straight species. Has been cured for commercial trade but the quality is poor and may be good only for fertilizer. One specimen in bad shape is with the collection of the Allan Hancock Foundation donated by the writer.

Specimens examined:

Acc. No.	Locality	Date	Quantity
1204-AHF	Marine Biological Ground, Zamboanga	1949	1
114-Za	Marine Biological Ground, Zamboanga	6-4-51	2
114-Zb	Zamboanga waters	6-7-51	6
114-Zc	Zamboanga waters	6-9-51	2

STICHOPUS HORRENS Selenka

Stichopus horrens SELENKA (1867) 316, pl. 18, figs. 27-29; H. L. CLARK (1922) 64-66, pl. 2, figs. 19-23; DOMANTAY (1933) 78-79, pl. 3, fig. 1.

Stichopus godeffroyi SEMPER (1868) 75, pl. 30, fig. 4.

Stichopus godeffroyi var. *pygmæus* SEMPER (1868) 75.

Stichopus godeffroyi var. *b.* SEMPER (1868) 246.

Stichopus tropicalis FISHER (1907) 676, pl. 70, figs. 1-11.

Body sub-quadrangular and elongated. Mouth ventral and anus terminal. With 20 short peltate tentacles. Papillæ arranged in four irregular rows along each of the dorso- and ventro-lateral ambulacra and none over the interambulacral area. In bigger or older individuals, according to H. L. Clark, the papillæ developed on the dorsal interambulacral area as in *S. godeffroyi* var. *b.*, Semper and *S. tropicalis* Fisher. Numerous pedicels arranged in three distinct bands on the trivium, the median row much wider than the laterals. Body-wall delicate and pellucid, almost transparent. In bigger individuals the integument is no longer transparent but somewhat olive-green mottled with darker shades on bivium and cream-color on trivium. Apparently color changes with the age of the animal. One of the specimens I examined in the Puerto Galera Marine Biological Station is somewhat variegated in color. Always found among rocks and corals usually covered apparently due to its tender and delicate integument.

Deposits.—Tables, rosettes and C-shaped bodies. The tables of two kinds, one big with a conical spire ending in single point with large perforated disk, and another one smaller with spire ending like a spinous crown. The rosettes are dichotomously X-shaped which together with the C-shaped bodies are almost typical to the other species of the genus. Pedicels with the regular end-plate and supporting rods, the latter resembling that of the *S. variegatus* Semper to some extent. According to the findings of H. L. Clark the tables undergo growth-changes with the age of the animal and that the C-shaped bodies appear at a certain stage in the life of the individual which marks the *horrens* stage, *sensu strictu*.

Specimens examined:

Acc. No.	Locality	Date	Quantity
115-Za	Marine Biological Ground, Zamboanga	1950	1
115-Zb	Marine Biological Ground, Zamboanga	1951	1

Genus *THELENOTA* Brandt, 1835*THELENOTA ANANAS* (Jaeger)*Trepang ananas* JAEGER (1833) 24, pl. 3, fig. 1.*Holothuria (Thelenota) ananas* BRANDT (1835) 253.*Stichopus ananas* SEMPER (1868) 75; SLUITER (1901) 30, pl. 2, fig. 1; MITSUKURI (1912) 150, pl. 1, figs. 6-8, text-fig. 25; THEEL (1886a) 196.*Thelenota ananas* H. L. CLARK (1921) 184, pl. 18, fig. 2; DOMANTAY (1933) 81-82, pl. 1, fig. 5.

Body subquadrangular and elongated. Mouth ventral and anus terminal. With 20 peltate tentacles. Papillæ on bivium large, conically compressed with their bases united together forming semi-starlike appendages. Numerous large pedicels arranged irregularly on the trivium. Body-wall very thick and hardy. Color in life light brown with dark brown spots and fine transverse black striations on bivium. Papillæ reddish-orange. In dried or preserved state the color is uniformly brown all over the body. Large size, the average length is around 400 mm.

Deposits.—Simple and dichotomously branched rods and innumerable minute oval granules. Some simple rods smooth, slightly curved and pointed at both ends, others irregular, more or less spinous and some branched at both ends. Dichotomously branched rods ranged from simple X-shaped to complex rosette. Tip of pedicel with regular end-plate. Some of the dichotomously X-shaped rosettes resemble that of *Holothuria (Actinopyga) formosa* (Selenka) in Panning (1929) 130, text-fig. 14.

Remarks.—Common all over the Islands and used mostly for *trepang* or *beche-de-mer*. Five cured specimens are with the collections of the Allan Hancock Foundation donated by the writer, transferred to alcoholic solution.

Specimens examined:

Acc. No.	Locality	Date	Quantity
1204-AHF	Zamboanga waters	1950	6
116-Z	Zamboanga waters	6-7-51	1

Order *APODA* Brandt, 1835Family *SYNAPTIDÆ* Ostergren, 1905Genus *SYNAPTA* Eschscholtz, 1829*SYNAPTA MACULATA* (Chamisso and Eysenhardt)*Holothuria maculata* CHAMISSE and EYSENHARDT (1821) 352.*Synapta mammillosa* ESCHSCHOLTZ (1829); JAEGER (1833).*Holothuria oceanica* LESSON (1830).

Synapta beselii JAEGER (1833); SEMPER (1868); THEEL (1886a).

Synapta oceanica JAEGER (1833).

Synapta astrolabi HELD (1857).

Synapta beselii TENNISON-WOODS (1880).

Chondrochlaea beselii OSTERGREIN (1898b).

Synapta maculata JAEGER (1833); H. L. CLARK (1907); (1924) 471-473, pl. 3, figs. 1-2; pl. 4, fig. 1; pl. 5; DOMANTAY (1933) 89-90; pl. 2, fig. 7.

Body long cylindrical and snake-like when under water. Mouth and anus terminal. With 14 to 15 pinnate tentacles. In life measures as long as three meters when extended, with five distinct longitudinal bands of two or three different colors crossed by incomplete irregular bands of variegated brown of darker and lighter shades alternated by black. Body surface rough and sticks to the skin when handled due to prominent anchors sticking outward from the integument. At times when external condition becomes abnormal due apparently to rise in temperature when partly exposed during low tide the body forms prominent folds in alternation along the whole length known as *verrucae*. This may vary greatly with size and nature of contraction of the animal. May be absent altogether in preserved specimens.

Deposits.—Large anchors and anchor-plates and numerous miliary granules. Anchor-plate almost as long as the shaft of the anchor, with a central hole surrounded by six to seven similar ones and many smaller ones at both ends. At the posterior end are two bows making that portion of the plate appear double. Anchor very large with finely spinous stock, smooth arms and with few very minute spherical knobs at the apex, either in a single central series or in short series on each side, or may be wanting altogether even in fully developed ones. Miliary granules very numerous and irregular rosette-like in form.

Specimens examined:

Acc. No.	Locality	Date	Quantity
117-Za	Marine Biological Ground, Zamboanga	6-11-51	1
117-Zb	Marine Biological Ground, Zamboanga	6-11-51	4

OPHEODESOMA SPECTABILIS Fisher var. **PUERTO-GALERÆ** Domantay

Opheodesoma spectabilis FISHER var. *puerto-galeræ* DOMANTAY (1933) 86-87, pl. 2, fig. 10.

Body tubular and worm-like when under water. Mouth and anus terminal. With 12 to 15 pinnate tentacles. Body-wall thin and rough to the touch due to anchors. When ex-

tended under water the body looks smooth but when partly contracted due to abnormal external conditions the integument may show five regular series of numerous folds or *verrucae* extending the whole length of the animal. Color in life brownish-green to dark green with some irregular longitudinal lighter stripes with numerous minute white specks. Alternation of brownish-green and lighter color with numerous minute white specks forming transverse bands may be seen in others. Apparently small size, the average length is around 300 mm.

Deposits.—Anchors, anchor-plates and miliary granules. Stock of anchor with 6 to 8 spinous projections. Vertex and arms smooth although in some the former may be seen with few minute spherical knobs. Anchor-plate with a small handle and distinct neck separating it from the plate. Handle with three small holes, sometimes with additional minutes ones, and with a small semi-lunar bow not attached to the neck. The body of the anchor-plate with one central and six peripheral dentate holes. Numerous miliary granules, disc-shaped, some with tiny hole.

Specimens examined:

Acc. No.	Locality	Date	Quantity
118-Za	Marine Biological Ground, Zamboanga	3-9-51	10
118-Zb	Marine Biological Ground, Zamboanga	6-11-51	6

Genus POLYPLECTANA H. L. Clark, 1907

POLYPLECTANA KEFERSTEINII (Selenka)

Synapta kefersteinii SELENKA (1867) 360.

Synapta kallipeplos SLUITER (1888).

Chondrocloea kefersteinii OSTERGREN (1898h).

Synaptula kefersteinii FISHER (1907).

Polyplectana kefersteinii H. L. CLARK (1907); (1908) 16, 77; (1924) 468-471; pl. 1, figs. 8-12; DOMANTAY (1933) 88, pl. 2, fig. 8.

Body tubular and worm-like when under water. Mouth and anus terminal. With 13 to 25 pinnate tentacles. Integument thin and smooth. Color in life reddish-brown to dark brown and more or less speckled with lighter shade. Body-wall somewhat delicate, does not preserve very well. In life body surface slightly rough to the touch due to anchors.

Deposits.—Anchors, anchor-plates and miliary granules. Stock of anchor without distinct processes but rather finely spinous resembling that of *Synapta maculata* (Chamisso and Eysenhardt). Arms smooth with few minute spherical knobs on vertex. Anchor-plate symmetrical with one central and six large peripheral dentate holes, one of which, the one toward

the handle is smaller, partly dentated and slightly heart-shaped. Handle without distinct neck and with two large and several small smooth holes. Bow of handle partly dentated on posterior border. Miliary granules irregular in shape and size from rod-shape to rosette.

Specimens examined:

Acc. No.	Locality	Date	Quantity
119-Z	Marine Biological Ground, Zamboanga	6-11-51	3

BIBLIOGRAPHY

- BELL, F. J. Echinodermata: Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. "Alert" 1881-82, London, 1884c.
- BRANDT, T. Fr. Prodomos description animalium ab H. Mertensie in orbis terrarum circumnavigatione observatorum, Petersburg, Heft 1 (1835).
- CHAMISSE, A., and C. G. EYSENHARDT. De Animalibus duce Ottone de Ketzue observatis. Act. Akad. Germ. (1821).
- CHIAJE, ST. DELLE. Memorie sulla steria et notomia degli animali senza vertebre del regne Napoli. Bd. 1-4 (1823-1829).
- CLARK, H. L. Notes on the Bermuda echinoderms. New York Acad. Sci. Ann. 11 (1898).
- CLARK, H. L. Further notes on the Bermuda echinoderms. New York Acad. Sci. Ann. 12 (1890).
- CLARK, H. L. The apodous holothurians: a monograph of the Synaptidæ and Molpadidæ, etc. Wash. D. C., Smith. Inst. Cont. to Knowledge 35 (1907).
- CLARK, H. L. The echinoderm fauna of Torres Strait; its composition and its origin. Carnegie Inst. Wash. Dept. Mar. Biol. Papers 10 (1921).
- CLARK, H. L. The holothurians of the genus *Stichopus*. Mus. Comp. Zool. Bull. 65 (1922).
- CLARK, H. L. Notes on a collection of echinoderms from the Australian Museum, Sidney, Australia. Museum, Records No. 2 15 (1926).
- CLARK, H. L. Echinoderms from Australia. Mus. Comp. Zool. Mem. 55 (1938).
- DEICHMANN, E. The holothurians of the western part of the Atlantic Ocean. Mus. Comp. Zool. Bull. (3) 71 (1930).
- DEICHMANN, E. Holothurians from the Gulf of California. The Templeton Croaker Expedition, 9. Zoologica 22 (1937).
- DEICHMANN, E. Holothurians from the western coast of Lower California and Central America, and from the Galapagos Islands; Eastern Pacific Expeditions of the New York Zoological Society, 16. Zoologica (4) 23 (1938).
- DOMANTAY, J. S. Littoral holothurioida of Port Galera Bay and adjacent waters. U. P. Nat. and Applied Sci. Bull. 3 (1933).
- DOMANTAY, J. S. Four additional species of littoral holothurioida of Port Galera Bay and adjacent waters. U. P. Nat. and Applied Sci. Bull. 4 (1934).

- DOMANTAY, J. S. Some holothurians from Guam and vicinity. Manuscript (1951).
- FISHER, W. K. The holothurians of the Hawaiian Islands. U. S. Nat. Mus. Proc 32 (1907).
- HEDING, S. C. Contributions to the knowledge of Synaptidæ. I. Vidensk Medd. fra Danak naturh. Foren. 88 (1929).
- HEDING, S. C. Echinoderm III. Holothurioidea 2 (Fam. Synaptidæ) Beitrage zur Kenntniss der Meeresfauna Westafrikus. (7) 3 (1932).
- JAEGER, S. F. De Holothuriis. Diss. inaug. Turici. 1833.
- KENT, W. S. Bêche-de-mer Fisheries. The Great barrier Reef of Australia; Its products and potentialities. W. H. Allan and Co. Calcutta (1893).
- KOEHLER, R. Echinoderms de la Baie d'Amboine. Rev. Suisse de Zool. 3 (1895).
- KOEHLER, R. and C. VANEY. An account of the littoral holothurioidea. Echinoderms of the Indian Museum, Calcutta (1908).
- LUDWIG, H. List of the holothurians in the collection of the Leyden Museum. Notes Leyden Museum (10) 4 (1882).
- LUDWIG, H. Die von Dr. J. Brook in Indischen Archipel gezammelten holothurien. Zool. Jahrb. 3 (1888).
- LUDWIG, H. The Holothurioidea; in Reports on an exploration off the west coast of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatros" Nr. 12. Mus. Harvard Coll. Mem. (3) 17 (1894).
- MITSUKURI, K. A list of holothurians known to occur in Japan. Zool. Mag. 8 (1896).
- MITSUKURI, K. Studies on Actinopodous Holothurioidea. Imperial Univ. Tokyo, Jour. Coll. Sci. (2) 29 (1912).
- MORTENSEN, TH. Echinoderms of New Zealand and the Auckland-Campbell-Island. III-V, Vidensk Medd. Dansk Naturh. Foren. 79 (1925).
- OSTERGREN, H.J. Über eine durchgreifende Umwandlung des Hautskeletts bei *Holothuria impatiens* (Forskål). Zool. Anzeig. 21 (1898).
- OSHIMA, H. The Synaptidæ of Japan. Annot. Zool. Jap. 8 (1914).
- OSHIMA, H. Report on the holothurians collected by the *Albatros*, etc. U. S. Nat. Mus. Proc. 48 (1915).
- PANNING, A. Echinoderm III. Holothurioidea I (Fam. Holothuriidæ); in Michaelsen, W. Beitrage zur. Kenntniss der Meeresfauna Westafrikus (5) 3 (1928a).
- PANNING, A. Über das optische Verhalten der Kalkkörper der aspidochiroten Holothurien. Zeit. Wiss. Zool. 132 (1928b).
- PANNING, A. Zur Kristalloptik der Kalkkörper der aspidochiroten Holothurian. Zool. Mus. Hamburg Mitt. Zool. Staats-inst. 44 (1929).
- PANNING, A. Die Gattung holothuria. Mitt. a.d. Zool. Staat. u. Zoolog. Mus. Hamburg. (1) 44 (1929).
- PANNING, A. Über die Kristalloptik der Kalkkörper der Seewelsen. Zool. Jahrb. (2) 49 (1931).
- PANNING, A. Die Gattung Holothuria. (2 Teil) Zoolog. Mus. Hamburg. Mitt. a.d. Zoolog. Staat. 45 (1934).

- PANNING, A. Die Gattung *Holothuria*. (3 Teil) Zoolog. Mus. in Hamburg Mitt. a.d. Zoolog. Staat. 45 (1934).
- PANNING, A. Die Gattung *Holothuria*. (4 Teil) Zoolog. Mus. in Hamburg. Mitt. a.d. Zoolog. Staat. 45 (1935).
- PANNING, A. Die Gattung *Holothuria*. (5 Teil) Zoolog. Mus. in Hamburg. Mitt. a.d. Zoolog. Staat. 46 (1935).
- PEARSON, J. Report on the *Holothurioidea* collected by Prof. Herdman at Ceylon, in 1902; in Herdman, W.A., Report to the Government of Ceylon, on the pearl oyster fisheries of the Gulf of Manaar. Teil 1, Suppl. 5 (1903).
- PEARSON, J. Notes on the *Holothurioidea* of the Indian Ocean. I. The genus *Holothuria*. *Spodia Ceylanica* 9 (1913).
- PEARSON, J. Proposed re-classification of the genera *Mulleria* and *Holothuria*. *Spodia Ceylanica* 9 (1914a).
- PEARSON, J. Notes on the *Holothurioidea*. II. The sub-genera *Argiodia* and *Actinopyga*. *Spodia Ceylanica* 9 (1914b).
- SAVILLE-KENT, W. The great barrier Reef of Australia; its products and potentialities. London (1893).
- SELENKA, E. Beitrage zur Anatomie und Systematik der *Holothurien*. Zeit. Wiss. Zoolog. 17 (1867).
- SELENKA, E. Nachtrag zu den Beitragen zur Anatomie und Systematik der *Holothurien*. Zeit. Wiss. Zool. 18 (1868).
- SEMPER, C. *Holothurien*. Reisen im Archipel der Philippinen, Teil 2, Wiss. Res. Leipzig 1 (1868).
- SIVICKIS, P. B. and J. S. DOMANTAY. The morphology of a holothurian, *Stichopus chloronotus* Brandt. Philip. Jour. Sci. 37 (1928) 299.
- SLUITER, C. PH. *Holothurien* des Java-Meeres. Nat. Tijds. v. Nederlandisch-Indie 47 and 49 (1887-90).
- SLUITER, C. PH. Die *Holothurien* der Siboga-Expedition. Monographie 44 (1901).
- THEEL, H. Report on the *Holothurioidea* dredged by H. M. S. Challenger during the years 1873-76, II; in The Voyage of H. M. S. Challenger. Zool. 14 2 Addenda in 14, I (1886a).
- VANEY, C. *Holothuries* recueillis sur la Cote Francaise des Somalis. Mus. d'Histoire Nat. Bull. 11 (1905).
- VERRIL, A. E. Additions to the Fauna of the Bermudas from the Yale Expedition of 1901, with notes on other species. Connecticut Acad. Arts Sci. Trans. 11 (1902).
- WHITELEGGE, T. The *Echinodermata* of Funafuti; in: the Atoll of Funafuti. Austral. Museum Mem. 3 (1897).