

plinstone I., Mergui Is. (BELL '86); Bay of Bengal (BELL '88); Indian Ocean (LUDWIG '82); Padang (LUDWIG '82); Djedda (LUDWIG '82); Thousand Is. (SLUTTER '95); Java (SELENKA '67); Batavia (SLUTTER '87); Sunda Is. (KOEHLER '95); Timor (LUDWIG '82, SLUTTER :01); Lucipara I. (LAMPERT '89, SLUTTER :01); Saleh Bay (SLUTTER :01); Sebangkatan (SLUTTER :01); Lombok (SLUTTER :01); Lumbu-Lumbu (SLUTTER :01); Seba (Savu) (SLUTTER :01); Kabala dua (SLUTTER :01); Haingsisi (SLUTTER :01); Roma (SLUTTER :01); Kangeang (SLUTTER :01); Jedan I. (SLUTTER :01); Celebes (JAEGER '33, LAMPERT '85); Macassar (LUDWIG '82); Amboina (SELENKA '67, SEMPER '67—'68, LUDWIG '82, LAMPERT '85, THÉEL '86, SLUTTER '94, '95); Batjan, Moluccas (SEMPER '67—'68); Moluccas (SEMPER '67—'68); Philippine Is. (SEMPER '67—'68); Zebu (LAMPERT '85); Uolan (BRANDT '35); ? Radaack Is. (CHAMISSO '21); Mermaid Strait, Dampier I. (LAMPERT '89); "Challenger" Stat. 177. (THÉEL '86); Great Barrier Reef (KENT '93); Adelaide (LAMPERT '85); Funafuti (WHITELEGGE '96, BEDFORD '98); Rotuma (BEDFORD '98); Fiji (SEMPER '67—'68, THÉEL '86); Tonga (THÉEL '86); Penope (THÉEL '86); Samoa (SEMPER '67—'68); Society Is. (SELENKA '67); Tahiti (LUDWIG '83); Sandwich Is. (SELENKA '67); Florida (POURTALÈS '51, SELENKA '67); ? Bermuda (HEILPRIN '88); Havana (LUDWIG '83); Jamaica (LUDWIG '83); Puerto Cabello (LUDWIG '83, LAMPERT '85); Torres Strait; Liu-Kiu; Ogasawara Is.; Amami-Ōshima.

18. *Holothuria bivittata*, sp. n.

(Pl. III., fig. 31; textfig. 75).

Specimens examined:—

Sci. Coll., Spec. No.	Number of individuals	Preservation	Locality	Depth in <i>hiro</i>	Collector	Date
1217, 1218	2	Alc.	Chinenzaki, Okinawa Is.	3.5	Mitsukui	Apr. 15, 1901.
1024	3	..	Liu-Kiu Is.			
1025	1	Cured	..			
1440	1	Dried	Miyakojima, Yayeyama Is., Liu-Kiu.			

Description :—Tentacles 20, small. Length of body in life ca. 30 cm. ; in alcohol quite 18 cm. Color markings very characteristic : dorsum and ventrum very differently colored. The ground color of the former, yellow to brown ; on this, two broad dark-brown transverse bands cross the whole breadth of the dorsum. One of these is at about $\frac{1}{6}$ — $\frac{1}{4}$ of the body length from the anterior end, and is over 2 cm. in breadth ; the other is at about the same distance from the posterior end and is of about the same breadth. Sometimes the band may not entirely cross the whole width of the body. The ventrum is lighter than the dorsum, and varies from a uniform brown to almost a white.

Ambulacral appendages very numerous, uniformly distributed in the ambulacra as well as the interambulacra without any regular arrangement, on both the dorsum and the ventrum. Dorsal appendages have end-plates almost as well developed as those of the ventrum. Hence all must be considered as pedicels. Except near the anterior and posterior ends I can not detect a single papilla. In life, however, the dorsal pedicels may appear like papillae ; for in my notes on the living animal, I put down "Dorsal surface papillae only. Small end-plates?" There are no large supporting rods, but there are delicate X-shaped spicules, which are somewhat larger than the calcareous bodies in the body wall. Some of these have long branches at both ends ; others are more rod-like with the ends slightly bifurcated. There are all intermediate stages between these.

Calcareous deposits are very much as in *H. marmorata*. In the dorsal perisome, they consist almost entirely of delicate rosettes of 20—25 μ (textfig. 15 *b*). They start with the X-shape, but the branches at the ends divide dichotomously 2—4 times and the whole looks like a delicate filigree-work. In the

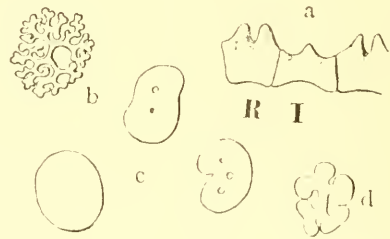
ventral perisome, the calcareous deposit is greater in quantity. The spicules are made on essentially the same plan as those in the dorsum, i.e., they are rosettes but of a much plumper appearance (*d*). The most delicate among them come near to the dorsal rosettes, but are plumper even then. The more plump among them are decidedly broader. They may even become oval or biscuit-shaped grains with or without holes (*c*). They measure 22—36 μ .

Anus in life a large circular opening with five groups of small papillae projecting into it. It no doubt becomes stellate, according to the condition of preservation.

Polian vesicle one, long, may be over 5 cm., situated in the left ventral interradius. Stone-canal attached to the mesentery, running forward in a sinuous course from the circumoral vessel, terminating near the calcareous ring with a slightly enlarged end. Calcareous ring as figured in *a*. Cuvier's tubes developed mostly on the left respiratory tree, but some on the right also. The tubes together form a very large mass.

Remarks :—Liu-Kiuan name —“Sunu-haya.”

Among the species I have examined, *H. argus*, *H. marmorata* and the present species resemble one another very closely. I therefore think that THÉEL'S belief that *H. marmorata*, *H. argus*, *H. viticensis*, *H. tenuissima*, *H. köllikeri*, *H. clemens*, *H. similis* are probably only young individuals or varieties of one and the same species, has much to recommend it. A somewhat exhaustive



Textfig. 15.

Holothuria bivittata: *a*—Calcareous ring; *b*—Delicate rosette of dorsum; *c*—Oval grains of ventrum; *d*—Plump rosette of ventrum. (*b*—*d* × 400). I—Interradialia; R—Radialia.

examination of the three species first mentioned convinces me that they resemble one another very closely in almost every anatomical detail:—in the calcareous deposits, the structure of the Cuvierian tubes, in the arrangement of the Polian vesicles and of the stone-canal, in the nature of ambulacral appendages, etc. But the reason why I have kept *H. marmorata* and *H. argus* separate and have ventured to burden the already overstocked nomenclature by establishing the present species is, that each of the three species has very characteristic and well-established color-markings of its own. It is true that one can not place much reliance on mere external markings, but in these cases they are so constantly and strikingly different, and so entirely without intermediate gradations, that the three species are distinguished with ease by the Liu-Kiu natives and have different names assigned by them. Such differences should also be taken notice of in science, and distinctive names be given the species for future reference. Whether the differences are specific or varietal can perhaps only be determined by a long study on the spot, and even then it may after all turn out to be a mere matter of fancy whether they should be assigned specific or varietal values. For the present, I have thought it best to give them specific values.

19. *Holothuria cinerascens* (BRANDT).

(Textfig. 16).

Stichopus (Gymnochirota) cinerascens BRANDT 1835, p. 51.—LUDWIG 1881, p. 597.

? *Holothuria umbrina* RÜPPEL & LEUCKART 1828, p. 10, Taf. II., Fig. 4.

Stichopus cinerascens (?) GRUBE 1840, p. 36.—SELENKA 1867, p. 319.
—SEMPER 1867—'68, pp. 74, 275.

PLATE III.

Mülleria lecanora JAEGER.

Fig. 21. Cured trepang, "Shi-bi." Dorsal view. $\times \frac{1}{4}$.

Fig. 22. Same. Ventral view. $\times \frac{1}{4}$.

Mülleria maculata (BRANDT).

Fig. 23. Cured trepang, "Shiro-usā." $\times \frac{1}{4}$.

Fig. 24. Another form, "Kuro-usā." $\times \frac{1}{4}$.

Mülleria mauritiana (QUOY & GAIMARD).

Fig. 25. Cured trepang, "Zōri-geta." Dorsal view. $\times \frac{1}{4}$.

Fig. 26. Same. Side view. $\times \frac{1}{4}$.

Fig. 27. Same. Ventral view. $\times \frac{1}{4}$.

Mülleria miliaris (QUOY & GAIMARD).

Fig. 28. Cured trepang, "Chirimen-iriko." Ventral view. $\times \frac{1}{4}$.

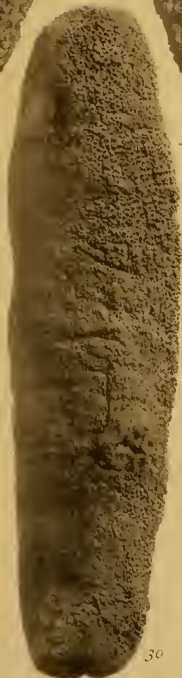
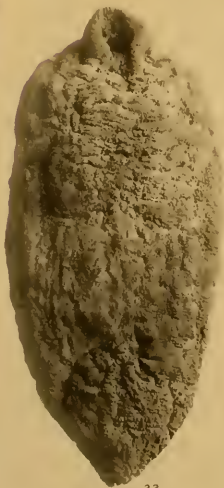
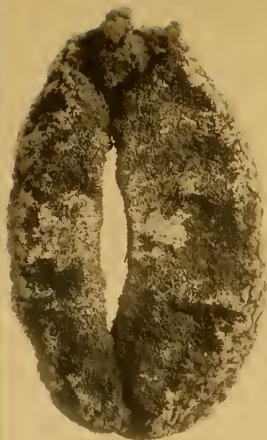
Fig. 29. Same. Dorsal view. $\times \frac{1}{4}$.

Holothuria argus (JAEGER).

Fig. 30. Cured trepang, "Me-haya." $\times \frac{1}{4}$.

Holothuria bivittata, sp. n.

Fig. 31. Cured trepang, "Sunā-haya." $\times \frac{1}{4}$.



ii. Uchiyama photo.

21-22 *Mülleria lecanora* JAEGER.

23-24 *Mülleria maculata* (BRANDT).

25-27 *Mülleria mauritiana* (QUOY & GAIMARD).

28-29 *Mülleria miliaris* (QUOY & GAIMARD).

30 *Holothuria argus* (JAEGER).

31 *Holothuria bivittata*, sp. n.