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CONTRIBUTIONS TO JAPANESE ASCIDIAN FAUNA

XV. SPORADIC MEMORANDUM (6)

Styela clava var. *symmetrica* nov., a new pedunculate styelid from the Inland Sea.¹⁾

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With one Text-figure

Since Dr. R. H. MILLAR asked me to send him some specimens of *Styela clava* HERDMAN to compare them with *Styela mammiculata* CARLISLE from the Plymouth Sound, I took several individuals out of the bottle labelled "*Styela clava* HERDMAN collected in August 1937 at Kada, Kii" and sent them to Dr. MILLAR. Later, he gave me a letter in which he stated that the specimens he received were not *S. clava* but *Styela longipedata* TOKIOKA, because they had each two gonads on each side, and asked me to send him some other specimens of real *S. clava*. I was very surprised at his information as I had never doubted but that these specimens were *S. clava*. None of the specimens conserved in the same bottle was dissected for identification, but the external appearance of these specimens is quite the same as that of the specimens of *S. clava* which I dissected for identification. Hurriedly I picked ten more individuals out of that bottle, dissected them and found that all of them were provided with two gonads on each side as stated by Dr. MILLAR in his letter. The existence of two gonads on each side is evidently a character common to all specimens collected at Kada and conserved in the same bottle. For comparison, I dissected a few specimens collected in Kasaoka Bay of the Inland Sea, one of which was related so closely in the external appearance to the specimens from Kada that I expected that this specimen might have two gonads on each side. All the dissected specimens were, however, provided with more than three gonads on each side; they were true *S. clava*.

Then I examined again the specimens from Kada in detail. This time I noticed the following tendencies in the external appearance: (1) the stalk is comparatively shorter than in *S. clava* and (2) protuberances on the body surface are always very prominent and especially those around the apertures are much larger than in *S. clava* (fig. 1). The stalk occupies 18-31% of the total body length and 26% on an average. In

1) Contributions from the Seto Marine Biological Laboratory, No. 340.

S. clava, the stalk is very variable in length. The specimens described by TRAUSTEDT (1885, Pl. III fig. 26, specimens from Kôbe and Hakodate) and REDIKORZEV (1916, Pl. V fig. 7) seem to be practically devoid of the peduncular portion, while HERDMAN's original specimens from Kôbe have considerably long stalk attaining 36-44% of the

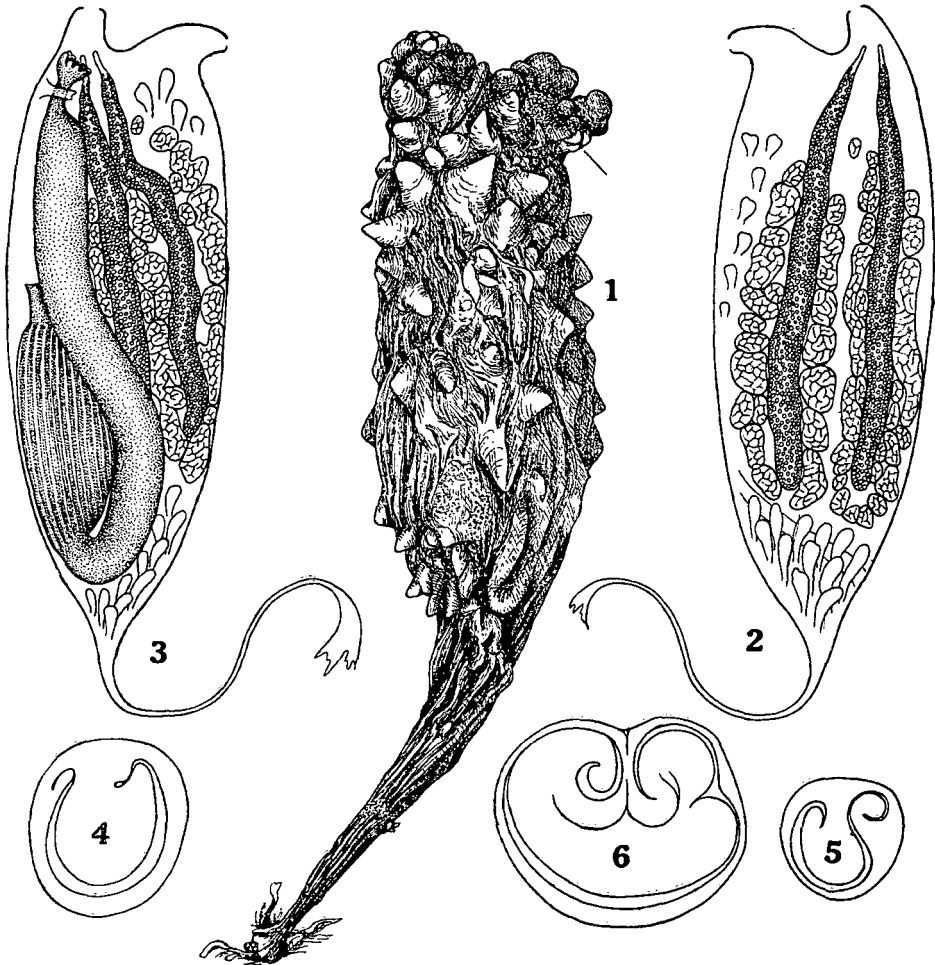


Fig. 1. *Styela clava* var. *symmetrica* nov. (1-4) 1...Entire animal from Kada, 2...Inside of the right half of mantle body, 3...Inside of the left half of mantle body, 4...Ciliated groove. *Styela clava* HERDMAN from Kasaoka Bay (5-6) Ciliated grooves.

total body length (1882, Pl. XIX fig. 9) and OKA's specimens from Mutu Bay (1935) have the stalk nearly as long as the body proper. Specimens from Kasaoka Bay seem to be provided with specially long stalk; it occupies 54% of the total body length in a 162 mm long individual, but up to 64% in a 110 mm long specimen. Further, there are the following data:-

TOKIOKA (1951a), Specimens from Akkesi, Hokkaidô, the stalk occupies about 50% of the total body length; (1953a), Specimens from Sagami Bay, 32% long stalk in a 103 mm long individual; (1954), Specimens from Ôsaka Bay, 45% long stalk in two 40 mm long individuals; (1959), Specimens from Wakasa Bay, 58% long stalk in a 60 mm long individual.

The body surface of *S. clava* is usually covered in the anterior half by irregularly shaped knobs (OKA 1935); they are not so prominent in TRAUSTEDT's (1885), REDIKORZEV's (1916) and TOKIOKA's (1951a, from Akkesi Bay) specimens. The knobs are confined to the area surrounding the apertures in the specimens from Sagami Bay (TOKIOKA, 1953a). However, HERDMAN's specimens (1882) are covered by very prominent knobs over the whole body surface as well as the previously mentioned specimens from Kasaoka Bay. In all of the specimens of *S. clava*, mentioned above, the knobs are more prominent in the anterior half of the body than in the posterior, but they are not larger in the area around the apertures than in other parts of the body.

In *Styela longipedata* TOKIOKA, the stalk is usually longer than in *S. clava*; the specimens from Sagami Bay (TOKIOKA 1953a) have the stalk reaching to 60-64% of the total length and a specimen from Wakasa Bay (TOKIOKA 1953c) has the stalk which is as long as the body proper. The surface of the leathery test may be wrinkled or grooved, but never provided with any knobs nor prominences even around the apertures which are always opened at the tip of short but distinct siphons. When the animal is alive, the test of the body is densely dotted with minute orange spots, with small white flecks scattered here and there. Both apertures are nearly sessile and siphons are practically indiscernible in *S. clava*, siphons are discernible but not distinct in the specimens from Kada.

The internal structure of the present problematic specimens conforms most closely to that of *S. clava* as shown in the part of the description, excepting that the gonads are always two on each side, endocarps are rather few but somewhat large, and fine follicular appendages are quite absent on the rectum. In HERDMAN's original specimens of *S. clava*, "several long, tubular, and slightly ramified genital glands are present upon each side of the body adhering to the inner surface of the mantle" (p. 159), TRAUSTEDT's specimens from Kôbe and Hakodate have 3-4 gonads on each side, REDIKORZEV showed 4 gonads on the left and 7 on the right side (fig. 44) and the specimens from Mutu Bay have the gonads up to 7 on the right and fewer ones on the left side (OKA 1935). My former observations show: in specimens from Akkesi, Hokkaidô, left 3-4, right 5-7; in specimens from Sagami Bay, left 3-4, right 5-8; in specimens from Wakasa Bay, left 2, right 4. The specimens from Kasaoka Bay have 3-4 gonads on the left and 5-6 ones on the right side.

In *S. clava*, endocarps are set very densely and they are rather small excepting those found in the posterior portion; and there are many follicular appendages on the rectum along the inner side of the intestinal loop.

S. longipedata has always two gonads on each side, but the arrangement of testes differs somewhat from that found in *S. clava* and the specimens from Kada. Testicular follicles are much smaller and situated far apart from the ovary. Endocarps are very scarce in this species and the rectum is quite devoid of follicular appendages.

Although the present problematic specimens conform to *S. longipedata* in the number of gonad and in the absence of the follicular appendages on the rectum, the general appearance of the inner structure of these specimens is considered to be related more closely to that of *S. clava*. Comparatively large stomach and the ciliated groove opened anteriorly are common to both of these specimen and *S. clava*, while in *S. longipedata* the stomach is very small and the ciliated groove opens towards the right side. Throughout the external and internal structures, it appears that the present problematic specimens are related much more closely to *S. clava* than to *S. longipedata*. The resemblance between these specimens and *S. clava* is very remarkable, but the constant occurrence of two gonads on each side and the complete absence of follicular appendages on the rectum are quite unique for the former. In addition to these internal characteristics, the constantly short peduncle and the constant existence of very prominent conical knobs around the apertures may be regarded as the external characteristics of these specimens. Putting these characteristics together, the specimens from Kada seem to deserve to be treated as a distinct form separable from *S. clava*. But considering the close resemblance to *S. clava*, they are treated here as a variety of *S. clava* rather than a new species and named after the symmetrical arrangement of gonads.

Styela clava var. *symmetrica* nov.

Styela clava DRASCHE (1884): Denkschr. Akad. Wiss. Wien, Bd. 48, p. 379, Taf. VI figs. 9-11.

Body elongate, 40 to 60 mm in length and ca. 50 mm on an average, width up to 18 mm near the middle; peduncle 10-20 mm in length. The branchial aperture is situated at the antero-ventral corner of the body and the atrial at the antero-dorsal corner; the former is opened towards the ventral side; both apertures are four-lobed, siphons are made obscure by prominent knobs. The posterior part of the body and the stalk creased longitudinally, while the most parts of the body are covered by irregularly shaped conical prominences which are always prominent around the apertures. Larger prominences attain 6 mm in height. Test is leathery, translucent and coloured faintly brownish. It is very thin, less than 1 mm between the prominences. Mantle is very delicate, short branchial and atrial siphons are defined distinctly on the mantle body. Endocarps are rather few, but somewhat large; those found in the area posterior to the rear end of the intestinal loop are remarkably elongate. Villi-form atrial tentacles are set densely along the atrial velum.

Branchial sac: Inner longitudinal vessels are arranged in a 40 mm long (length of body proper) specimen as follows:

Left	D.	0	(ca. 20)	4	(ca. 20)	7	(17)	6	(12)	3	V.
Right	D.	12	(ca. 20)	8	(ca. 20)	6	(20)	8	(13)	5	V.

Dorsal lamina is a plainly edged membrane. Transverse vessels are arranged as...thick thin

medium thin thick..., parastigmatic vessels are present. Up to 6 stigmata in a mesh. Ciliated groove (fig. 4) is U-shaped, opened anteriorly and with horns curled in or out. About fifteen large tentacles between which smaller ones intervene.

Alimentary system: The intestinal loop occupies the ventral half of the left side. Oesophagus very short. Stomach elongate and with longitudinal plications on the surface, they are ca. 13 on the right side. Rectum is very thick and quite devoid of follicular appendages along the inner side of the loop, it is constricted markedly before it attains the anus. Anal margin is cut into a dozen lobes. The descending branch of the intestinal loop is about half as long as the ascending branch.

Gonad: Two gonads on each side. Ovary elongate; testes surround most parts of ovaries as in *S. clava* (figs. 2-3) leaving anterior portions exposed.

Loc.: Many specimens from Kada on the south-eastern coast of Ōsaka Bay.

Remarks: The specimen described by DRASCHE (1884) also has two gonads on each side. The stalk occupies 38% of the total length, most parts of the body are wrinkled but devoid of tubercles. However the anterior part of the body, especially both short siphons and the area surrounding them, are furnished with prominent knobs (Taf. VI fig. 9). No follicular appendages on the rectum (Taf. VI fig. 11). This is evidently considered to belong to the present new variety. The specimen came from Japan, but further locality is unknown. In addition to this specimen, he had other two specimens also came from Japan. But it is uncertain whether these two are the same in the structure as the above-mentioned specimen.

Other features of *S. clava* from Kasaoka Bay else than those already given in the preceding pages are described here as the data for future studies.

Peduncle is rather long, this is probably attributable to the environmental condition of the locality. Protuberances are developed as well as in the present new variety, although those around the apertures are not so prominent. Test is thin, only 1 mm even in large specimens. It is yellowish brown in colour on protuberances, but tinted reddish brown between them; the inner surface is reddish or dark brownish. Mantle is of a moderate thickness and coloured yellowish. Atrial tentacles are fine, long and set very densely. Inner longitudinal vessels on the branchial folds are arranged as:

40 mm long individual (length of body proper),

Left	D.	12 (22)	8 (22)	8 (22)	10 (16)	5 V.
Right	D.	5 (26)	4 (25)	4 (29)	5 (12)	2 V.

75 mm long individual (length of body proper),

Left	D.	3 (38)	9 (36)	6 (44)	5 (30)	2 V.
Right	D.	8 (30)	10 (36)	7 (44)	4 (40)	3 V.

About 30 tentacles, larger and smaller ones are differentiated, besides some minute ones intervene between them. Fifteen to sixteen plications on the right side of stomach. Margin of anus is cut into more than 20 lobes. The descending branch of the intestinal loop attains 52-61% of the ascending branch.

The above-mentioned three forms are separable from one another by the following characteristics.

A. Constantly two gonads on each side. No follicular appendages on the rectum.

- 1) No knobs are formed on the body surface, both siphons very distinct, stalk very long. Stomach much shorter than 1/2 of the ascending branch of intestinal loop. Testes arranged far apart from ovaries.

.....*Styela longipedata*

ТОКИОКА (1953a, p. 271; 1953c, p. 28)

- 2) Many knobs over the body surface, those around the apertures very prominent; siphons present but not so distinct; stalk rather short. Stomach attains nearly 1/2 of the ascending branch of intestinal loop. Testes arranged near ovaries.*Styela clava* var. *symmetrica*
 DRASCHE (1884, p. 379)
- B. Two or more gonads on the left and more than two gonads on the right side. Many follicular appendages on the rectum.
- 3) The anterior half of the body, at least the area around the apertures, is covered by knobs, both apertures nearly sessile, stalk very variable in length. Stomach 1/2 or more of the ascending branch of the intestinal loop. Testes arranged near ovaries.
*Styela clava*
 HERDMAN (1881, p. 70; 1882, p. 158)
 TRAUSTEDT (1885, p. 45)
 HARTMEYER (1906, p. 15)
 OKA (1935, p. 444)
 TOKIOKA (1951a, p. 16; 1951b, p. 180;
 1953a, p. 270; 1953b, p. 17;
 1954, p. 90; 1955a, p. 212;
 1955 b, 1959, p. 231)
Botryorchis clava.....REDIKORZEV (1916, p. 219)
Styela mammiculata...CARLISLE (1954, p. 329)

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