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Redescription of *Pterygascidia mirabilis* Sluiter, 1904 (Ascidiacea, Cionidae), based on the type specimens

TAKASI TOKIOKA

ABSTRACT

As a result of the re-examination of the type-material of *Pterygascidia mirabilis* Sluiter a lectotype is designated, and the original description of this species is emended on five points. It is concluded that *Pterygascidia* is related more closely to *Ciallusia longa* Van Name than was thought previously.

Since I actually examined some specimens, including the type specimen, of *Ciallusia longa* Van Name, 1918, at the United States National Museum, I became interested in the re-examination of specimens, the type specimen if possible, of *Pterygascidia mirabilis* Sluiter, 1904. This, because in my opinion *Ciallusia* appeared to be related most closely to *Pterygascidia* (Tokioka, 1967: 136). Recently, I learned that eleven specimens of *Pterygascidia mirabilis* collected by the Siboga-Expedition were still kept as syntypes at the Institute of Taxonomic Zoology (Zoological Museum), University of Amsterdam (van der Spoel, 1969: 190), and I was able to study these type specimens and to dissect one of them for a re-examination of the internal structures.

Some important discrepancies were found between the descriptions given by Sluiter (1904: 21-24) and the results of my own observation, indicating a closer affinity indeed between *Pterygascidia* and *Ciallusia*. As these genera are noticed not only for their peculiar appearances but also from a systematic point of view (Millar, 1963), a detailed description of *Pterygascidia mirabilis* based on the type specimens is given below.

I want to express here my hearty thanks to the authorities of the Institute of Taxonomic Zoology (Zoological Museum), University of Amsterdam, and particularly to Dr. S. van der Spoel, for the privilege of re-examining the type specimens.

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Pterygascidia mirabilis Sluiter, 1904

Sluiter, 1904: 21-24, Pl. 2 fig. 3, Pl. 7 figs. 1-5.

Eleven specimens from the Siboga Exped. Station 302, 10° 27.9′ S, 123° 28.7′ E; near Timor Island; 216 m deep, sand and coral sand; preserved in alcohol.

Specimen number	Trunk (in mm) length	Trunk (in mm) width	Peduncle (in mm) length	Peduncle (in mm) thickness
ZMA TU 282.1 (lectotype)	47	12	34	3.5
ZMA TU 282.2 (dissected for re-examination)	45	12	33	3
ZMA TU 282.3 (dissected already)	ca. 47	12	42	4
ZMA TU 282.4	24	7	25	2
ZMA TU 282.5	38	11	29	3
ZMA TU 282.6	48	12	35	3
ZMA TU 282.7	50	12	40	2
ZMA TU 282.8	40	9	28	3
ZMA TU 282.9	28	8	36	2
ZMA TU 282.10	38	10	10+	2
ZMA TU 282.11	45	12	lost	lost

External appearance (Figs. 1A; 2A, B): The elongate trunk is supported by a long thin peduncle fixed with the proximal end to the substratum. The peduncle is slightly extended and furnished with many rooty prominences. The trunk is 3.5 to 4 times as long as wide and markedly compressed laterally in a preserved state. The peduncle is nearly as long as the trunk in smaller specimens but shorter in larger ones; about one-tenth as thick as long. The test is soft gelatinous, colourless and transparent, and very thin especially in the anterior half of the trunk; the surface is smooth and usually quite free from any foreign matters. Both apertures are situated at the distal end of the trunk, the branchial at the antero-ventral corner and the atrial at the antero-dorsal corner. The former opens to the ventral side at the tip of a siphon curved dorsad. It is surrounded by a small posterior lip, and a much larger anterior lip with nearly smooth margin. On the other hand, the atrial aperture opens anteriorly at the tip of a short siphon and it is surrounded by six very prominent lobes, of which the two dorsal ones are surprisingly extended on the ventral side to form an elliptical fan-shaped fin (Fig. 2 C, D) of the thin test substance, about 14 mm long and 5-6 mm wide in the specimen No. 2. The pair of fins thus formed are stretched posteriorly near to, or slightly beyond, the level of the anus (Figs. 1A, B; 2A, B). The distance between the fins increases a little posteriorly (Fig. 2 C).

Mantle body (Fig. 3A): The mantle is extremely thin and adheres so tightly to the test that it was impossible to take the mantle body out of the test without serious damage. It is quite colourless and transparent. The atrial lobes are each marked with a roundish tissue (Figs. 1A, 2C). The muscles

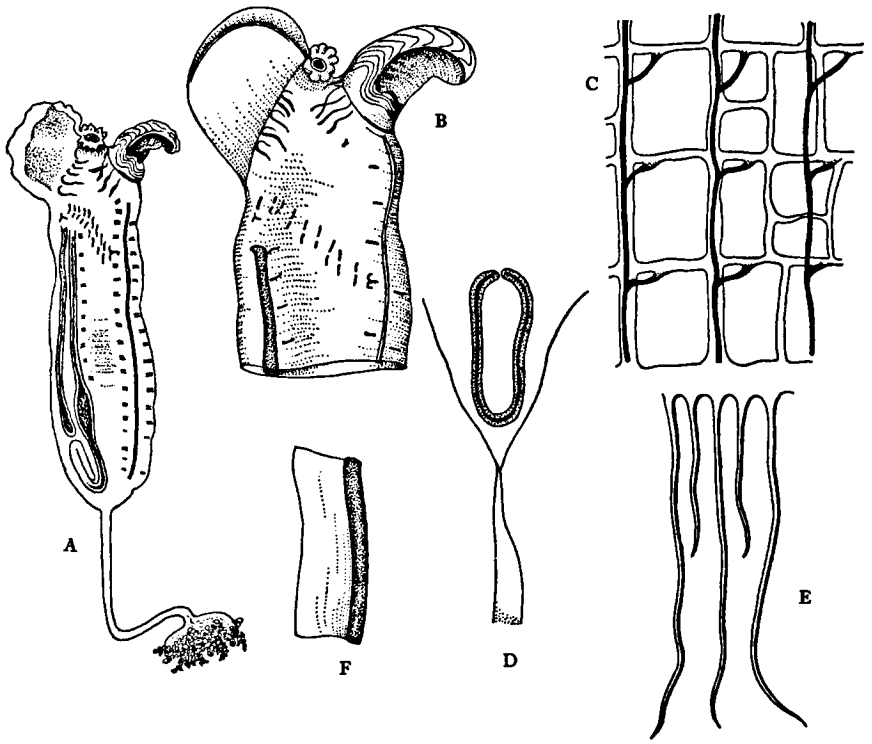

FIG. 1. *Pterygascidia mirabilis* Sluiter. Reproduction of Sluiter's original figures, 1904. A: Right side of an entire animal (Pl. II, fig. 3). B: Anterior part of trunk, right side (Pl. VII, fig. 1). C: A part of branchial sac (Pl. VII, fig. 2). D: Ciliated groove and dorsal lamina (Pl. VII, fig. 3). E: Branchial tentacles (Pl. VII, fig. 4). F: A part of branchial tentacle, enlarged (Pl. VII, fig. 5).

are all split into pieces except for some sphincters of the siphons. The arrangement of the sphincters of the atrial siphon and that of the sphincters and some retractors of the branchial siphon are shown in figure 3A. The principal arrangement of body muscle pieces is shown clearly by Sluiter (Fig. 1A, B). There are two pairs of longitudinal series of muscle pieces: the ventral pair consists of 20 to 30 pieces, with the endostyle in between, and the dorsal pair consists of 12 to 20 pieces, with the intestine in between. The right series of the dorsal pair runs near and almost parallel to the dorso-median line of the trunk, the left series is arranged along the left side of the intestine and thus clearly separated from the dorso-median line, especially in the posterior half. Some short muscles are found fringing around the posterior end of the branchial sac. Furthermore, there is a unique oblique series of muscle pieces on each side, at the level around the anus; the series consists of several up to a dozen pieces, some of which may be divided into anterior and posterior halves (Figs. 1A, B; 2A, B; 3A). The mantle extension in the peduncle seems partly somewhat fascicular.

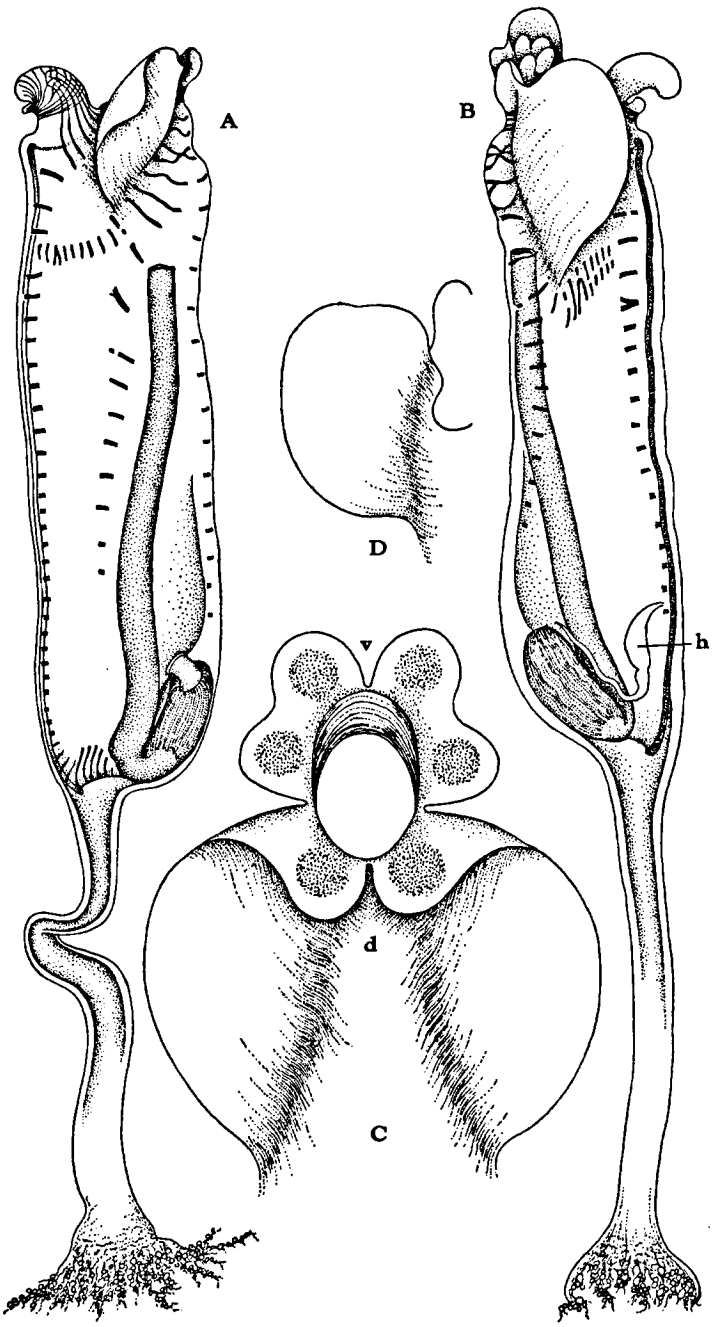

FIG. 2. *Pterygascidia mirabilis* Sluiter. A: Specimen ZMA TU 282 No. 1, left side. B: Specimen ZMA TU 282 No. 2, right side. C: Schematic representation of atrial lobation. d — dorsal side, v — ventral side. D: Fin-shaped extension of dorsal lobe of atrial aperture, extended to show its outline.

Internal structure (Figs. 1A, C-F; 2A, B; 3): The branchial tentacles are simple finger-shaped, very elongate, about one hundred or more in number, and without any size difference between the dorsal and ventral sides (Fig. 1E, F). The ciliated groove assumes a longitudinal slit in the specimen No. 2. The peripharyngeal bands together form a short lamellar plate posterior to the ciliated groove, but the dorsal lamina is distinctly represented by a series of elongate dorsal languets (Fig. 3B). The structure of the wall of the branchial sac is already described precisely by Sluiter (Fig. 1C). There are no real stigmata fringed with ciliated cells on the wall, but only meshes formed by longitudinal and transverse vessels; one to three of such meshes are found between each pair of inner longitudinal vessels of which there are about 35 on the left side of the sac in the specimen No. 2. The inner longitudinal vessels may be partly imperfect; the supporting processes of vessels form no special process projecting out beyond the edge of the vessel. No vaults are found on the wall of the branchial sac.

The alimentary system consists of the long and straight ascending intestine and the elliptical descending stomach that is about one-fourth to one-fifth as long as the intestine (Figs. 2A, B; 3A). The oesophagus is very short; it opens into the branchial sac far anteriorly, approximately at the level of the posterior one-fifth of the branchial sac, and into the cardiac end of the stomach on the left side. The stomach wall is provided with fine longitudinal vaults. The pyloric end of the stomach, discerned by the posterior end of the wall vaults, falls a little anterior to the bending point of the alimentary canal, but there are no parts definitely referable to the hindstomach and middle intestine. The intestine goes up along the left side of the dorso-median line and ends approximately at the level of the anterior one-fourth of the trunk; the anus shows a plain margin.

The ovary may be a tubular organ running anteriorly parallel to the intestine from the bending point of the alimentary canal and continued to the oviduct without any demarcation between. The testis consists of many fine follicles spread over the intestinal wall around the bending point of the alimentary canal, especially on the right side. Genital apertures open on the dorso-median line of the branchial sac near the posterior-most sphincter of the atrial siphon, roughly at a level of the middle between the anus and the anterior end of the trunk. The vas deferens ends a little more anteriorly than the oviduct and is divided distally in the specimen No. 2 into six tubules ending respectively to an orifice (Fig. 3C). The heart (Fig. 2B, h) is a prominent curved tubular organ situated on the right side of the trunk between the stomach and the endostyle; the ventral arm is swollen much more than the dorsal.

Remarks: The descriptions given by Sluiter and the structures confirmed by my own observation differ in the following five points.

(1) According to Sluiter, the atrial aperture is surrounded by a rather tall

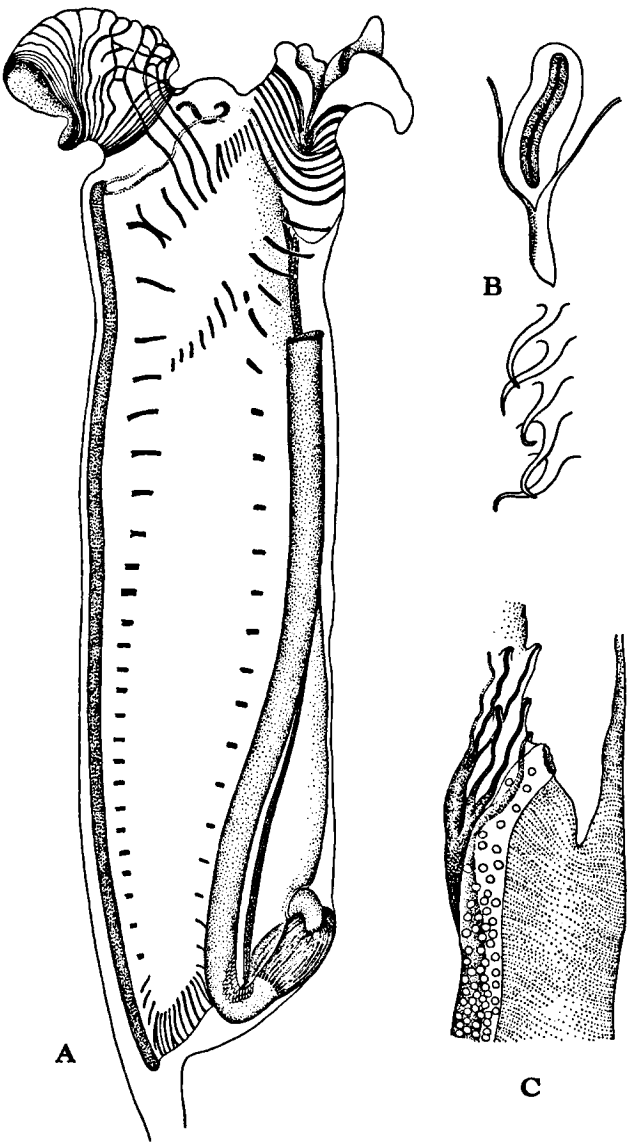

FIG. 3. *Pterygascidia mirabilis* Sluiter, specimen ZMA TU 282 No. 2. A: Mantle body, left side. B: Ciliated groove and anterior five dorsal languets. C. Ends of vas deferens and oviduct, left side.

and folded margin (p. 22, line 12). The exact number of atrial lobes is not given in his descriptions, although eight (Fig. 1B) and nine (Fig. 1A) lobes are shown in his figures. Actually it is rather difficult to define the respective lobes distinctly, but throughout the specimens examined the formation of six lobes seems to be the principle of lobation. The boundary between lobes is seemingly clearly cut, between the pair of dorsal lobes with fin-shaped extension, between the dorsal lobes and the dorsal ones of the lateral pairs of lobes of ordinary appearance, and between the ventral ones of the two lateral pairs (Fig. 2C).

(2) The ciliated groove of the specimens examined by Sluiter is U-shaped (p. 23, lines 9-10; Fig. 1D), but it is a simple longitudinal slit in the specimen No. 2.

(3) The dorsal lamina of the specimens dissected by Sluiter is a considerably narrow membrane with smooth edges (p. 23, line 11; Fig. 1D), but it is represented by a series of languets in the specimens Nos. 2 and 3.

(4) In the specimens observed by Sluiter, the alimentary canal starts quite posteriorly in the trunk, with a considerably long oesophagus which forms a loop anteriorly before it enters the stomach (p. 23, lines 12-13; Fig. 1A). In every specimen of the type series, the oesophagus is very short and opens to the branchial sac at a level far anterior of the rear end of the trunk.

(5) The stomach is ascending and situated in the longitudinal axis of the trunk (p. 23, lines 13-14; Fig. 1A) in the specimens observed by Sluiter, but in the type specimens it is descending and situated obliquely between the short oesophagus and the posterior end of the straight intestine.

Of these differences, the third concerning the morphology of the dorsal lamina is the most important from a systematic point of view. On account of the true structure of the dorsal lamina described here the genus *Ciallusia* now seems to be related more closely to the genus *Pterygascidia* than was realized before.

Sluiter examined 13 specimens of this ascidian (p. 21, last line). As there remain now 11 specimens, two specimens must have been dissected by him to study the details of the internal structure. If his descriptions and figures were correct, the eleven specimens left as syntypes of *P. mirabilis* would represent another species of the genus distinct from *P. mirabilis*, the type specimens of which were then destroyed by dissection. However, I am of the opinion that some descriptive statements and figures of Sluiter were incorrect because of the great difficulty of dissecting this delicate ascidian species, and, therefore, I propose an amendment to Sluiter's characteristics of *P. mirabilis* on account of the above-mentioned differences in five features.

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Dr. TAKASI TOKIOKA
Seto Marine Biological Laboratory
Kyoto University
Sirahama, Wakayama-ken — Japan 649—22

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