

ON PSEUDOBONELLIA, A NEW GENUS OF
THE BONELLIAN ECHIUIROIDS

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ONE PLATE AND THREE TEXTFIGURES

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In the summers of 1932 and 1933 during my stay at Goza, a small village on the sea-coast near Hamajima, Shima Province, I had opportunities of examining two female specimens of *Bonellia* collected by fishermen and brought to me for investigation.

The two specimens (A and B) were nearly of the same size and shape. One of the specimens (Specimen B, collected in 1933) was found, according to the collector, on a sandy bottom at about one fathom in depth, with the body proper buried in sand, and the proboscis stretched about 3 cm on the bottom. Nothing is known of the habitat of the other specimen (Specimen A, collected in 1932).

The worms in living state performed a regular peristaltic movement. The body proper is rather long and pear-shaped (Plate 1, fig. 1). In the preserved state, Specimen B measures about 38 mm in length and its posterior region 20 mm in width. The proboscis measures about 42 mm in length and 5 mm in breadth; ventrally it is deeply grooved, especially at the anterior end. In specimen A, the left arm of the proboscis was much shorter than the right one which measures about 17 mm in length and is cut short at its tip. In the other specimen, on the contrary, the right arm was shorter than the left one. This disparity in the length of the proboscis arms is probably due to an accidental injury.

The ground colour is light yellowish-brown, mottled with light-brown specks of irregular shape. The animal became somewhat transparent in formalin, the coiled intestine and ova being visible through the body-wall. The skin is covered by numerous papillæ which can be observed under a low-power magnification. But there occur no

spinous bodies like those described and figured by I. Ikeda for his *B. misakiensis* (Ikeda, 1904, p. 75, Pl. 1. fig. 24).

One of the most characteristic features of the present specimens is the absence of ventral hooks, a feature shared by Ikeda's specimen of *B. misakiensis* (Ikeda, 1904, p. 75) also. The muscular sheaths for the ventral hooks are also missing.

The body-wall of the worm is encased in a thin cuticle. The epidermal layer is composed of single-layered epithelial cells (fig. 2 *ep*).

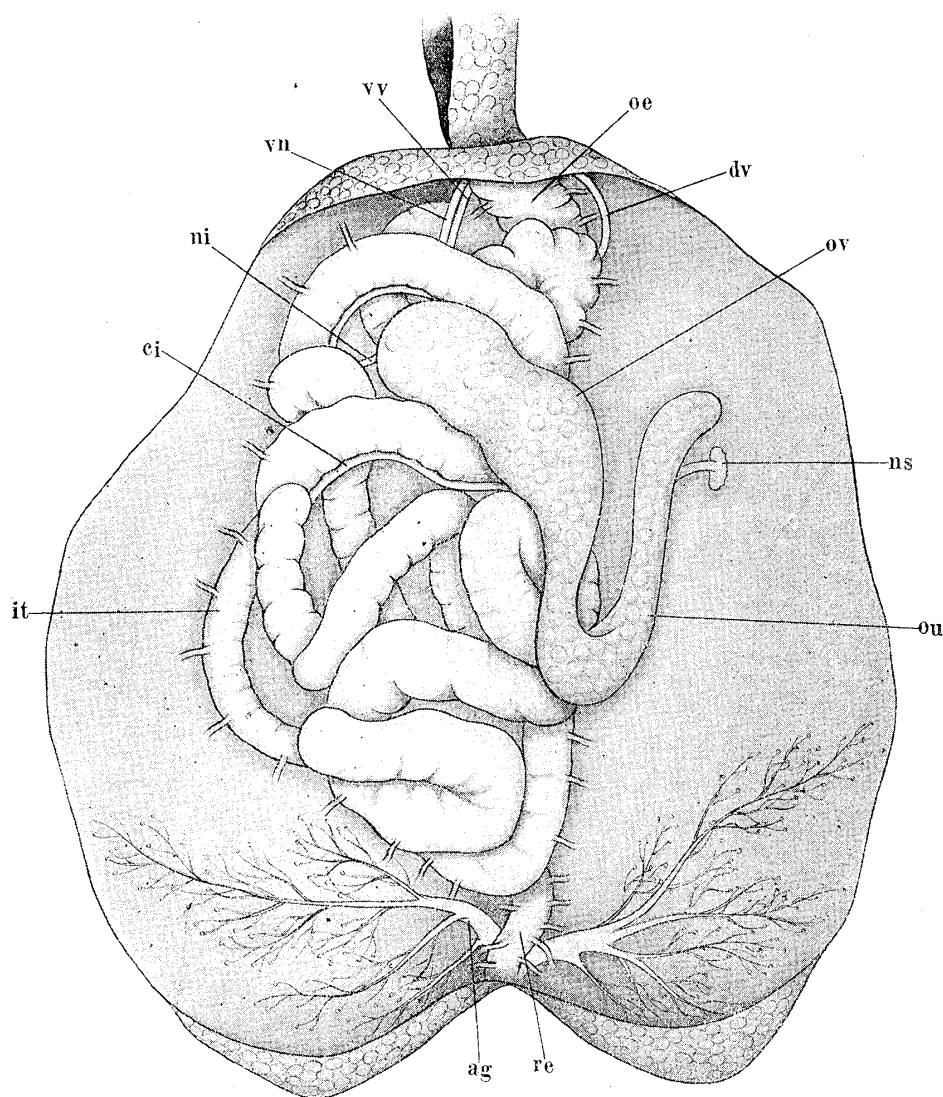


Fig. 1.—Internal view of Specimen B, cut open along the middorsal line. Ca. $\times 3$.
oe, oesophagus; *it*, intestine; *ci*, collateral intestine; *re*, rectum; *vv*, ventral vessel; *vn*, ventral nerve; *ni*, neuro-intestinal vessel; *dv*, dorsal vessel; *ov*, oviduct; *ns*, nephrostome; *ou*, ova; *ag*, anal gland.

Under the layer lies a comparatively thick layer of cutis (*ct*). Then follow a thick layer of circular muscle fibres (*cm*) and a thin longitudinal muscle layer (*lm*). Then comes a layer of oblique muscles (*om*), and finally a thin layer of the peritoneum (*pn*), the innermost layer of the body-wall.

The alimentary canal is a long and exceedingly convoluted tube tied *in situ* by muscular fibres rising from the body-wall. The oesophagus (textfig. 1, *oe*) measures ca. 30 mm in length; the intestine (*it*) is a highly convoluted tube accompanied by a collateral intestine (*ci*) all through the course of ca. 100 mm. The rectum (*re*) is fairly long, measuring ca. 50 mm and terminates at the posterior extremity of the body. The posterior portion of the rectum is tied to the body-wall by numerous muscular fibres.

As regards the vascular system, I have little to add to what is already known in other echiuroids, except that the ventral vessel (textfigs. 1 and 2, *vv*) running along the ventral nerve-cord (*vn*) gives off a branch, the neuro-intestinal vessel (*ni*), at a point about 50 mm behind the end of the oesophagus. This neuro-intestinal vessel (7 mm in length) is connected with the heart by two short roots. The dorsal vessel (*dv*) arises at the internal end of the oesophagus; it is attached to the body at a point about 5 mm from its origin and proceeds forward.

The oviduct (anterior nephridium) is an unpaired organ as is characteristic of the Bonellian worm. It opens on the left side, very close to the ventral nerve-cord (fig. 1, *ov*). No muscular junction is found be-

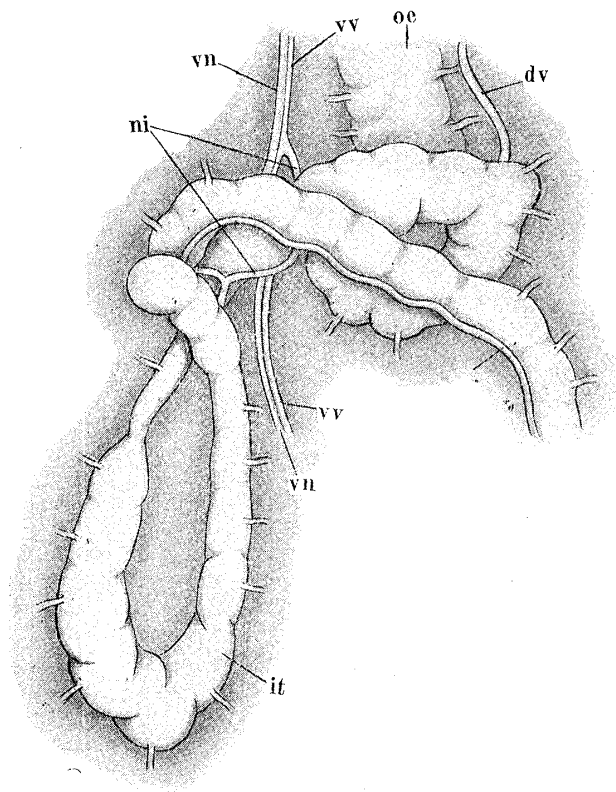


Fig. 2. - The parts surrounding the neuro-intestinal and dorsal vessels, and the communication between the ventral and neuro-intestinal vessels. Legends as in the preceding figure.

tween the organ and the body-wall. The neck portion is relatively short and narrow, measuring about 5 mm in length and 2 mm in diameter. It has an exceedingly thick muscular wall. The portion is followed by a thin-walled, elongated, swollen sack measuring ca. 5 mm in diameter in its thickest part. This portion goes insensibly into a narrower tube, ca. 35 mm in total length. As may be seen in fig. 1, the ovary runs in a diagonal direction first and turns upwards at about 20 mm from the neck. The terminal funnel is short, measuring 3 mm in length, and situated at about 7 mm from the other end of the organ. The organ in Specimen B is filled with ripe ova (fig. 1, *ou*) of uniform size, indicating that the worm is sexually mature. The ova are light yellowish in the preserved state and are relatively large, measuring 0.3 mm in diameter. In Specimen A, however, the organ is very small, measuring only 10 mm in total length. No ova were found in the organ nor in the coelomic fluid. This is probably owing to immaturity of the specimen.

The sections of the ovary show that the organ is composed of an aggregate of peritoneal cells, surrounding the ventral blood vessel (Plate 1, fig. 2, *or*). The young ova which had fallen into the coelom were found either floating in the body fluid or lying on the inner surface of the body-wall.

The paired anal glands (posterior nephridia) (textfig. 1, *ag*), occur one on each side of the terminal part of the rectum. They have dendritic appearance because of repeated branching; the ultimate branchlets are provided with numerous funnel-tubes (textfig. 3, *ft*).

A parasitic male was discovered in the oviduct of Specimen B; (Plate 1, fig. 3). It has an appearance of a nematode, being cylindrical in form and tapering towards both ends. The body presents, in the preserved state, a light yellowish colour, and is covered thickly by minute cilia (Plate 1, figs. 3 and 4, *cl*). It measures 3.5 mm in length and 0.3 mm in breadth at the broadest part. No ventral hook is present.

The cross-section in the middle region of the male exhibits a circular outline (fig. 4). The ciliated epidermal layer (*ep*) is composed of short columnar cells with spherical nuclei situated in their central parts. Beneath this layer lies a thin continuous layer of fine fibres (*ml*) which are probably of a muscular nature. Of these fibres, circular ones are the most prominent.

In the anterior body region a parenchymatous tissue occurs beneath the muscle layer. This tissue is pronouncedly basophilous (fig. 5,

cn), and is thickest on the lateral sides of the worm. This is probably a connective tissue judging from its appearance. Within this tissue are

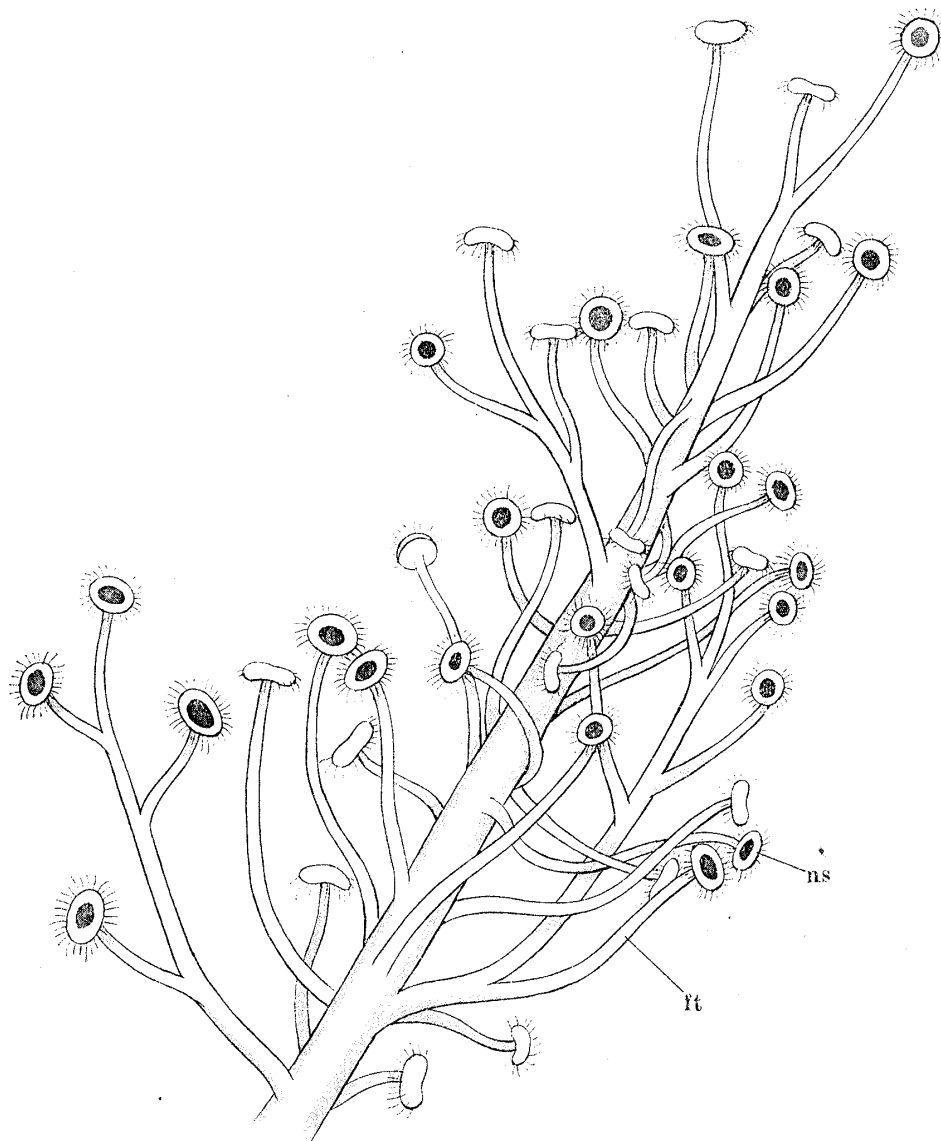


Fig. 3.—A part of the anal gland, showing the ciliated funnels. Ca. $\times 105$.
ft, funnel tube; *ns*, nephrostome.

found muscle fibres. The connective tissue disappears gradually toward the middle region of the body. In all probability this tissue corresponds to the trabecular layer of *B. miyajimai*, where it forms the greater part of the body-wall throughout the entire body-length. The innermost layer of the body-wall is formed by the peritoneum (*pl*).

There is a spacious coelom (*bc*) which contains masses of acidophilous cells. These may be called, for convenience' sake, the inner cell masses (fig. 4, *ic*). The granular bodies seen through the body-wall (fig. 3) are nothing but these inner cell masses.

The vas deferens (figs. 5 and 6, *vd*) measures about one fifth as long as the whole body and is filled up with spermatozoa (*as*). The entire canal is imbedded in the body-wall (fig. 5, *vd*), leaving only a short posterior portion free in the coelomic space (fig. 6, *vd*).

In the coelomic fluid are found sperm cells (fig. 4, *as*). These are derived from the peritoneal cells in various parts (*ps*) and also from the inner cell masses found in the coelomic space (*ps'*). In *B. miyajimai*, however, according to Ikeda, the testis is formed exclusively from the part of the peritoneum above and along the ventral nerve-cord (Ikeda, 1907, p. 140).

There is no trace of an alimentary tract. This is in contrast to all the other cases of *Bonellia*; in most cases the alimentary tract forms an elongated canal lacking both mouth and anus. In Ikeda's *B. miyajimai* and *misakiensis*, the canal is divided into a large number of vesicular sacs, hanging freely in the fluid of the body-cavity (Ikeda, 1904, p. 76, and 1907, p. 10). Thus the last stage in the degeneration of the organ seems to be represented by the present male worm where the organ has disappeared entirely.

Plate 1, fig. 2 shows ribbon-like bodies occurring near the posterior end (*rb*). They are masses of expelled spermatozoa.

Judging from what has been described above there seems no doubt that the present worms are identical with *Bonellia misakiensis* Ikeda.

The absence of the ventral hooks and the internal anatomy of the female conform especially well to the accounts in Ikeda's paper. The difference in the male which appears important, namely, the entire absence of alimentary tract in the present specimen, whereas it is represented by a number of vesicular sacs in his specimen, may possibly be attributable to an individual variation.

The entire absence of the ventral hooks is a feature very characteristic of this species, and seems to deserve a generic distinction. I thus propose the new generic name, *Pseudobonellia*, for the species.

PSEUDOBONELLIA n. g.

Diagnosis:

1. The body is swollen and the long proboscis is bifurcated at the apex.

2. There are a single anterior nephridium (oviduct) and two posterior nephridia (anal glands) provided with ciliated funnels.
3. Ventral hooks are entirely missing.
4. The male is nematode-like, without mouth and anus. Type species : *Pseudobonellia misakiensis* (Ikeda).

In conclusion I express my gratitude to Professor Dr. Taku Komai for many suggestions and also for allowing me to examine the specimens of various species of *Bonellia* in custody of the Kyoto Imperial University.

LITERATURE

- Baltzer, F. 1931 Echiuroidea in: W. Kükenthal-Th. Krumbachs Handbuch der Zoologie.
- Fischer, W. 1919 Gephyreen der Südwestküste Australiens. Zool. Anz., Bd. 50, Nr. 11/13.
- Harmer, S. F. and A. E. Shipley 1901 The Cambridge Natural History, Vol. 2.
- Ikeda, I. 1901 On the Bonellian worms of Japan (Japanese). Dôbutsugaku Zasshi, vol. 13.
- 1904 The Gephyrea of Japan. Jour. Coll. Sci. Imp. Univ., Tokyo, vol. 20, art. 4.
- 1905 Gephyreans collected by Prof. Dean at Manjuyodi, Southern Negros (Philippine Is.) Annot. Zool. Japon., vol. 5.
- 1907 On three new and remarkable species of Echiuroids. Jour. Coll. Sci. Imp. Univ., Tokyo, vol. 21, art. 8.
- 1908 a On a new Echiuroid (*Hamingia ijimai*) from the Sagami Bay. Annot. Zool. Japon., vol. 7, part 1.
- 1908 b Note on a new deep-sea Echiuroid, *Protobonellia mitsukurii*. Annot. Zool. Japon., vol. 6.
- 1924 Further notes on the Gephyrea of Japan, with descriptions of some new species from the Marshall, Caroline and Palau Islands. Japan. Jour. Zool., vol. 1, no. 2.
- Lampert, K. 1883 Über einige neue Thalassemen. Zeits. wiss. Zool., Bd. 39.
- Lanchester, W. F. 1905 a The marine fauna of Zanzibar and British East Africa, from collections made by Cyril Crossland in the years 1901-1902. Gephyrea. Proc. Zool. Soc. London, 1905, vol. 1.
- 1905 b On the Sipunculids and Echiurids collected during the "Skeat" Expedition to the Malay Peninsula. Proc. Zool. Soc. London, 1905, vol. 1.
- Sato, H. 1930 Report of the Biological Survey of Mutsu Bay. Sci. Rep. Tôhoku Imp. Univ., 4th Ser., Biol., vol. 5, no. 1.
- 1931 Report of the Biological Survey of Mutsu Bay. Sci. Rep. Tôhoku Imp. Univ., 4th Ser., Biol., vol. 6, no. 2.
- Seitz, Ph. 1907 Der Bau von *Echiurus chilensis* (*Urechis*, n. g.). Zool. Jahrb., Abt. Anat., Bd. 24.
- Selenka, E. 1885 Report on the Gephyrea. "Challenger" Report, Zool., vol. 13.
- Shipley, A. 1898 Report on the Gephyrean worms, collected by Mr. Stanley Gardiner at Rotuma and Funafuti. Proc. Zool. Soc. London, 1898, part 3.
- 1899 Notes on a collection of Gephyrean worms found at Christmas Island by Mr. C. W. Andrews. Proc. Zool. Soc. London, 1899, part 1.

- Sluiter, C. P. 1890 Die Evertebraten aus der Sammlung des königlichen naturwissenschaftlichen Vereins in niederländisch Indien in Batavia. Naturk. Tijds. Nederl. Indie, Bd. 50.
- Spengel, J. W. 1879 Beiträge zur Kenntniss der Gephyreen. Mitt. Zool. Stat. Neapel.
- 1880 Beiträge zur Kenntniss der Gephyreen II. (Die Organisation des *Echiurus pallasii*). Zeits. wiss. Zool., Bd. 34.
- 1912 Beiträge zur Kenntnis der Gephyreen III. (Zum Bau des Kopflappens der armaten Gephyreen.) Zeits. wiss. Zool., Bd. 101.
- Vejdovsky, F. 1878 Über die Eibildung und die Männchen von *Bonellia viridis*. Zeits. wiss. Zool., Bd. 30.
- Wilson, C. B. 1900 Our North-American Echiuroids. Biol. Bull., vol. 1, no. 4.

PLATE

PLATE 20

Pseudobonellia misakiensis (Ikeda)

(All figures are made from Specimen B)

- Fig. 1, The female, Specimen B. ca. $\times 1.5$.
Fig. 2, Cross-section of body-wall in the posterior region of the female.
Fig. 3, The male. ca. $\times 50$.
Fig. 4, Cross-section of the male, made at about the middle region of the body. ca. $\times 230$.
Fig. 5, Cross-section of the male in the anterior region of the body. The vas deferens is imbedded in the body-wall. ca. $\times 230$.
Fig. 6, Cross-section of the male, in the anterior region of the body.
The vas deferens is found in the coelom. ca. $\times 230$.

ABBREVIATIONS

as, aggregation of spermatozoa. *bc*, coelom. *cl*, cilia. *cm*, circular muscle layer. *cn*, connective tissue. *ct*, cutis. *ep*, epidermal layer. *gc*, ganglionic cell. *ic*, inner cell mass. *lm*, longitudinal muscle layer. *ml*, muscle layer. *om*, oblique muscle layer. *or*, ovary. *pl*, peritoneal layer. *pn*, peritoneum. *ps, ps'*, primordial sexual cell. *rb*, ribbon-like band. *vd*, vas deferens. *vn*, ventral nerve. *vv*, ventral vessel.

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PLATE 20

