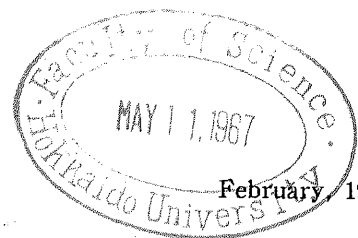




Title	The Fauna of Akkeshi Bay : XXIII. Enteropneusta (With 8 text-figures)
Author(s)	Okuda, Shiro; Yamada, Mayumi
Citation	Publications from the Akkeshi Marine Biological Station, 2-7
Issue Date	2017-12-27
Doc URL	<a href="http://hdl.handle.net/2115/68004">http://hdl.handle.net/2115/68004</a>
Type	bulletin (article)
File Information	Akkeshi_No06.pdf



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**The Fauna of Akkeshi Bay**  
**XXIII. Enteropneusta**

By

Shiro OKUDA and Mayumi YAMADA

SAPPORO, JAPAN

# The Fauna of Akkeshi Bay

## XXIII. Enteropneusta

By

Shiro OKUDA<sup>1)</sup> and Mayumi YAMADA

(Department of Zoology, Faculty of Science, Hokkaido University)

(With 8 text-figures)

The first reference to the Japanese enteropneusts is found in the work of Marion, who in 1885 described *Balanoglossus hacksi* (= *Glandiceps hacksi*) which had been taken by Hacks in Yokohama. Since the work of Marion this group has been treated by some workers, Spengel (1893, 1907), Kuwano (1902), Ikeda (1908), and van der Horst (1930), and up to the present time the following 5 species in 3 genera are recorded from Japan.

Species	Localities
1) <i>Balanoglossus misakiensis</i> Kuwano	Misaki; Tateyama
2) <i>Balanoglossus carnosus</i> (Willey)	Misaki
3) <i>Glandiceps eximius</i> Spengel	(Japan)
4) <i>Glandiceps hacksi</i> (Marion)	Yokohama; near Nagoya; Tomo (?)
5) <i>Saccoglossus sulcatus</i> Spengel	Enoshima, Sagami Bay

As is clear from above, all known enteropneusts from Japan were recorded from central Honshu and no ones were from other localities.

In summer of 1939, during a dredging survey of Akkeshi Bay, Hokkaido, a single specimen of an enteropneust was secured by Mr. T. Yamaoka. Although the specimen was considerably damaged and poorly preserved, it proved to belong to the genus *Saccoglossus* and it could not be identified with any known species of the genus from the external and internal characters.

Recently the staff of the Akkeshi Marine Biological Station collected a young *Tornaria* and a larva just metamorphosed from *Tornaria* in different plankton tow-nets in Akkeshi Bay. It has been stated the species of *Saccoglossus*, a member of Harrimaniidae, have a direct development and do not pass through a larval stage as *Tornaria*. From this view-point the *Tornaria*-larva and the metamorphosed larva from *Tornaria* collected in Akkeshi Bay are not the young stages of the enteropneust here described. Another species of the enteropneusts belonging to the Spengelidae or Ptychoderidae will probably inhabit

1) Dr. Okuda left this world in December, 1950.  
Publ. Akkeshi Mar. Biol. Stat., No. 6, 1955.

Akkeshi Bay.

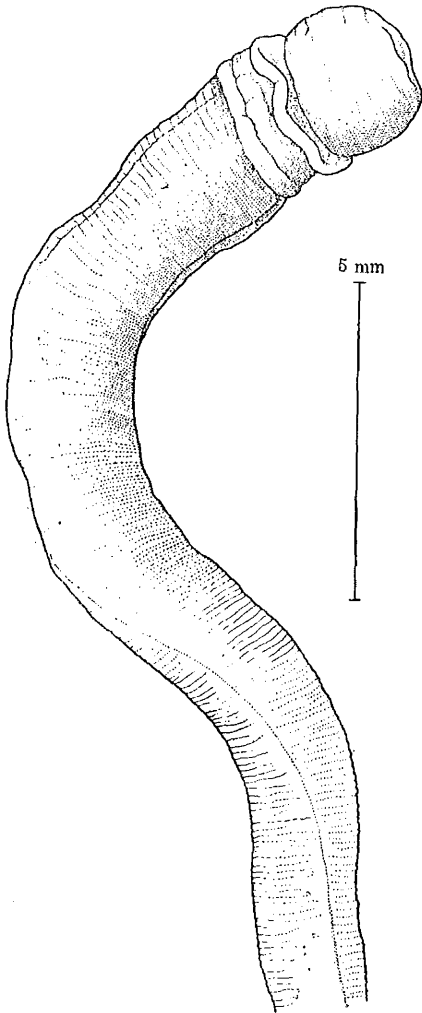
Before describing the enteropneust we wish to express our best thanks to Prof. Tohru Uchida for his kind guidance.

*Saccoglossus borealis* n. sp.

(Figs. 1-8)

External features

As is usual in species of *Saccoglossus*, the specimen is coiled but not so much degree as in other species. It is small in size and about 24



mm or more in length. The proboscis is greatly reduced in size due to its contraction and loss of the anterior lobe, and a hollow is present at the anterior end. The epidermis of the proboscis is marked with fine irregular transverse striations, but devoid of a dorsal longitudinal furrow. The proboscis neck is distinct. The collar is shorter than the proboscis. It is divided into five epidermal zones, of which the first and fifth zones are easily distinguishable. Surrounding the proboscis stalk the first zone constitutes a free edge, forming a frill with an undulated margin. The fifth zone is represented by a raised, ring-shaped band and corresponds to the posterior end of the collar. Two transverse grooves are externally marked in the collar, of which the posterior one is more distinct than the anterior one. The trunk is divided into two regions, the branchial and genital regions, but the boundary of these regions is indistinct. The abdominal region is broken off in our specimen. The branchial region is not distinctly marked off from the following genital region. The branchial region is

Fig. 1. Anterior part of *Saccoglossus borealis* n. sp.

rather short and is traversed by fine transverse striations. In this region paired gill pores are present, which are anteriorly distinct while posteriorly fade gradually. There are about 30 or more gill pores. The genital region follows on the branchial region, but gonads are also found in the branchial region. There are no external genital markings in this region and only the cross-striations are made out. There are no liver sacculations in our specimen. The dimensions of the body are as follows: proboscis 1.6–1.7 mm in length, 2.2–2.3 mm in breadth; collar 1.4–1.5 mm in length, 2.3–2.4 mm in breadth; branchial region about 5 mm in length, about 2 mm in breadth; genital region about 16 mm in length.

### Internal anatomy

*Proboscis*: In cross-section the epidermis shows narrow furrows which correspond to the fine longitudinal striations seen externally. The epidermis is rather thick and of uniform thickness, and consists of an

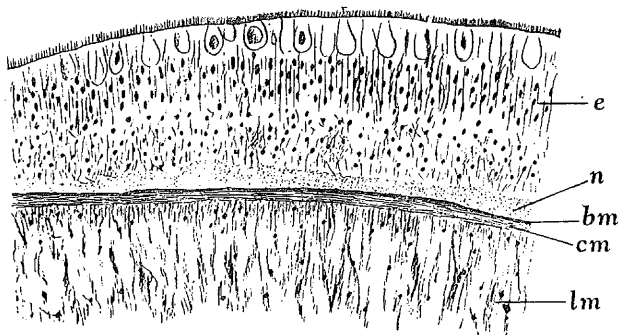


Fig. 2. Cross section of a part of proboscis.  $\times 200$ . bm. Basement membrane; cm. Circular muscle layer; e. Epidermis; lm. Longitudinal muscle layer; n. Nervous layer.

outer layer of elongated epithelial cells intermingled with many glandular cells which are arranged in peripheral part of the epidermis between the ordinary epithelial cells, and of an inner nervous layer. The nuclei of the epidermal cells are oval in shape and scattered in the middle of the layer of epidermal cells. Besides these oval nuclei round ones are present in the basal part of the epidermis outside the nervous layer, which are the nuclei of the nerve cells. The basement membrane is distinct. The circular and longitudinal muscle layers are well developed. The circular muscle layer is found underneath the basement membrane of the epidermis. It is of rather uniform thickness and about half as thick as the nervous layer. The longitudinal muscle fibers are not ar-

ranged in distinct ring layers but form radially arranged bundles. The proboscis cavity is rather wide, extending beyond the anterior end of the proboscis organs. The pericardium reaches as far anteriorly as the stomochord. The anterior part of the pericardium, not divided into pouches nor split up into outgrowths, shows a tendency to surround the stomochord, while posteriorly it grows more spacious and is displayed

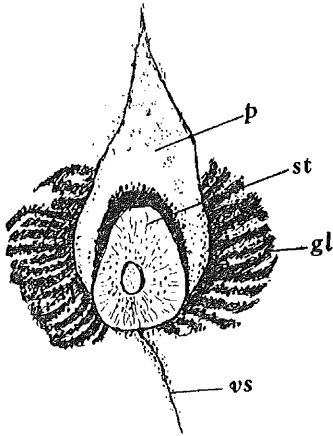


Fig. 3. Cross section of frontal part of proboscis organs.  $\times 80$ . gl. Glomerulus; p. Pericardium; st. Stomochord; vs. Ventral proboscis septum.

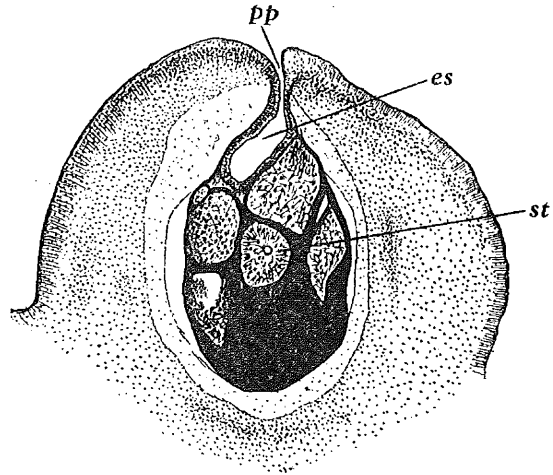


Fig. 4. Cross section of proboscis neck.  $\times 90$ . es. End-sac; pp. Proboscis pore; st. Stomochord.

dorsally. The central blood sinus lies between the pericardium and the stomochord. The glomerulus covers and surrounds the anterior parts of both the pericardium and the stomochord. It is well developed and stretches on the lateral side of the stomochord, but not extend towards the ventral side. The stomochord is not more or less curved or hooked at the anterior end. It is straight, gradually tapers anteriorly, and has a continuous lumen to its anterior end. The anterior end of the stomochord extends just behind the level of the anterior limit of the glomerulus. The ventral septum is rather long, its anterior free edge being found at the level a little behind the top of the stomochord. It stretches to the end of the ventral coelomic pouch, so that there is no inter-communication at their caudal end. Single proboscis pore is situated on the left side. The end-sac is rather small. The nuchal skeleton consists for the greater part of a blunt keel with two pairs of lateral projections. The chondroid tissue is not well developed.

*Collar*: The dorsal and ventral septa are complete and separate the collar coelom into the right and left coelomic cavities. The anterior

part of the collar coelom is densely filled with connective tissue in which many longitudinal muscle fibers are embedded. As is seen in other species of Harrimaniidae, a tuft of longitudinal muscle fibers is attached to the base of each of two crura of the skeleton, and these spread laterally fan-like into two collar coeloms. This fan of muscle fibers is rather small at the anterior part but is thicker and wider at the posterior part. The periaemal cavities are well developed. In the anterior part of the periaemal cavities no trace of a separation between them

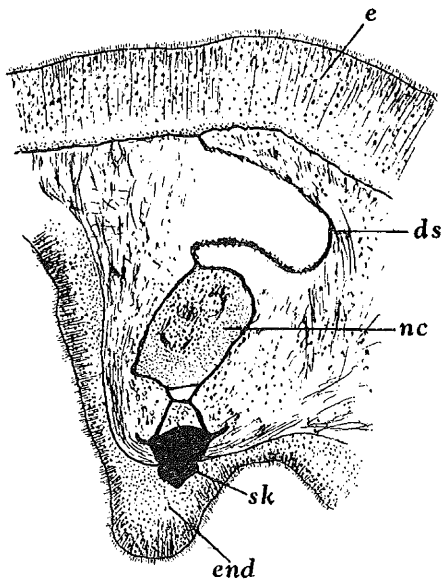


Fig. 5. Dorso-medial portion of a cross section of collar.  $\times 60$ . ds. Dorsal septum; e. Epidermis; end. Wall of mouth cavity; nc. Nerve cord; sk. Skeleton.

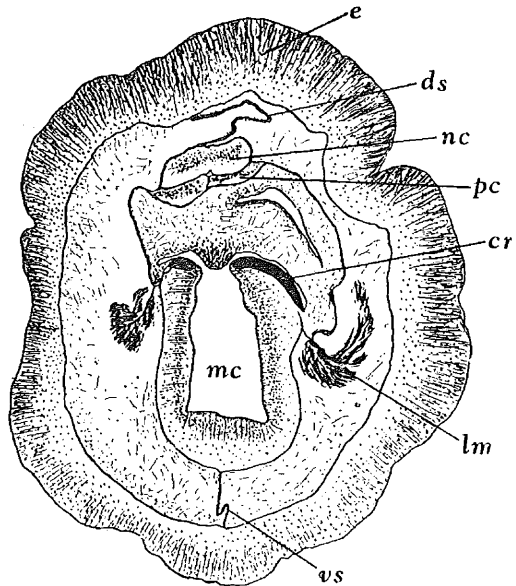


Fig. 6. Cross section of collar slightly caudal to that of Fig. 5.  $\times 40$ . cr. Cruron; ds. Dorsal septum; e. Epidermis; lm. Longitudinal muscle; mc. Mouth cavity; nc. Nerve cord; pc. Periaemal cavity; vs. Ventral septum.

can be found. In their posterior part there exists a complete partition between them. The periaemal cavities are never separated from each other, so they are always bordered with each other. Throughout their entire length these are narrower than the nerve cord. There are no peripharyngeal cavities. The dorsal nerve cord is solid, devoid of cavities. It is connected with the epidermis by the dorsal septum, but there are no neural crests nor dorsal nerve roots. The mouth cavity is rather large. The two collar pores are present dorso-laterally.

*Trunk*: The branchial region is rather short. In cross-section it is nearly circular. The epidermis of the trunk is thinner than that of the

collar, though it is still fairly thick at the anterior part. There are long and narrow epidermal cells, between which a number of glandular cells are present in the periphery. The epidermal nerve-layer of the trunk is rather thin, while the ventral nerve cord which is a triangular thickening of this layer lying in the mid-ventral part, is very thick especially in the posterior region. The external circular muscle layer is hardly visible. The longitudinal muscle fibers are well-developed in the

branchial region on the ventral than on the dorsal side. These form two large muscular bands, which lie ventro-laterally to the pharynx and are attached to the

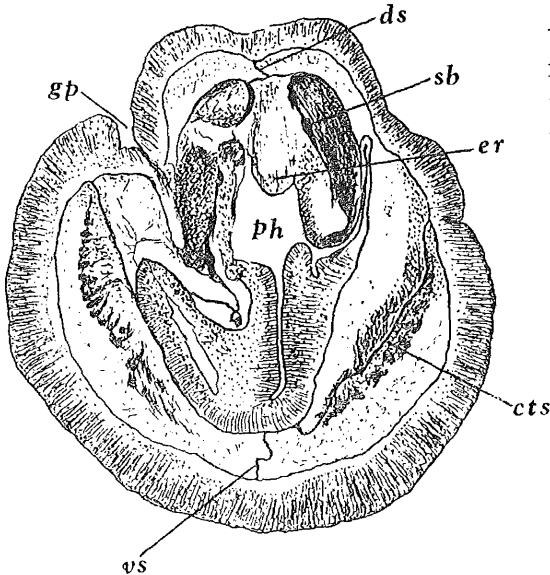


Fig. 7. Cross section of anterior part of branchial region.  $\times 40$ . cts. Collar-trunk septum; ds. Dorsal septum; er. Epibranchial ridge; gp. Gill pore; ph. Pharynx; sb. Septal bar of skeleton; vs. Ventral septum.

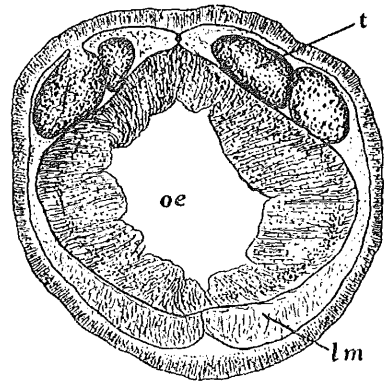


Fig. 8. Cross section of genital region.  $\times 30$ . lm. Longitudinal muscle; oe. Oesophagus; t. Testis.

collar-trunk septum. The epibranchial ridge is on the mid-dorsal line, and rather large. It is triangular in cross-section, with a concave surface. It consists of only one kind of epithelial cell which is long and fairly wide, and is continuous on either side with the dorsal ends of the branchial skeleton. There is no trace of limiting ridge between the upper and lower parts of the pharynx. The lumen of the ventral parts of the pharynx is reduced to a very narrow slit in levels almost of whole the branchial region. Behind the branchial region the oesophagus begins and the lumen of the oesophagus becomes very narrower posteriorly. The wall of the oesophagus in this region is very thick. We can not ascertain the feature of the intestinal pores. The dorsal septum is complete throughout the entire length of the trunk. As the ventral septum is present only at the anterior part of the trunk,



the ventral epidermis is directly attached to the wall of the oesophagus at the posterior part. There are about 30 or more gill pores. As stated above the genital region shows no external genital markings. It overlaps the branchial region. The present specimen is male. The testis is found at the level of the fourth gill slit and the opening of the first genital pore occurs at the level of the fifth gill pore. The testes form rather large and somewhat lobed sacs, not simple ones. Each testis is covered with a thin basement membrane and filled with many spermatoocytes in the present specimen. There are no hepatic sacculations.

*Remarks:* From consulting the descriptions of previous authors it appears that the present specimen is referable to a new species of the genus *Saccoglossus*, despite of its incomplete condition. This species seems to be related to *Saccoglossus pusillus* (Ritter) from the Californian coast. It can be distinguishable from the latter by some inner features. Though *Saccoglossus sulcatus* Spengel has been recorded by Spengel (1893) from Enoshima, Sagami Bay, as described above, his description is very brief and we are now impossible to realize the species. van der Horst (1934) reported from the Okhotsk Sea *Saccoglossus mereschkowskii* (Wagner), from which we can easily distinguish the present species especially in small number of gill slits.

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