

The Morphology of the Skeletal Element of *Saccoglossus mereschkowskii* (Hemichordata, Enteropneusta)¹

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Enteropneusta is one of two classes constituting the phylum Hemichordata, whose representatives are bottom burrowers of marine sediments. Hemichordates have some features that allow them to be considered a group closely related to ancestors of Chordata [1–3, 5]. One of such features is the development of skeletal formations from connective tissue. Among these structures are the gill skeleton and the unpaired skeletal element of the stalk connecting the collar and the proboscis. The morphology of the unpaired skeletal element of relatively few species has been studied [4, 7]. This work

deals with the structure of the skeletal element of *Saccoglossus mereschkowskii* Wagner, 1885.

In this study, we used specimens collected in the vicinity of the White Sea Biological Station of the Moscow State University (Kandalakshsky Bay of the White Sea) at a depth of 5–10 m on a muddy bottom. The animals were fixed in Bouin's fluid and then placed into 70% ethanol, where they were kept until the histological processing. The standard method was used for microscopical anatomy study, including dehydration in alcohols, embedding into paraplast, and making slices 7 µm thick. The slices were stained with haematoxylin.

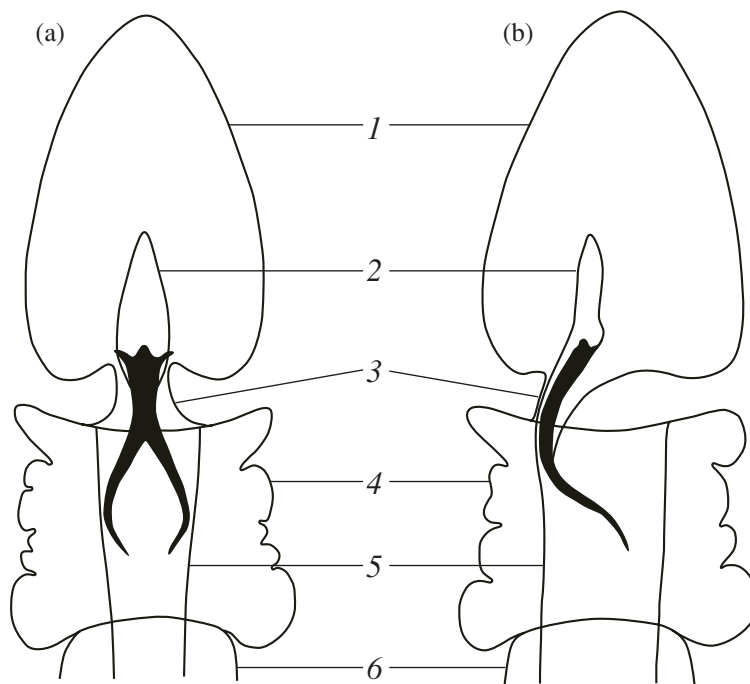


Fig. 1. Location of the skeletal element of the stalk of *S. mereschkowskii*. (a) The ventral view; (b) the lateral view. Designations: 1, proboscis; 2, stomochord; 3, stalk; 4, collar; 5, digestive tube; 6, trunk. The skeletal element is shaded.

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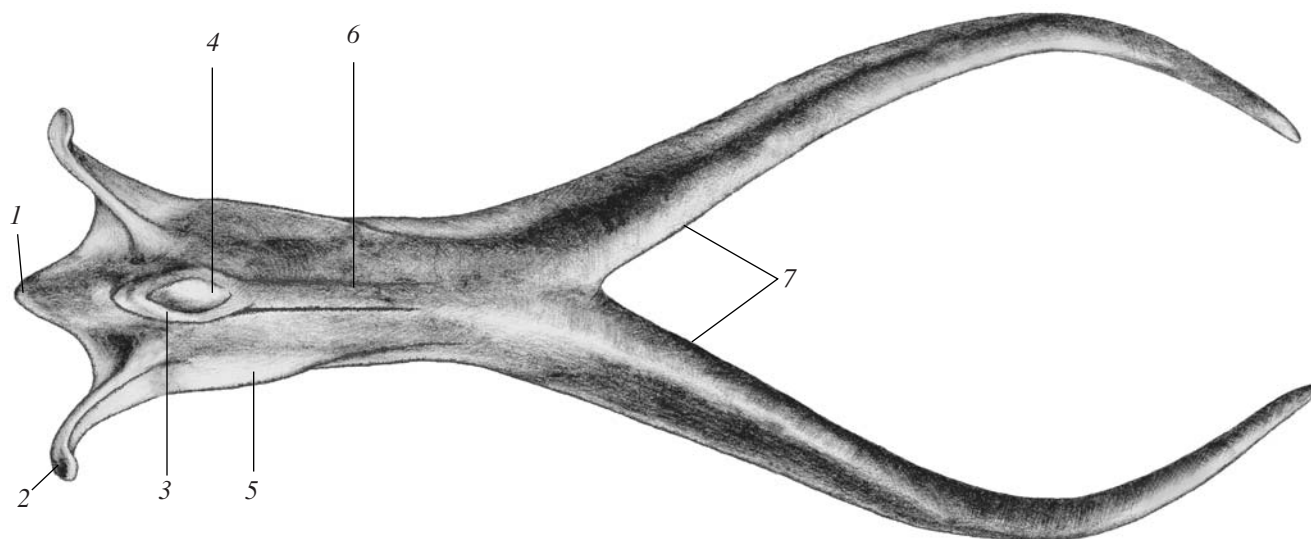


Fig. 2. The skeletal element of the stalk of *S. mereschkowskii*. The ventral view. Designations: 1, rostrum; 2, supporting saucer; 3, bordering ridge; 4, central fossa; 5, lateral wing; 6, ventral keel; 7, paired posterior horns.

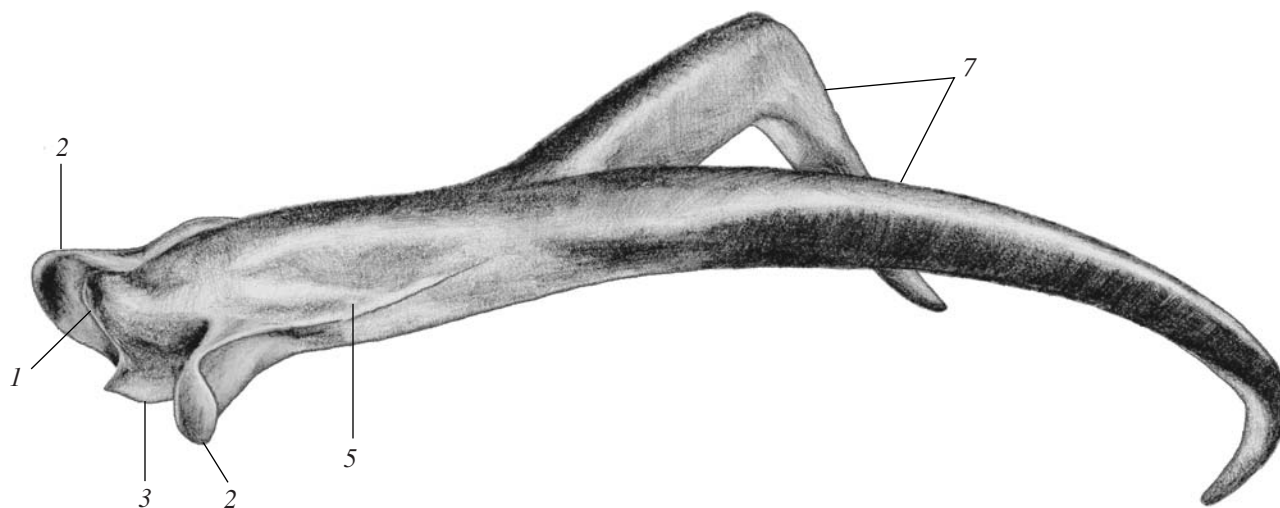


Fig. 3. The skeletal element of the stalk of *S. mereschkowskii*. The lateral view. Designations are the same as in Fig. 2.

The skeletal element is a Y-shaped organ located in the stalk connecting the collar and proboscis divisions (Fig. 1). By nature, the skeletal element is an overgrowth of acellular substance of the basal plate separated endodermal epithelia of the pharynx and the stomochord, as well as endodermal stomochord epithelium and ectodermal proboscis epithelium. The skeletal element consists of an unpaired plate directed forward to the proboscis and paired horns extended rearward to the collar department on each side of the digestive tube. The length of the skeletal structure is, on average, 1.2 mm, the horns accounting for 0.7 mm, i.e., approximately 55% of the entire length of the skeletal element.

The anterior part of the unpaired plate is a conical rostrum with symmetrical supporting saucers on each side (Figs. 2, 3). The rostrum rests on the stomochord tissue on the ventral side, and supporting saucers spread under the lateral invaginations of proboscis epidermis. At the saucer base level, there is a central fossa on the ventral side of the skeletal element. The fossa is bordered by a ridge on each side (Fig. 2). There are lateral wings on either side of the skeletal element, which extend from the saucer base to the most narrow region of the unpaired plate. A ventral keel passes along the median line of the ventral surface from the posterior margin of the central fossa (Fig. 2). The dorsal surface,

prominent in the transverse section, lacks any relief modifications.

At the level of the anterior collar region, the skeletal element divides into paired horns. The posterior horn tips are located in the very middle of the collar (Fig. 1). The horns are bent symmetrical processes tapering from the base to the posterior end (Figs. 2, 3). The horns are flattened laterally in the transverse section.

Judging from the published data, the skeletal element of Enteropneusta is organized according to a common scheme. In all examined species, it consists of an unpaired anterior plate and paired posterior horns [6, 7]. Among the common characteristic features is the ventral keel, which is present, besides *Saccoglossus*, in *Balanoglossus* [6] and *Schizocardium* [6]. All studied species have the lateral wings to a greater or lesser extent. The anterior region of the unpaired plate forms symmetrical supporting saucers, although their shape considerably varies even in closely related species. The rostrum in the form of a short tubercle is distinct in almost all species except *Saccoglossus kowalevskii* [6]. The shape of the unpaired plate substantially varies in specimens of different genera of Enteropneusta. For example, species of *Balanoglossus* have a rectangle unpaired plate [6]. In *Schizocardium*, the unpaired plate tapers in the anterior direction, i.e., to the saucer base [6]. In *Saccoglossus caraibicus* [7] and *S. mereschkowskii*, the unpaired plate looks like a rod. On the

other hand, in *S. kowalevskii*, the unpaired plate has the shape of a triangle widening anteriorly [6]. The horns are typically bent outgrowths, tapering posteriorly. Conversely, in *Balanoglossus* it widens toward the posterior end [6].

The observed variation of the skeletal element organization allows us to expect that the morphology of this organ will be important for the classification of Enteropneusta and diagnosis of individual species.

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