

## Descriptions of *Pedinosoma curtum* Reibisch from North-West Pacific and a late larva of *Pedinosoma polaris* sp. nov. from the Arctic Basin (Polychaeta: Phyllodocida: Lopadorhynchidae)

### Описание *Pedinosoma curtum* Reibisch из северо-западной части Тихого океана и поздней личинки *Pedinosoma polaris* sp. nov. из Арктического бассейна (Polychaeta: Phyllodocida: Lopadorhynchidae)

G.N. BUZHINSKAJA

Г.Н. БУЖИНСКАЯ

G.N. Buzhinskaja, Zoological Institute, Russian Academy of Sciences, 1 Universitetskaya Emb., St Petersburg 199034, Russia. E-mail: polychaeta@zin.ru

A specimen of the pelagic polychaete *Pedinosoma curtum* Reibisch (Lopadorhynchidae) is described from the North-West Pacific. It differs from the Atlantic specimens of the species in longer aciculae, larger antennae as compared with palps and pigmentation of the dorsal cirri. A late larva of *Pedinosoma polaris* sp. nov. is described from plankton of the Arctic Basin (depth 2000–1000 m). The distinctive characters of the new species are: podial lobes, aciculae and compound chaetae present on the tentacular segment, the absence of cirrophores of the tentacular and ventral podial cirri, the podial cirri arranged on the podial process, and a well-developed pygidium bearing anal cirri. An additional diagnosis of the genus *Pedinosoma* Reibisch is provided.

Приводится описание экземпляра *Pedinosoma curtum* Reibisch (Lopadorhynchidae) из северо-западной части Тихого океана. Он отличается от атлантических особей вида более длинными ацикулами, более крупными антеннами по сравнению с пальпами и наличием пигментации на спинных усиках. Описана поздняя личинка *Pedinosoma polaris* sp. nov. из планктона Арктического бассейна (глубина лова 2000–1000 м). Новый вид характеризуется наличием подиальных бугорков, ацикул и сложных щетинок на тентакулярном сегменте, расположением подиальных усиков на подиальном выросте, отсутствием циррофоров у тентакулярных и брюшных параподиальных усиков и хорошо развитым пигидием с анальными усиками. Дополнен диагноз рода *Pedinosoma* Reibisch.

**Key words:** pelagic polychaetes, North-West Pacific, Arctic Basin, Lopadorhynchidae, *Pedinosoma curtum*, larva of *Pedinosoma*, new species

**Ключевые слова:** пелагические полихеты, северо-запад Тихого океана, Арктический бассейн, Lopadorhynchidae, *Pedinosoma curtum*, личинка *Pedinosoma*, новый вид

## INTRODUCTION

Lopadorhynchids are entirely planktonic small flattened worms, basically similar to Phyllodocidae. They were first described as a tribe of pelagic phyllodocids in the family Phyllodocidae (Claparède, 1870). Some authors considered lopadorhynchids as a subfamily within Phyllodocidae (Reibisch,

1895; Fauvel, 1959; Tebble, 1962; Day, 1967; Uschakov, 1972) and others, as a family within the order Phyllodocida (Hartman, 1959; Fauchald, 1977; Pleijel & Dales, 1991; Rouse & Fauchald, 1997; Rouse & Pleijel, 2001).

Lopadorhynchids comprise four genera: *Lopadorhynchus* Grube, *Pelagobia* Greef, *Maupasia* Viguier and *Pedinosoma* Reibisch.

It was suggested that lopadorhynchids originated from benthic phyllodocids and that their genera might have different origins (Uschakov, 1972; Rouse, Pleijel, 2001). The genus *Lopadorhynchus* closely resembles the bottom-living genus *Chaetoparia* in some characters, while *Pelagobia* and *Maupasia* originate from the benthic genus *Eteone* (Bergström, 1914; Uschakov, 1972). The systematic position of the genus *Pedinosoma* is not clear, because the structure of its anterior segments was differently interpreted by various authors (Uschakov, 1972).

The genus *Pedinosoma* has been considered monotypic so far. Its only species *P. curtum* Reibisch, 1895 was described in detail from warm waters of the Atlantic. The subsequent descriptions were rather short and did not add anything to the original description (Lo Bianco, 1904; Fauvel, 1923; Tebble, 1962; Day, 1967). There were differences mainly in the pictures of the parapodia. The pygidium of the species was not described. *P. curtum* occurs in subtropical and tropical zones of the Atlantic Ocean, in the Mediterranean Sea and in the South-West of the Indian Ocean. The species is rarely recorded in the Pacific Ocean. Some specimens were found in subtropical zone of the North-East Pacific (Tebble, 1962). One specimen of *P. curtum* was recorded from boreal zone of the North-East Pacific (Berkeley & Berkeley, 1960). A single specimen was also found in the North-West Pacific (Uschakov, 1972), but the description and figures in the cited work were borrowed from Tebble (1962). The specimen is described here and kept in the collection of the Zoological Institute, Russian Academy of Sciences (ZIN RAS).

Larval development was described for two species of *Lopadorhynchus* (Kleinenberg, 1886; Åkesson, 1967) and for *Pelagobia longicirrata* (Reibisch, 1895; Yingst, 1974). M. Böggemann (2009) published a drawing of the two-segmented larva of *Pelagobia* from the South-East Atlantic without a description. Larvae of *Maupasia* and *Pedinosoma* are unknown. Only the young

stage of *Pedinosoma curtum* with six segments is known (Reibisch, 1895).

A late polychaete larva of the family Lopadorhynchidae was found in one of the plankton samples collected during a cruise of R/V "Polarstern" in 1995 in the Arctic Basin at depths of 2000–1000 m over the depth 3566 m. The larva is described here as a new species. The emended diagnosis of the genus *Pedinosoma* is provided. The holotype of the new species is also deposited in the collection of ZIN RAS.

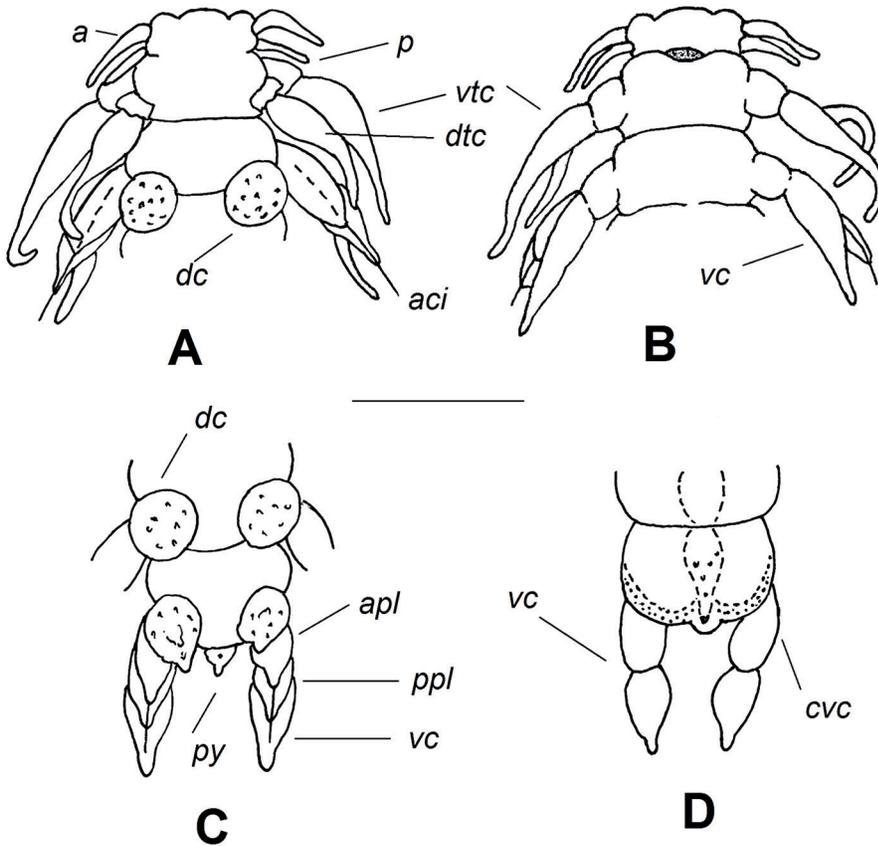
*Remark.* Many authors consider both pairs of prostomial tentacles of Phyllodocidae and Lopadorhynchidae to be antennae (Reibisch, 1895; Bergström, 1914; Fauvel, 1923; Uschakov, 1972; Fauchald, 1977). But Orrhage & Eibye-Jacobsen (1998) re-investigated the anatomy of the central nervous system of Phyllodocidae and concluded that the so-called ventrolateral antennae of phyllodocids are homologous with the palps of other polychaetes. Following Rouse & Pleijel (2001) and by analogy with phyllodocids, the "ventrolateral antennae" of lopadorhynchids are regarded here as palps.

## RESULTS

Family **Lopadorhynchidae** Claparède, 1870

Genus ***Pedinosoma*** Reibisch, 1895

*Diagnosis.* Prostomium very short, fused partly or completely with first segment. One pair of antennae and one pair of palps situated at sides of prostomium. Eyes absent. Pharynx without papillae. First segment with two pairs of tentacular cirri. Podial lobe and chaetae present or absent at base of tentacular cirri. Parapodia of subsequent segments uniramous, with dorsal and ventral cirri: dorsal cirri rounded; ventral cirri rounded or elongated, with or without cirrophores. All chaetae fine, compound (heterogomph spinigers), with elongate and slender distal part. Anal cirri present or absent. Body short, consisting of 7–9 segments. Small pelagic species.



**Fig. 1.** *Pedinosoma curtum* Reibisch. **A, B**, anterior part of body (**A**, dorsal view; **B**, ventral view); **C, D**, posterior part of body (**C**, dorsal view; **D**, ventral view). Chaetae omitted. Abbreviations: *a*, antenna; *aci*, acicula; *apl*, anterior (presetal) podial lobe; *cvc*, cirrophore of ventral cirrus; *dc*, dorsal podial cirrus; *dtc*, dorsal tentacular cirrus; *p*, palp; *ppl*, posterior (postsetal) podial lobe; *py*, pygidium; *vc*, ventral podial cirrus; *vtc*, ventral tentacular cirrus. Scale bar: 0.4 mm.

**Comparison.** The genus *Pedinosoma* is closely related to *Pelagobia* and *Maupasia*. But, unlike *Pedinosoma*, *Pelagobia* has no dorsal cirri on the second body segment, and *Maupasia* has a pair of tentacular cirri on this segment.

***Pedinosoma curtum*** Reibisch, 1895  
(Fig. 1)

Reibisch, 1895: 27–30; Taf.2, Fig. 17; Taf.3, Fig. 1–4.

**Material studied.** ZIN RAS № 1/17067, one specimen, **North-West Pacific**, Kuro Shio

Current, 31°N, 155°E, 20 February 1967, R/V “Yu.M. Shokalskyi”.

**Description.** Body broad and flattened, consisting of nine segments. Length of body 2.1 mm, width 0.4 mm without parapodia and 0.9 mm including parapodia. Prostomium broad, very short, dorsally fused with first visible segment (Fig. 1 A, B). One pair of antennae and one pair of palps arranged on sides of prostomium. Antennae and palps tapered, antennae somewhat larger than palps. Eyes absent. Proboscis retracted, not observed. Nuchal organs invisible, as typical of fixed specimens. First visible segment

large, with two pairs of elongated tapered tentacular cirri with cirrophores. Dorsal tentacular cirri with short cirrophores, ventral tentacular cirri longer, with elongated cylindrical powerful cirrophores (Fig. 1 A, B). Tentacular segment without chaetae. Parapodia uniramous, bilobate: anterior lobes oval and slightly pointed; posterior lobes lanceolate, longer than anterior ones. Aciculae long, longer than posterior podial lobes. Dorsal and ventral cirri situated at base of chaetigerous process. Dorsal cirri round to oval, flattened (Fig. 1 A, C). Ventral cirri skittle-shaped, long with pointed ends, longer than posterior podial lobes, with cylindrical cirrophores (Fig. 1 B, D). Ventral cirri of last segment with powerful and long cirrophores, directed backwards (Fig. 1 D). Fifteen–eighteen long chaetae in each parapodium. Distal parts of chaetae long, thin and smooth. Pygidium without anal cirri, small (Fig. 1 C). Body opaque, light brown; small brown spots on dorsal cirri and on border of ventral side of last segment.

**Remarks.** *Pedinosoma curtum* usually has seven–nine segments (Lo Bianco, 1904; Tebble, 1962; Day, 1967; Uschakov, 1972). A mature female with eggs from the Pacific Ocean had nine segments (eight chaetigers) and was 3 mm long (Tebble, 1962). Reibisch (1895) mentioned 10–12 segments for this species, although in the original figure only nine segments were shown.

**Comparison.** The specimen of *P. curtum* from the North-West Pacific is most similar to the original description of the type specimens from the Atlantic Ocean (Reibisch, 1895) and differs from them in somewhat larger antennae as compared to palps, longer aciculae which are longer than the posterior parapodial lobes, and pigmentation of the dorsal cirri. In the original description, the antennae and palps are equal in length. At the posterior end of the specimen from the North-West Pacific, there is a small anal lobe which was not described by Reibisch (1895). The parapodium of the specimen from the Sargasso Sea depicted by Bergström (1914)

has too short an acicula and an indistinct cirrophore. A short acicula was also depicted by Day (1967), and his figure of the whole worm did not show the anal lobe.

Drawings of *P. curtum* from the North-East Pacific (Tebble, 1962) differ from our specimen and from the original pictures of the type specimens (Reibisch, 1895) in the absence of cirrophores and in the antennae being somewhat shorter than the palps. But the specimens from the Pacific, unlike those from the Atlantic and Indian Oceans, have long aciculae and pigmentation on the dorsal cirri.

### *Pedinosoma polaris* sp. nov.

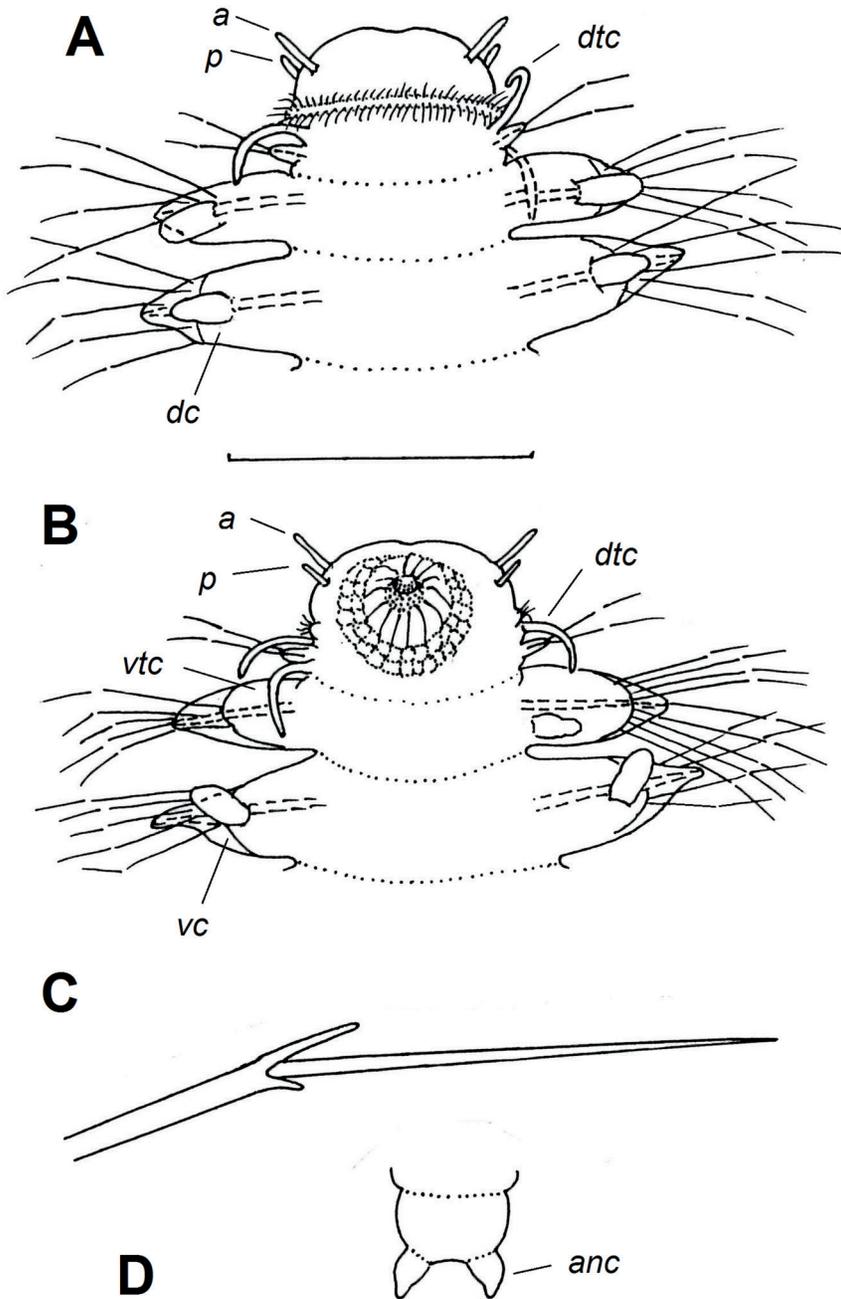
(Figs 2–4)

**Holotype.** ZIN RAS № 1/50615, late larva, Arctic Basin, 80°55.6'N 122°39.8'E, depth 2000–1000 m over depth 3566 m, multinet, 4 September 1995, R/V “Polarstern”, coll. K.N. Kosobokova.

**Description.** Body with nine segments. Length of body 0.73 mm. Prostomium short, broad, with a pair of antennae and a pair of palps (Fig. 3 A, B). Both pairs similar in shape, but palps shorter. Eyes absent. Prototroch with two rows of cilia, preserved as dorsal semi-circle. First visible segment



**Fig. 2.** *Pedinosoma polaris* sp. nov., holotype: habitus, ventral side (light microscope).



**Fig. 3.** *Pedinosoma polaris* sp. nov., holotype. **A, B**, anterior part of body (**A**, dorsal view; **B**, ventral view); **C**, chaeta; **D**, pygidium. Abbreviations: *a*, antenna; *anc*, anal cirrus; *dc*, dorsal podial cirrus; *dtc*, dorsal tentacular cirrus; *p*, palp; *vc*, ventral podial cirrus; *vtc*, ventral tentacular cirrus. Scale bar: 0.4 mm.

completely fused with prostomium on both dorsal and ventral sides, with two pairs of thin elongated tentacular cirri shorter than body width. Small podial lobe with acicula and two compound chaetae present at base of each pair of tentacular cirri. Subsequent body segments with uniramous parapodia. Podial processes elongated, bilabiate (Fig. 3, 4). Anterior podial labium short, oval; posterior one conical, longer than anterior labium. Dorsal and ventral cirri arranged on parapodial process, uniform in shape, oval. Aciculae long, reaching end of posterior labium. Chaetae thin, very long; up to 16 chaetae in parapodium (Fig. 3 C, 4). Parapodium with chaetae 2.3 times as long as body width. Parapodia of posterior segments directed backwards (Fig. 2, 3). Pygidium well developed, with two short anal cirri; anus on ventral side (Fig. 3 D). Larva opaque, lecithotrophic.

**Comparison.** The structure of the anterior segments, cephalic lobe, parapodia and chaetae of the larva is characteristic of the genus *Pedinosoma*: a short body, a short and broad prostomium with four cephalic tentacles, the first visible segment fused with the prostomium, two pairs of tentacular cirri on the first segment, all parapodia uniramous with dorsal and ventral cirri, all chaetae compound. Moreover, the larva of the new species resembles *P. curtum* in the absence of the eyes, the shape of the chaetigerous lobes and in the structure of the chaetae. The distinctive characters of the larva are: the presence of podial lobes with aciculae and compound chaetae on the first segment, the structure of tentacular and ventral podial cirri (which have cirrophores in *P. curtum*), the presence of a well-developed pygidium with anal cirri, and the arrangement of podial cirri on the podial process. Besides, according to Reibisch (1895), the six-segmented juvenile of *P. curtum* did not differ from the adult, which was why he supposed that the species had direct development.

Larvae of *Lopadorhynchus*, described for the species *L. brevis* (Grube) and *L. krohnii* (Claparède), have more than 10 segments

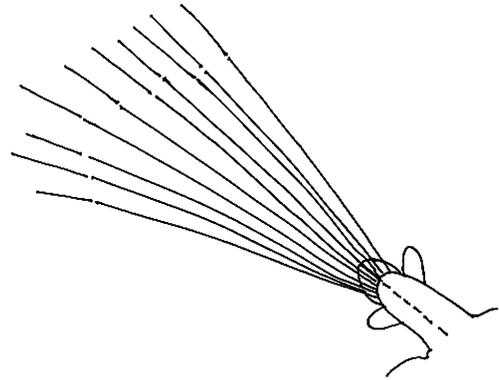


Fig. 4. *Pedinosoma polaris* sp. nov., holotype: parapodium.

already at the metatrochophore stage (Kleinenberg, 1886). The parapodia of the first segments in *Lopadorhynchus* nectochaetes are poorly developed. Only the arrangement of the podial cirri of *Pedinosoma polaris* is similar to that in the nectochaete of *L. krohnii*.

The larvae of *Pelagobia longicirrata* from Humboldt Stream, unlike the larva of *Pedinosoma polaris*, have no ciliary rings, are completely covered with cilia and possess a pair of eyes (Reibisch, 1895). Already at the seven-segmented stage, the specimens of *P. longicirrata* have the habitus of adult animals and long, fingerlike tentacular and podial cirri (Reibisch, 1895; Yingst, 1974). The nine-segmented young worms do not differ from the adults and, unlike the larva of *Pedinosoma*, have no dorsal cirri on the second segment (Reibisch, 1895; Yingst, 1974).

In outward appearance, the larva of *Pedinosoma polaris* resembles the seven- or eight-segmented nectochaetes of the phyllocid *Eteone longa* (Fabricius, 1780) (Thorson, 1946, fig. 26 B, E; Rasmussen, 1956, fig. 12; Sveshnikov, 1978, fig. 4, D). But, unlike in the larva of *Pedinosoma* and the adult of *Pedinosoma curtum*, the tentacular segment of the nectochaete and adult in *E. longa* is not fused with the prostomium while the dorsal cirri on the second segment are absent. Besides, nectochaetes of *E. longa*

differ from those of *Pedinosoma polaris* in the structure of parapodia and chaetae.

*Etymology.* The species name means “polar”.

## DISCUSSION

According to Fauvel (1923), the cephalic lobe of *Pedinosoma* is fused only with the first segment which bears two pairs of tentacular cirri. In the opinion of Bergström (1914), the cephalic lobe is fused with the first two segments; each of these segments having one pair of tentacular cirri. Among the benthic Phyllodocidae, only the genus *Eteone* also has two pairs of tentacular cirri on the first segment. Pleijel (1991) and Eibye-Jacobsen (1993) supposed that the first visible segment of *Eteone* is homologous with the second segment of other phyllodocids, and the first segment has been reduced in *Eteone*. Investigation of the central nervous system of Phyllodocidae confirmed the homology between the tentacular cirri of *Eteone* and the second and third pairs of tentacular cirri of other phyllodocid genera, and also the reduction of the first pair in *Eteone* (Orrhage & Eibye-Jacobsen, 1998). By analogy with *Eteone*, it is most likely that the first segment in the lopadorhynchid genera *Pelagobia*, *Maupasias* and *Pedinosoma* has been reduced and the first visible segment of these genera corresponds to the second segment of phyllodocids. It should be also noted that *Pelagobia*, *Maupasias* and the larva of *Pedinosoma polaris* have chaetae at the base of tentacular cirri of the first visible segment, while chaetae are present only on the second segment of adults or larvae of phyllodocids.

The presence or absence of chaetae at the base of the tentacular cirri is a generic character in the Lopadorhynchidae (Day, 1967; Uschakov, 1972; Fauchald, 1977). Nevertheless, the degree of reduction and fusion of the anterior segments is much more important for the definition of genera. Therefore, the described larva is considered here merely as a new species.

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