Fossil impression of a nephtyid polychaete (Polychaeta: Nephtyidae) in the Miocene sediments of Sakhalin (NW Pacific)

Фоссильный отпечаток нефтииды (Polycheta: Nephtyidae) в миоценовых отложениях Сахалина (С.-З. Пацифика)

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Abstract. During the expedition of the Zoological Institute of the Russian Academy of Sciences (ZIN RAS) in 1998, a fossil impression of a polychaete worm belonging to the family Nephtyidae Grube, 1850, containing fragments of jaws, was found in the west of Sakhalin. The find is dated to the Middle and Upper Miocene. There are no published records of any finds of fossil nephtyids in the area. Based on the analysis of the jaw shape, it is concluded that the nephtyid impression may belong to the genus Nephtys Cuvier 1817 or the genus Aglaophamus Kinberg, 1865.

Резюме. Ископаемый отпечаток полихеты, принадлежащий к семейству Nephtyidae Grube, 1850 и содержащий фрагменты челюстей, найден во время экспедиции Зоологического института РАН в 1998 г. на западе Сахалина. Нахodka датирована средним и верхним Мiocеном. Упоминания в литературе о каких-либо находках ископаемых нефтиид в обозначенном районе отсутствуют. На основании анализа формы челюстей сделан вывод, что отпечаток нефтииды принадлежит к роду Nephtys, Cuvier 1817 или к роду Aglaophamus Kinberg, 1865.

Key words: fossil impression, Miocene sediments, West Sakhalin, nephtyid jaws, Nephtyidae

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During the expedition of the Zoological Institute of the Russian Academy of Sciences (ZIN RAS) in 1998, a fossil impression of a polychaete worm belonging to the family Nephtyidae Grube, 1850, containing fragments of jaws, was found by M.V. Nazarkin in the west of Sakhalin. The find is dated to the Middle and Upper Miocene: the layers of Cape Markevich or the Agnevskaya Formation (Fotianova & Serova, 1987) (Fig. 1). In the middle of the Middle Miocene, a significant, rapid and prolonged cooling occurred, followed by a short-term return to higher mid-annual temperatures in the middle of the Late Miocene. The Agnevskaya Formation was deposited during extensive Cenozoic marine transgressions and typically comprises gaize, diatomite siltstone and tuffaceous diatomite (Nazarkin, 2016). A Late Miocene fossil polychaete of the family Pectinariidae Quatrefages, 1865 was found on Sakhalin earlier (Gagaev, 2017). Although fossil polychaete...
S.Yu. Gagaev. Fossil impression of a nephtyid polychaete from Sakhalin

**Fig. 1.** Impression of a nephtyid polychaete from Sakhalin. Photo by M.V. Nazarkin.

**Fig. 2.** Recent polychaete worm *Aglaophamus macroura* (Shmarda, 1861) from East Antarctica. Photo by B.I. Si- renko.
worms belonging to the family Nephtyidae are known from earlier (Carboniferous) deposits (Rouse & Pleijel, 2001), there are no published records of any findings of fossil nephtyids in the region. Impressions of worms of this family are comparatively rare because they do not build tubes and their bodies are formed mainly of soft tissue that is poorly preserved in the ground; therefore such findings deserve close attention (Mierzejewska & Mierzejewski, 1978). A single impression of the anterior half of a worm, split in two longitudinally, is deposited under number 1/50625 at the Annelids collection of the ZIN RAS. It should be emphasized that this impression is practically indistinguishable from the living polychaetes of this family (Fig. 2).

Nephtyids are benthic polychaetes occurring worldwide from the intertidal to abyssal depths and mainly inhabiting soft sediments. Most of them are actively burrowing predators but several species may be subsurface deposit feeders (Jumars et al., 2015). The smallest species are less than 10 mm long while others can be rather large. The largest species from the Sea of Okhotsk may grow up to 300 mm long (Alalykina et al., 2017). The family Nephtyidae includes approximately 140 species united in the four or five genera: Aglaophamus Kinberg, 1865, Bupalonephtys Ravara, Wiklund, Cunha, Pleijel, 2010, Inermonephtys Fauchald, 1968, Micronephtys Friedrich, 1939 and Nephtys Cuvier, 1817 (Read & Fauchald, 2018); some authors consider Bupalonephtys as a junior synonym of Micronephtys (Dnestrovskaya & Jirkov, 2010; Jirkov & Dnestrovskaya, 2012). More than 90 species are known to occur in the Pacific waters (Hartman, 1938; 1950, Hilbig, 1997; Buzhinskaja, 2013; Murray et al., 2015).

The nephtyid impression studied herein belongs to the genus Nephtys or to the genus Aglaophamus. This conclusion is based on the works of Fauchald (1968) and Ravara et al. (2018), in which the presence of conical jaws in the pharynx was considered among the main features distinguishing these two genera from others. The jaws are located inside the pharynx and can only be examined by dissection, which is why they are frequently overlooked. However, Fauchald (1968) regarded the jaw shape as a good generic and specific diagnostic character and described differences between the jaws of the genera Nephtys, Aglaophamus, Micronephtys and Inermonephtys. The jaws of Nephtys have a roughly triangular base with a spur on the posterior edge and a recurved tip. The jaws of Aglaophamus have the same general shape but differ in the presence of an inner supportive ridge. The triangular base is clearly visible in the impression but the other features are indistinguishable (Fig. 3). Unfortunately, a more precise identification of the available impression is impos-

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**Fig. 3.** Jaws of fossil and recent nephtyids. 1, *Nephtys paradoxa* Malmgren, 1874 from Barents Sea, length 0.9 mm; 2, fossil nephtyid from Sakhalin, length 0.7 mm; 3, *Aglaophamus malmgreni* (Théel, 1879) from Barents Sea, length 1.2 mm.
sible. The morphological feature most frequently used to differentiate the two genera, namely the outward or inward direction of the apex of the branchiae (Dnestrovskaya & Jirkov, 2001, 2010), cannot be discerned in the impression.

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