Fossil impressions of pectinariid tubes (Polychaeta) in Miocene sediments of the Sakhalin Island

Фоссильные отпечатки трубок пектинариид (Polychaeta) в миоценовых отложениях Сахалина

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The fossil impressions of tubes belonging to the bristle worms of the family Pectinariidae and probably the genus *Pectinaria* Savigny, 1818 was found at the coastal cliffs of the Tartar Strait (Southern Sakhalin) in deposits of the late Miocene Kurasi Formation. Rare mentions of findings of impressions of the polychaetes tubes perhaps may be explained by the fact that such impressions are misidentified as fossils of animals from other higher taxa. Some new data on the bionomics of the recent pectinariids are given and some taphonomical aspects of the group are considered.

В береговом обрыве Татарского пролива (Южный Сахалин) в отложениях позднего миоцена курасийской свиты найдены отпечатки ископаемых трубок многощетинковых червей семейства Pectinariidae, вероятно принадлежащие к роду *Pectinaria* Savigny, 1818. Редкое упоминание о подобных находках отпечатков трубок полихет, возможно, объясняется тем, что отпечатки принимаются за животных других высших таксонов. Приведены новые данные об образе жизни современных пектинариид и рассмотрены некоторые тафономические особенности группы.

Key words: fossil impressions, tubes of polychaetes, Miocene sediments, South Sakhalin, Pectinariidae

Ключевые слова: фоссильные отпечатки, трубки полихет, миоценовые отложения, Южный Сахалин, Pectinariidae

During the expedition to Southern Sakhalin in 2015–16, the fossil impressions of tubes belonging to the polychaeta annelids were found by M.V. Nazarkin on at the coastal cliffs of the Tartar Strait in 5 km to the South of the village Penzenskoe, Tomari District. The impressions were contained in deposits of the middle-upper Miocene Kurasi Formation. This formation was deposited during periods of extensive Cenozoic marine transgressions and typically comprises gaize, diatomite siltstone, and tuffaceous diatomite (Nazarkin, 2016). I consider the impressions as belonging to the family Pectinariidae and most likely to the genus *Pectinaria* Savigny, 1818 because of the characteristic bending of the tubes and surface granulation well noticeable under a high magnification on their sandy walls which do not include other substances (Fig. 1). The relatively well preserved impressions are 48–50 mm long; mouth width is 9–10 mm. The material in the number of the five intact impressions on four stones is stored in the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZIN). In Russian literature there are no mentions about similar findings in Sakhalin, however they are known from the relatively close located region, the south-west of Japan (Katto, 1976). As known, polychaetes are largely absent from the fossil record due to

Fig. 1. Impression of the polychaete tube of *Pectinaria* sp. **A**, general view; **B**, enlarged fragment. Photo by V.V. Potin.

Fig. 2. Polychaete worm *Cistenides granulata* (Linnaeus, 1767).

the characteristic of being soft-bodied, and possessing no resistant features (Thomas & Smith, 1998; Rouse & Pleijel, 2001; Vinn & Luque, 2013), so the mention of the considered finding is fully justified.

At present, 50 species and 5 genera of the family Pectinariidae are known in the world fauna. Pectinariids inhabit the shelf zone of the seas, and members of different families are consimilar in their bionomics. Some species live on slopes and reach depths of 500 m like as *Cistenides hyperborea Malmgren*, 1866 distributed in the Arctic and the Pacific (Zhirkov, 2001). In the Long Strait of the Chukchi Sea, the author found some alive individuals of this species reaching 55 mm in length that corresponds to the dimensions of the considered impressions. According to Holthe (Holthe, 1986), one of pectinariid species having the most typical mode of existence for the family, *Pectinaria koreni* Malmgren, 1866, lives in the tubes immersed in a soft bottom and directed upwards by the narrow part. A worm digs out a U-shaped stroke and lives in this space ventilated by the movements of its body. Accordinr to my observation in the Chaunskaya Bay of the East Siberian Sea, the other species of this family, *Cistenides granulata* (Linnaeus, 1767), lives on a sandy, not very silty bottom predominantly at depths up to 50 m. This species (Fig. 2) reaches a maximum length of 31 mm and lives more than 3 years (Gagaev, 1996). The observations of this species in an Arctic aquarium show the rather com-

plex behavior of these worms that move around the surface of a dense bottom (Gagaev, 2012). Being in a horizontal position, a worm crawls out of the tube for almost half of the length, clings to the ground with the palea, raises the tube vertically by the body contraction and then lowers it in the direction of the translational motion. Two features of the considered taxa deserve the attention: 1) a sensitivity of the worms to the presence of hydrogen sulphide which in a high concentration is harmful to them; 2) the empty polychaetes tubes can remain intact in the marine environment for a long time. So, in the Pevek Bay (the East Siberian Sea), which is in its essence a shallow lagoon the mass death of worms occurred during water stagnation (when they were leaders in the bottom community biomass). Until now, a great number of the tubes of worms that had lived there before can be seen in black silt of this bay.

Doubtless, containing in the ground empty tubes of the recent pectinariids can lie there without destruction for a long time. Traces of the more ancient representations of this family are preserved as impressions of their tubes. Rare literary mentions of findings of such fossils probably can be explained by the fact that these impressions are misidentified as fossils of some animals from other higher taxa.

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REFERENCES

Gagaev S.Yu. 1996. Ecology and bioenergetic peculiarities of some populations of polychaetes of the Chaun Bay of the East Siberian Sea. *Oceanology*, **36**(5): 756–758.

Gagaev S.Yu. 2012. *Zapiski vodolaznogo starshiny (vzglyad zoologa-naturalista)* [Notes of the Chief diver (view of the zoologist-naturalist)]. Moscow: Tovarishchestvo nauchnykh izdaniy KMK. 232 p. (In Russian).

Zhirkov I.A. 2001. *Polikhety Severnogo Ledovitogo okeana*[Polychaetes of the Arctic Ocean]. Moscow: Yakus-K. 632 p. (in Russian).

Holthe T. 1986. *Polychaeta Terebellomorpha*. Norwegian University Press. 194 p.

Katto J. 1976. Additional Problematica from Mama, Kochi City, Japan. *Research Reports from Kochi University, Natura lSciences,* **25**:17–24.

Nazarkin M.V. 2016. Cenozoic fossil fishes of the extinct alepisauroid family Polymerichthyidae from the Sakhalin Island, Russia. *Acta Palaeontologica Polonica*, **61**(4): 829–838. doi:http://dx.doi.org/10.4202/app.00247.2016

Rouse G.W. & Pleijel F. 2001. *Polychaetes*. Oxford; Oxford University Press. xiii + 354 p.

Thomas A.T. & Smith M.P. 1998. Terebellid Polychaete burrows from the Lower Palaeozoic. *Palaeontology*, **41**: 317–333.

Vinn O. & Luque J. 2013. First record of a pectinariid-like (Polychaeta, Annelida) agglutinated worm tube from the Late Cretaceous of Colombia. *Cretaceous Research*, **41**: 107–110.

Zhang J-H. & Qiu J-W. 2017. A new species of Pectinaria (Annelida, Pectinariidae), with a key to pectinariids from the South China Sea. *ZooKeys*, **683**: 139–150. https://doi.org/10.3897/zookeys.683.12272

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