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Distribution of scaphopod molluscs (Mollusca, Scaphopoda) in the North Atlantic and Arctic oceans, based on materials of Russian and Soviet expeditions

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ABSTRACT. The study of more than 700 lots of scaphopod molluscs collected by Russian and Soviet expeditions in 1898-1980 in the North Atlantic and Arctic ocean, has revealed the presence of six species of Scaphopoda: *Entalina tetragona, Siphonodentalium lobatum*, *Cadulus subfusiformis*, *Antalis entalis*; *A. agilis* and *A. occidentalis*. Previously recorded for the region *Pulsellum lofotense* was not found in the collection; information about localities, distribution, and ecological preferences is given for all the species found. In contrast to previouse publications, only four species of Scaphopoda (*S. lobatum*, *C. subfusiformis*, *A. entalis* and *A. agilis*) were recorded in Russian territorial waters.

Scaphapod molluscs are very characteristic of bottom communities in the Arctic ocean and North Atlantic. Nevertheless, very rich materials collected by Russian and Soviet expeditions during more than hundred years were never examined, and there were no special publications on the distribution and ecology of Scaphopoda in the Russian seas. For the present work, we studied collections of the Zoological Museum of Moscow State University and the Zoological Institute of the Russian Academy of Sciences. In total, 709 lots (more than 1500 specimens) of Scaphopoda were identified (Table 1). Six species of 4 genera, 3 families and 2 orders were found.

Scaphopoda Bronn, 1862
Gadilida Starobogatov, 1974
Entalinidae Chistikov, 1979

Entalina Monterosato, 1872

Type species: *Dentalium tetragonum* Brocchi, 1814 (OD)

Entalina tetragona (Brocchi, 1814)

(Figs. 1D, 2)

Dentalium tetragonum Brocchi, 1814: 627.
[= *Dentalium quinquangulare* Forbes, 1844; *Siphonodentalium pentagonum* M. Sars, 1865]

Type locality: Pliocene of Italy.

The species was found at 12 stations (samples from 3 stations contained only empty shells) from Greenland, Norwegian and Barents seas at depth from 315 to 445 m, on silty and sandy-silty bottom. The most northwestern locality is off Finnmark. Places of habitat are characterised by a very narrow range of salinity (34.69 to 35.3‰) and wide range of temperature (+1.84 to +8.12°C).

Remark. This species occurs predominantly in the Mediterranean and East Atlantic, from the Bay of Biscay to Northern Norway, at depth from 10 to 2664 m [Steiner, 1997], and the finding westward of Iceland extends the range of the species. *Entalina tetragona* was not found in Russian territorial waters.

Gadilidae Stoliczka, 1868
Siphonodentalium M. Sars, 1859

Type species: *Siphonodentalium vitreum* M. Sars, 1851 (OD)

Siphonodentalium lobatum (Sowerby, 1860)

(Figs. 1E, 3)

Dentalium lobatum Sowerby, 1860: 100, pl. III, fig. 44.

Type locality: unknown.

The species was found at 485 stations (samples from 50 stations contained only empty shells) from northern part of the Atlantic, Arctic Basin, Greenland, Norwegian, Barents, Kara, Eastern Siberian, Laptevykh and Chukcha seas, at depth 16 to 2754 m, on silty and sandy-silty bottom. The most western locality is in the Greenland sea, the most southern – off Shetland Islands, the most northern – near the North Pole. Places of habitat are characterised by a very wide range of salinity (27.8 to 35.2‰) and the range of temperature from –2.0 to +5.8°C. The finding of *S. lobatum* near the neck of the White Sea indicates the wide ecological preferences of the species.

Remark. See *Antalis entalis*.

FIG. 1. Shells of Scaphopoda: A – *Antalis entalis*; B – *Antalis agilis*; C – *Antalis occidentalis*; D – *Entalina tetragona*; E – *Siphonodentalium lobatum*; F – *Cadulus subfusiformis*.

РИС. 1. Раковины Scaphopoda: A – *Antalis entalis*; B – *Antalis agilis*; C – *Antalis occidentalis*; D – *Entalina tetragona*; E – *Siphonodentalium lobatum*; F – *Cadulus subfusiformis*.

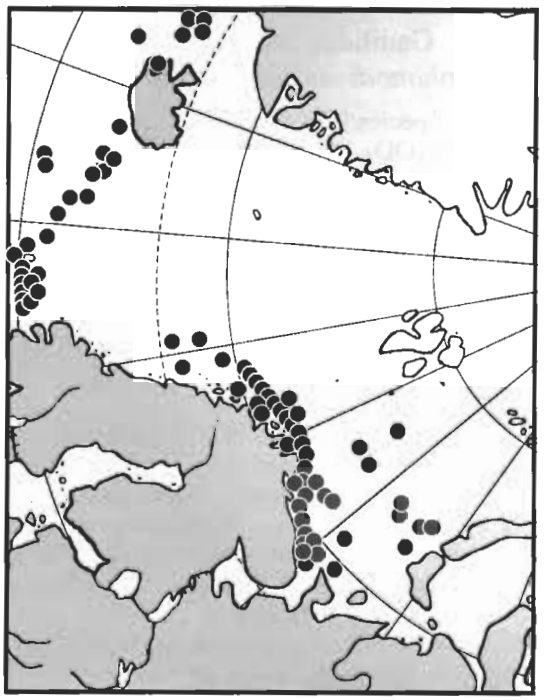

Fig. 2. Map of findings of *Entalina tetragona* (black circles) and *Cadulus subfusiformis* (black squares).

Рис. 2. Карта точек нахождения *Entalina tetragona* (черные круги) and *Cadulus subfusiformis* (черные квадраты).

Cadulus Philippi, 1844

Type species: *Dentalium ovulum* Philippi, 1844 (monotypy)

Cadulus subfusiformis (M. Sars, 1865)

(Figs. 1F, 2)

[= *Helonyx subfusiformis* var. *abyssicola* Monterosato, 1875, *Helonyx abyssicola* Monterosato, 1878]

Siphonodentalium subfusiforme M. Sars, 1865: 301, pl. 6, figs. 36-40, pl. 7, figs. 41-44.

Type localities: Drøbach, Langesund and Flekkefjord, 50-120 fms; Bergen, 50-60 fms; Lofoten, 100-300 fms.

The species was found at 2 stations (sample from 1 station contained empty shells only) in the Barents sea, at 328 and 340 m, on silty and sandy-silty bottom. The most western locality is off the Rybachy Peninsula. Habitats are characterised by salinity about 35‰ and temperature about +5°C.

Remark. Earlier *Cadulus subfusiformis* was found along the Norwegian coast and in the North Sea near the British Isles, on 74 to 1300 m [Knudsen, 1949].

Pulsellidae Scarabino in Boss, 1982
Pulsellum Stoliczka, 1868

Type species: *Siphonodentalium lofotense* M. Sars, 1865 (SD Cossmann, 1888)

Pulsellum lofotense (M. Sars, 1865)

Siphonodentalium lofotense M. Sars, 1865: 297.

Type locality: Lofoten Islands, Norway; 90-216 m.

Remark. This species occurs predominantly in the Mediterranean, North Atlantic from Spain to Finmark, Ireland and New England, on depth from 26 to 3500 m [Steiner, 1997]. Earlier *P. lofotense* was recorded from western Murman [Zatsepin, 1948], but it was not found in our material.

Dentaliida Da Costa 1776
Dentaliidae Children, 1834
Antalis H. et A. Adams,1854

Type species: *Dentalium entalis* L., 1758 (SD Pilsbry, Sharp, 1897)

Antalis entalis (Linné, 1758)

(Figs. 1A, 4)

Dentalium entalis Linné, 1758: 785

[= *Dentalium labiatum* Brown, 1827; *Dentalium striolatum* Stimpson, 1851]

Type locality: Atlantic Ocean.

The species was found at 209 stations (samples from 29 stations contained empty shells only) from northern part of the Atlantic, Greenland, Norwegian and Barents seas, on depth between 15 and 560 m (live specimens were not found shallower than 30

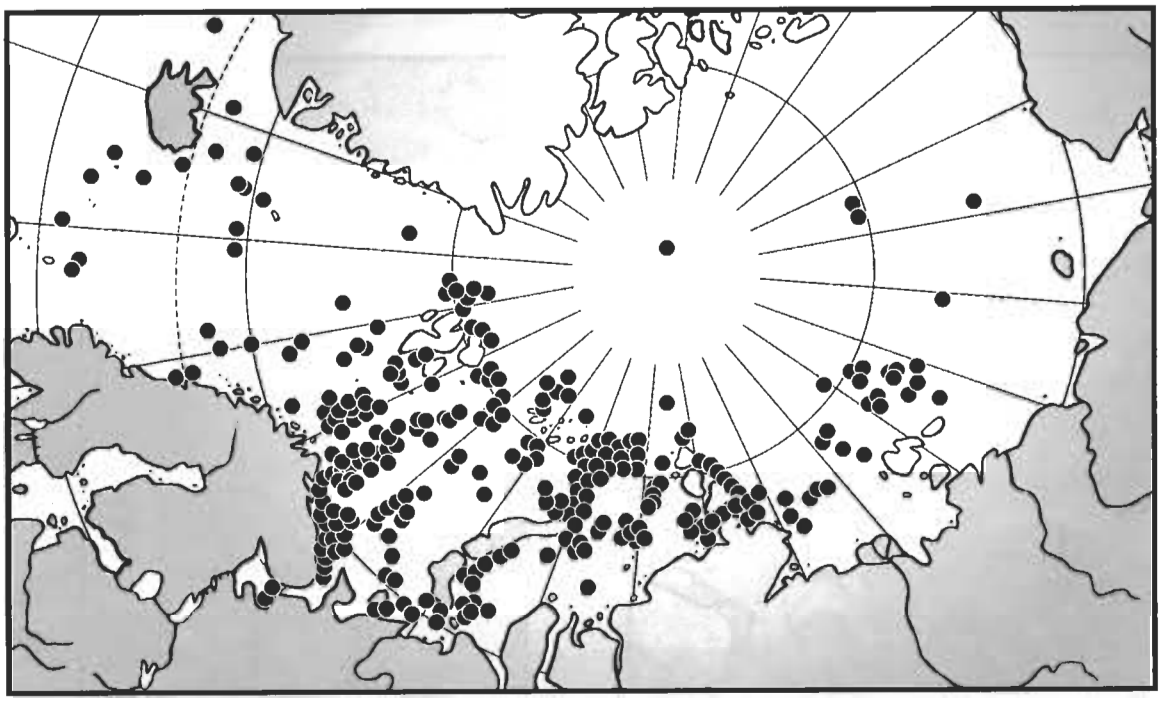

FIG. 3. Map of findings of *Siphonodentalium lobatum*.

РИС. 3. Карта точек нахождения *Siphonodentalium lobatum*.

m), on sandy, stony and shelly bottom. The most western locality is in the Greenland Sea, the southern – off Orkney Islands, the eastern – off Novaya Zemlya, the northen – southeastward of Spitzbergen. Habitats are characterised by a narrow range of salinity (33.3 to 35.4‰) and a wide range of temperature (+1.65 to +11.32°C).

Remarks. This species occurs predominantly in the North Atlantic, from Spain northward to Spitzbergen and Maine, Massachusetts to Bay of Fundy, at depth from 6 to 3500 m [Zatsepin, 1948; Knudsen, 1949; Steiner, 1997]. *A. entalis* is a temperate species preferring higher temperature than *S. lobatum*. Therefore, the distribution of *A. entalis* in the Polar Basin correlates with waters of warm currents, and the species is absent in the Kara Sea. Ranges of *S. lobatum* and *A. entalis* notedly coincide in the well studied Barents Sea but, nevertheless, these species very rarely co-occur (at 12 stations of 209 studied in this work). This is explained not only by different temperature preferences of the species but also by the way of life. *S. lobatum* prefers much softer sediments than *A. entalis*.

Antalis agilis (M. Sars in G.O. Sars, 1872)

(Figs. 1B, 5)

Dentalium agile M. Sars in G.O. Sars, 1872: 34.
[= *Dentalium incertum* Philippi, 1844 non Deshayes, 1825; *Dentalium fusticulus* Brugnone, 1876; *Dentalium vagina* Jeffreys, 1877; *Dentalium calabrum* Crema, 1910]

Type locality: Lofoten Islands, North Atlantic, at 360-540 m.

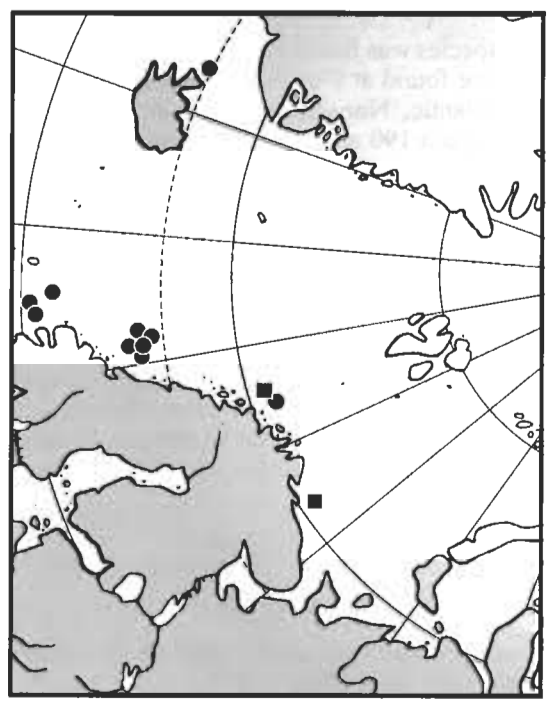

FIG. 4. Map of findings of *Antalis entalis*.

РИС. 4. Карта точек нахождения *Antalis entalis*.

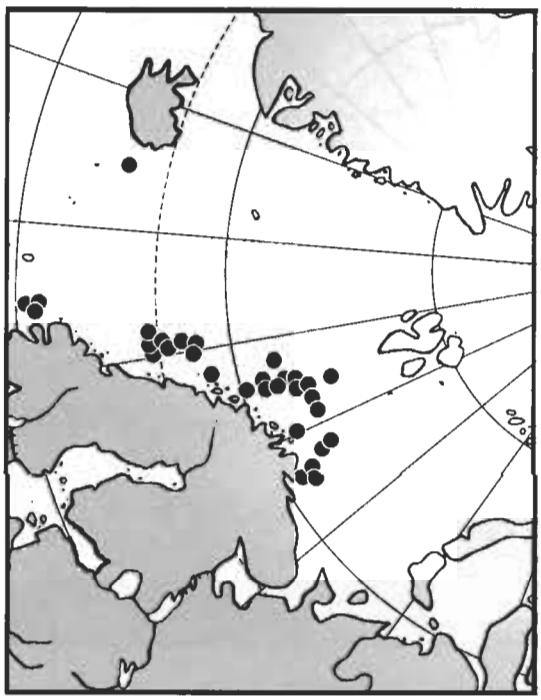

FIG. 5. Map of findings of *Antalis agilis*.

РИС. 5. Карта точек нахождения *Antalis agilis*.

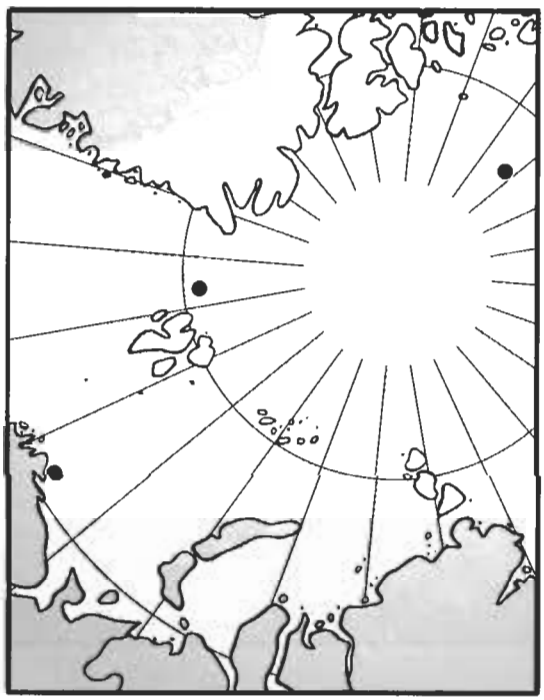

FIG. 6. Map of findings of *Antalis occidentalis*.

РИС. 6. Карта точек нахождения *Antalis occidentalis*.

The species was found at 30 stations (only empty shells were found at 9 of them) from northern part of the Atlantic, Norwegian and Barents seas, on depth between 190 and 480 m, on sandy and stony bottom. The most western locality is eastward of Iceland, the southern – off Bergen, the eastern – off the Rybachy Peninsula, the northen – southward of Spitzbergen. Habitats are characterised by extremely narrow range of salinity (35.0 to 35.3‰) and a wide range of temperature (-0.5 to +7.7°C).

Remark. This species occurs predominantly in the North Atlantic from from Portugal to Lofoten and Halifax to Cuba, Gulf of Mexico, Azores; Mediterranean, on depth from 60 to 5000 m [Steiner, 1997]. It has not been recorded previously from the Barents Sea.

Antalis occidentalis (Stimpson, 1851)

(Fig. 1C, 6)

Dentalium occidentale Stimpson, 1851: 28 [*D. dentale*, Gould, 155, fig. 5 (non auct.)].

[= *Dentalium abyssorum* M. Sars, 1859, *Dentalium striolatum* — G.O. Sars, 1878, non Stimpson, 1851, nec Risso, 1826].

Type locality: Deep water on the coast of Maine and in Mass. Bay (?).

Only empty shells of the species were found at 3 stations in Basin of Arctic Ocean and Barents Sea, at depth 250, 1700 and 1843 m, on silty-sand bottom, at salinity from 35.0‰ and temperature about -0.4°C.

Remark. Earlier this species was recorded for deepwaters of Massachusetts Basin, near the coast of Maine, off Iceland and in the southwestern Barents Sea to Western Murman, on depth from 100 to 2000 m [Stimpson, 1851; Zatsepin, 1948; Knudsen, 1949].

Thus, of five species of scaphopods molluscs which were earlier known for the fauna of northern seas of Russia [Zatsepin, 1948], the presence of only three of it confirmed (*Siphonodentalium lobatum*; *Antalis entalis* and *A. agilis*). *Cadulus subfusiformis* is new for this fauna. Records of *A. occidentalis* are doubtful because no live specimens were found. *Pulsellum lafotense* was not found in the area.

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Распространение лопатоногих моллюсков (Mollusca, Scaphopoda) в Северной Атлантике и Северном Ледовитом океане по материалам российских и советских экспедиций

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РЕЗЮМЕ. На основании исследования более 700 проб лопатоногих моллюсков, собранных русскими и советскими экспедициями, проводившимися с 1898 по 1980 годы в Северной Атлантике и Полярном бассейне, установлено присутствие в данном регионе шести видов Scaphopoda: *Entalina tetragona; Siphonodentalium lobatum*, *Cadulus subfusiformis*, *Antalis entalis*; *A. agilis* и *A. occidentalis*. Отмечено отсутствие в данном материале *Pulsellum lofotense*, ранее отмечавшегося в Северной Атлантике; для всех обнаруженных видов приведены данные о находках, распространении и экологических предпочтениях. В отличие от предыдущих работ, показано, что в российских территориальных водах обитают лишь следующие виды: *S. lobatum*, *C. subfusiformis*, *A. entalis* и *A. agilis*.