

Surviving at the edge of land: finding of the limnetic snail *Sibirenauta sibirica* (Gastropoda: Physidae) on the coast of the Laptev Sea (Eastern Siberia)

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The freshwater gastropod *Sibirenauta sibirica* (Westerlund, 1877) was found in several lakes and pools of the Lena River delta and on the coast of Tiksi Bay (Extreme North of Eastern Siberia). The reported localities of *S. sibirica* are the northernmost ones known with certainty. Some discrepancies in the usage of the genus name *Sibirenauta* Starobogatov et Streletzkaja, 1967 are discussed.

Key words: Gastropoda, Physidae, *Sibirenauta*, the Arctic, Siberia, freshwater mollusks.

Выжившие на краю земли: находка пресноводной улитки *Sibirenauta sibirica* (Gastropoda: Physidae) на побережье моря Лаптевых (Восточная Сибирь)

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Пресноводный брюхоногий моллюск *Sibirenauta sibirica* (Westerlund, 1877) был обнаружен в нескольких озёрах и лужах в дельте реки Лена и на побережье бухты Тикси (крайний север восточной Сибири). Указанные местонахождения являются самыми северными из достоверно известных для *S. sibirica*. Обсуждаются ошибки в использовании родового названия *Sibirenauta* Starobogatov et Streletzkaja, 1967.

Ключевые слова: Gastropoda, Physidae, *Sibirenauta*, Арктика, Сибирь, пресноводные моллюски.

The species diversity of freshwater molluscs decreases evidently from south to north in the Northern Hemisphere, and only few widespread freshwater gastropod species are known from the Arctic, e.g. *Gyraulus borealis* (Lovén in Westerlund, 1875), *Radix balthica* (L., 1758), *Lymnaea jacutica* Starobogatov et Streletzkaja, 1967 and some others [Westerlund, 1877; Esmark, Hoyer, 1886; Starobogatov, Streletzkaja, 1967]. However, the data on freshwater molluscan fauna of many areas of the Extreme North are restricted either to rather old works [Westerlund, 1877, 1885; Esmark, Hoyer, 1886; Smith, 1896] or to species lists in the publications summarizing the results of voluminous ecological studies [e.g. Gukov, 2001; Yakovlev, 2005], whereas special

studies of the Extreme North as an area of freshwater gastropods' distribution are remarkably sparse [Økland, 1990; Nekhaev, 2006; Dolgin, Sviridenko, 2011; Vinarski et al., 2013b, 2015].

The preliminary data on the molluscan fauna of the lower Lena River basin are presented by Gukov [2001] who listed molluscs of the genus *Sibirenauta* Starobogatov et Streletzkaja, 1967 in his index of benthic invertebrates of the region. Collections of mollusks sampled in the summer 2015 confirm the presence of *Sibirenauta* species in small waterbodies of the Lena River delta as well as along the coast of Tiksi Bay. The molluscs found were identified as *S. sibirica*, the species previously not recorded in the region. This brief note describes the finding.

Material and methods

Mollusks were collected from several waterbodies situated in the Lena River delta and in the vicinities of Tiksi Bay (Extreme North of Siberia) (Table 1). The delta of the Lena River is a flat floodplain with numerous branches, small lakes and pools.

Table 1

Collection sites of *Sibirenauta sibirica*

Locality	Coordinates	Habitat	Date	Specimens
Pool in Lena River floodplain	72°11'38.8" N 128°04'30.7" E	Sedge and mosses on silt and detritus bottom, ca 0.1 m	8.07.2015	32
Pool in Lena River floodplain	72°11'38.8" N 128°04'30.7" E	Sedge and mosses on silt and detritus bottom, ca 0.2-0.3 m	8.07.2015	6
Tyulahk-Kuel Lake (Fig. 1A)	72°08'01.8" N 128°00'44.9" E	Amphibiotic vegetation and water mosses on clay with stones bottom, ca 0.3-0.4 m	10.07.2015	137
Lake in Lena River floodplain	72°11'17.4" N 128°03'46.2" E	Amphibiotic vegetation on brown silt with pebbles bottom	12.07.2015	7
Small lake, coast of Tiksi Bay	71°35'57.4" N 128°51'27" E	Sedge on sand with stones bottom	21.07.2015	5
Small lake, coast of Tiksi Bay	71°35'09.3" N 128°51'40.7" E	Sedge on silty bottom	21.07.2015	12
Small pool, coast of Tiksi Bay (Fig. 1 B)	71°35'40.2" N 128°53'07.8" E	Amphibiotic vegetation and algae on stones and silt bottom	21.07.2015	8
Small pool, coast of Tiksi Bay	71°35'59.6" N 128°53'23" E	Amphibiotic vegetation on silty stones bottom, occasionally with trash	21.07.2015	14

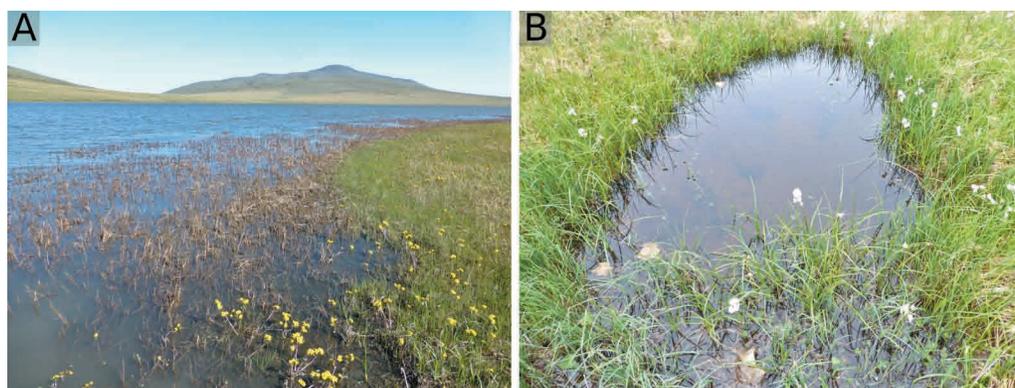


Fig. 1. Collecting sites of *Sibirenauta sibirica*. **A** – Tyulahk-Kuel Lake, **B** – small pool on the coast of Tiksi Bay. Photographs by A. Nekhaeva.

The coast of Tiksi Bay is located in the permafrost area, with low mountains having a maximal elevation of 319 m. The mean annual temperature is about -14°C ; the period with the mean air temperature above zero is 98 days [Gukov, 2001].

All mollusks were collected by means of a hydrobiological net from shallow depths in small lakes and pools; on the other hand, no snails were found in the coastal zone of the Lena River or its branches. Mollusks were immediately fixed in 95% ethanol. Material studied includes 221 molluscan specimens in all (Table 1). The anatomical features of three specimens from Tyulahk-Kuel Lake were studied under a Carton SPZT50 stereomicroscope with a DCM-510 eyepiece camera.

Results and discussion

The collections studied contained representatives of the only species of molluscs (Fig. 2). These specimens clearly corresponded in the morphology of both their shells and copulatory organs to the published descriptions of the species *Sibirenauta sibirica* (Westerlund, 1877) [Starobogatov et al., 1989; Starobogatov et al., 2004; Khokhutkin, Vinarski, 2013; Vinarski et al., 2013a]. No other gastropod species were found. Shell dimensions of the specimens from Tyulahk-Kuel Lake are presented in Table 2.

The female genitalia of *Sibirenauta sibirica* were not previously studied. Nonetheless the anatomy of dissected molluscs (Fig. 2) generally conforms to the description and drawings of *Sibirenauta elongata* (Say, 1821) provided by Taylor [2003]. Vagina is tubular, short, its length about 1.5–3 times width. Bursa copulatrix large, roughly spherical, its wall coalesces with mantle and pericardium wall. Distal part of oviduct is relatively long and coiled. Albumen gland large, slightly elongated. External papilla with female reproductive pore not marked.

The reported range of *Sibirenauta sibirica* includes Siberia and Alaska [Starobogatov et al., 2004; Khokhutkin, Vinarski, 2013; Vinarski et al., 2013a]. The species was

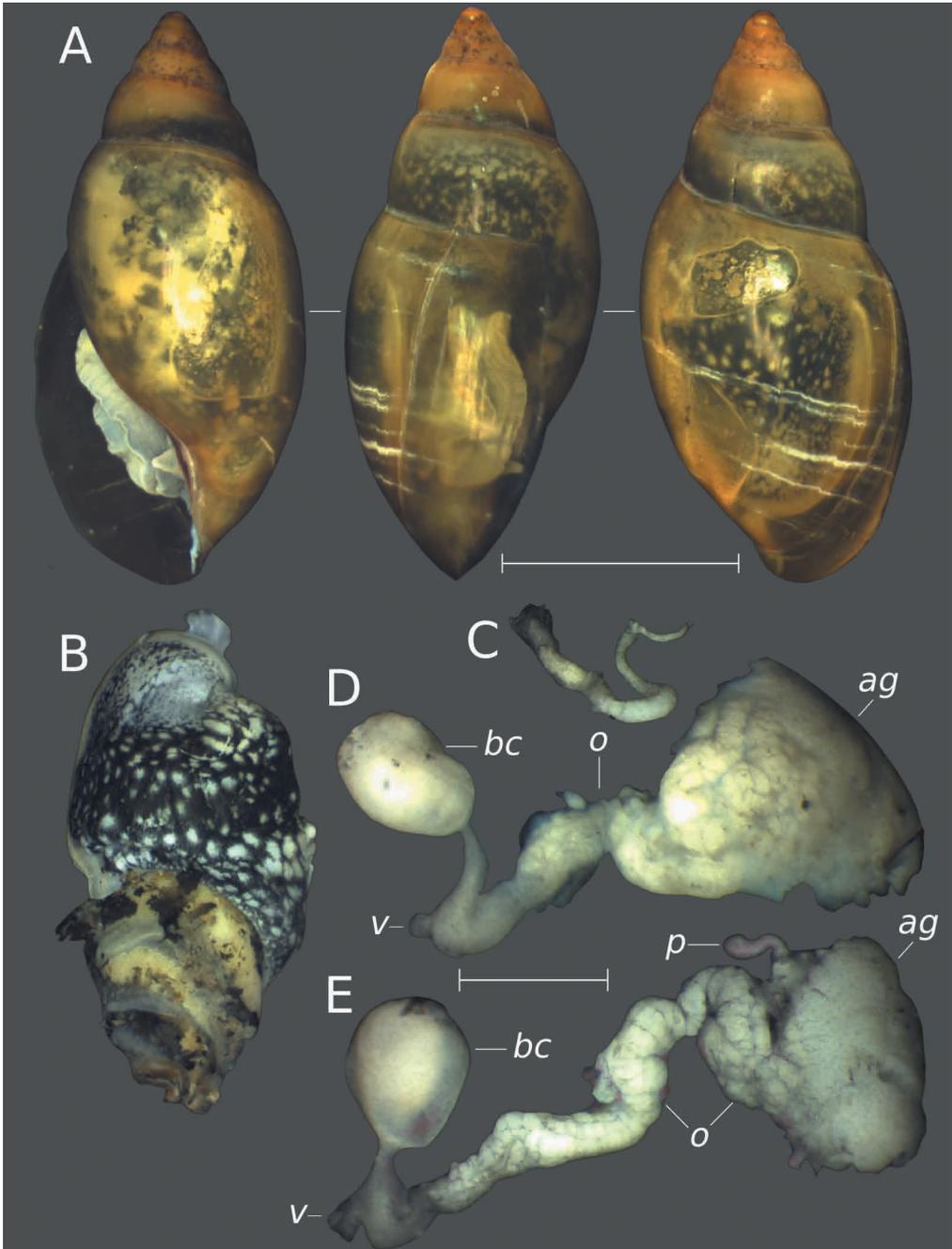


Fig. 2. Shell and anatomy of *Sibirenauta sibirica*, Tyulakh-Kuel Lake. **A** – shell, **B** – body extracted from the shell, **C** – copulatory apparatus, **D**, **E** – female reproductive system. **A–D** – organs of the same specimen. *ag* – albumen gland, *bc* – bursa copulatrix, *c* – caecum, *o* – oviduct, *v* – vagina. Scale bars: 5 mm (**A–B**), 2 mm (**C–E**).

Table 2

Morphometric characters (mm) *Sibirenauta sibirica* from Tyulakh-Kuel Lake (n=31)

	SH	LWH	AH	SW	AW
Mean	11.5	8.7	6.3	5.4	2.8
Max	13.8	10.6	7.9	6.6	4
Min	9.2	7.3	5.2	4.5	2.4
σ	1	0.7	0.6	0.5	0.4

Note. SH – shell height, LWH – last whorl height, AH – aperture height, SW – shell width, aw – aperture width.

originally described based on several specimens from the lower Yenisei drainage basin (71°40' N) [Westerlund, 1877; Vinarski et al., 2013a]. Recently Vinarski et al. [2015] reported several small living specimens of *S. sibirica* from a single lake of Wrangel Island (71°28' N). Thus the findings reported here indicate the northernmost localities of *S. sibirica* known with certainty.

There are some misunderstandings in the gender of the genus name *Sibirenauta* Starobogatov et Streletzkaja, 1967. Its etymology was not stated in the original description, but the name is obviously derived from the words «Siberia» and «nauta» (the latter is Latin for «a sailor»). Nonetheless, the gender of the name was directly stated as feminine [Starobogatov, Streletzkaja, 1967, p. 234], which was overlooked by Taylor [2003] who used the name as masculine. As «nauta» may be considered as a word of variable gender, the article 30.1.4.2 of the ICZN is acceptable and feminine gender must be used for *Sibirenauta*.

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