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A new species of *Boreotrophon* P. Fischer, 1884 (Gastropoda, Muricidae, Pagodulinae) from the Sea of Japan

I.P. BONDAREV

A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS, Sevastopol, 299011, Nakhimov Avenue 2, Sevastopol, RUSSIA. E-mail:igor.p.bondarev@gmail.com

ABSTRACT. *Boreotrophon* ***oparini*** sp. nov., found in the Sea of Japan, off Russian Maritime Territory, is described and illustrated. The type material was sampled at a depth of 40 m (holotype) and 110 m (paratype) during the 64th expedition of R/V Akademik Oparin. *Boreotrophon oparini sp. nov*. is compared with the sympatric B. candelabrum and other congeneric species.

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Новый вид рода *Boreotrophon* P. Fischer, 1884 (Gastropoda, Muricidae, Pagodulinae) из Японского моря

И.П. БОНДАРЕВ

Институт биологии южных морей имени А.О. Ковалевского РАН, 299011, Проспект Нахимова,2, Севастополь, РОССИЙСКАЯ ФЕДЕРАЦИЯ. E-mail: igor.p.bondarev@gmail.com

РЕЗЮМЕ. Описан и иллюстрирован *Boreotrophon* ***oparini*** sp. nov., обнаруженный в Японском море у Приморского края России. Типовой материал был отобран с глубин 40 м (голотип) и 110 м (паратип) в 64-й экспедиции НИС «Академик Опарин». *B.* ***oparini*** sp. nov. сравнивается с симпатрическим *B. candelabrum* и другими родственными видами.

Introduction

Gastropods of the genus *Boreotrophon* P. Fischer, 1884 are characteristic representatives of the molluscan fauna of the boreal and arctic zoogeographic regions. *Boreotrophon* species have been studied by taxonomists for centuries; the species variability has been fairly well studied and illustrated in original descriptions and in monographic publications [Egorov, 1993; Habe, Ito, 1965; Houart, 1981, 1995; Houart *et al*., 2019; Kantor, Sysoev, 2006]. In the meantime, researchers discover and describe new primarily small-sized species of *Boreotrophon*, mainly from bathyal and abyssal zones [Houart *et al.*, 2019]. The discovery of a new *Boreotrophon* species with a rather large shell (HS up to 46.2 mm) at moderate depth (40–110 m) in a well-studied area of the Sea of Japan, Russian Maritime Territory (Primorye) in the course of the 64th expedition of R/V *Akademik Oparin* (2021) came as a surprise. *B. candelabrum* (Reeve, 1848) was recorded earlier from the Primorye region [Egorov, 1993] and *B. alaskanus* Dall, 1902 [Egorov, 1993; Habe, Ito, 1965: pl. 10, fig. 17 (only)] from the northern part of the Sea of Japan. However, this last name has often been used erroneously [Egorov, 1993, Habe, Ito 1965 (in part, pl. 10, figs 12, 16)] for *B. alborostratus* Taki, 1938 [Houart *et al*., 2019]. Both species *B. candelabrum* and *B. alborostratus* were also sampled in the 64th expedition of R/V *Akademik Oparin* in the Primorye region and used for comparison with the new species.

Material and methods

The type material was collected at a depth of 40 m, near Vladimir Bay (holotype) and at 110 m, near Olga Bay (paratype) off Russian Maritime Territory in the western part of the Japan Sea (Fig. 1) in June-July 2021 with a small Sigsby trawl from the board of R/V *Akademik Oparin*.

The characters used here to describe the shell morphology refer to the general aspects of the shell: the shape, size, color, spire characteristics, number and shape of the teleoconch whorls, details of the suture, axial and spiral sculpture, the shape and color of aperture, siphonal canal and operculum, and follow Houart *et al*. [2019]. The measurements accuracy equals 0.1 mm.

The holotype is deposited in the Zoological Museum of Moscow State University; the paratype is deposited in the A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS (Sevastopol, Russia) collection.

FIG.1. Map of the type material sampling area (black spot).

РИС.1. Карта района отбора типового материала (черная точка).

Abbreviations: AH, aperture height, AW; aperture width; HBW, height of the body whorl; IBSS, A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS (Sevastopol, Russia); LS, length of the siphonal canal, OH, operculum height, OW, operculum width, SH, shell height, SW, shell width, or diameter of the body whorl; WC, width of the siphonal canal; w/o, shell with operculum; ZMMU, Zoological Museum of Moscow State University, Russia.

Taxonomy

Class Gastropoda Cuvier, 1795
Subclass Caenogastropoda Cox, 1960
Order Neogastropoda Wenz, 1938
Family Muricidae Rafinesque, 1815
Subfamily Pagodulinae Barco, Schiaparelli, Houart et Oliverio, 2012
Boreotrophon P. Fischer, 1884

Type species *Murex clathratus* Linnaeus, 1767 (by monotypy).

Diagnosis. Shell fusiform, spire high; protoconch paucispiral, rounded or shouldered. Last teleoconch whorl with numerous axial lamellae; spiral sculpture faint if present, not crossing or raised above axial lamellae; suture impressed. Aperture large, ovate, outer lip smooth within, siphonal canal moderately long, broad, broadly open near ventral end [Houart *et al*., 2019].

Boreotrophon ***oparini*** sp. nov.
(Figs 2 A–J, Table 1)

Zoobank registration: urn:lsid:zoobank.org:act:F8174FD1-64F6-4377-A297-68B48663273A

Type material: holotype ZMMU Lc-41237, SH 46.2 mm, w/o (Figs 2 A–E); paratype IBSS, #ibss.bent.1.Mol. p., SH 41.1 mm, w/o (Figs 2 F–J).

Type locality: Sea of Japan, off Russian Maritime Territory: 44°04.0’N, 135°40.0’E, 40 m depth, bivalves shells, sand, gravel and pebbles bottom (holotype); 43°40.5’N, 135°26.3’E, 110 m depth, gravel and pebbles bottom (paratype).

Etymology: The species is named in honor of academician A.I. Oparin.

Diagnosis. *Boreotrophon* ***oparini*** sp. nov. is characterized by a medium sized fusiform shell (SH/SW ratio – 2.35) consisting of 6 slightly angulated whorls with barely visible spiral lines and cords and 9 or 10 widely spaced axial lamellae; spire moderately high, siphonal canal moderately long (1/3 of the shell height) broadly open. Color whitish to light cream or brown with occasionally spread light brown spots, mostly on lighter colored axial lamellae and outer lip. Operculum elongated oval, dirty–yellow.

Description. Shell fusiform consisting of 6 slightly angulated whorls, moderately solid, medium sized for the genus, up to 46.2 mm in height (holotype), SH/SW ratio – 2.35, suture impressed. Protoconch is unknown. Spire moderately high, spiral sculpture consisting of barely visible lines and cords (more visible on paratype), axial sculpture consisting of very thin growth lines and rather low, widely spaced lamellae 9 (paratype) or 10 (holotype) on the last teleoconch whorl. Aperture ovate, distinctly separated from broadly opened, slightly curved backward moderately long siphonal canal covering 1/3 of the total shell height, tips of previous canals projected behind. Aperture is milky white to light cream with yellowish tint and light brown small spot on the outer lip. Outer lip is smooth within, inner lip covered by thin glossy callus. Shell whitish or cream to brown on the spire whorls, which are obviously worn and the whitish outer shell layer is eroded (less in the paratype), so the shell naturally would be more whitish. Tip of holotype siphonal canal is brown, siphonal canal of paratype white to light cream. Axial lamellae white to light cream, with occasionally spread light brown spots. Operculum is small, elongated oval, OH/OW ratio – 1.85–1.89, dirty–yellow.

Distribution. Known only from the type locality.

Remarks. *Boreotrophon* ***oparini*** sp. nov. differs from the sympatric *B. candelabrum* by its more slender shell with less developed axial lamellae and longer siphonal canal. *B. candelabrum* (Fig. 3 A–H) has a darker and bright shell color with light pinkish-brown to brown-violet aperture, occasionally with brown bands or spots; the operculum is dark brown. *B. candelabrum* is a mostly shallow water sublittoral species, but can be found up to 90-100 m depth [Golikov, Kussakin, 1978]. The shell of the other sympatric species *B. alborostratus* (Fig. 3 I–J) is similar in its general shape, but wider (SH/SW ratio – 2.05) with more rounded aperture; the axial lamellae are more numerous (12–14), the siphonal

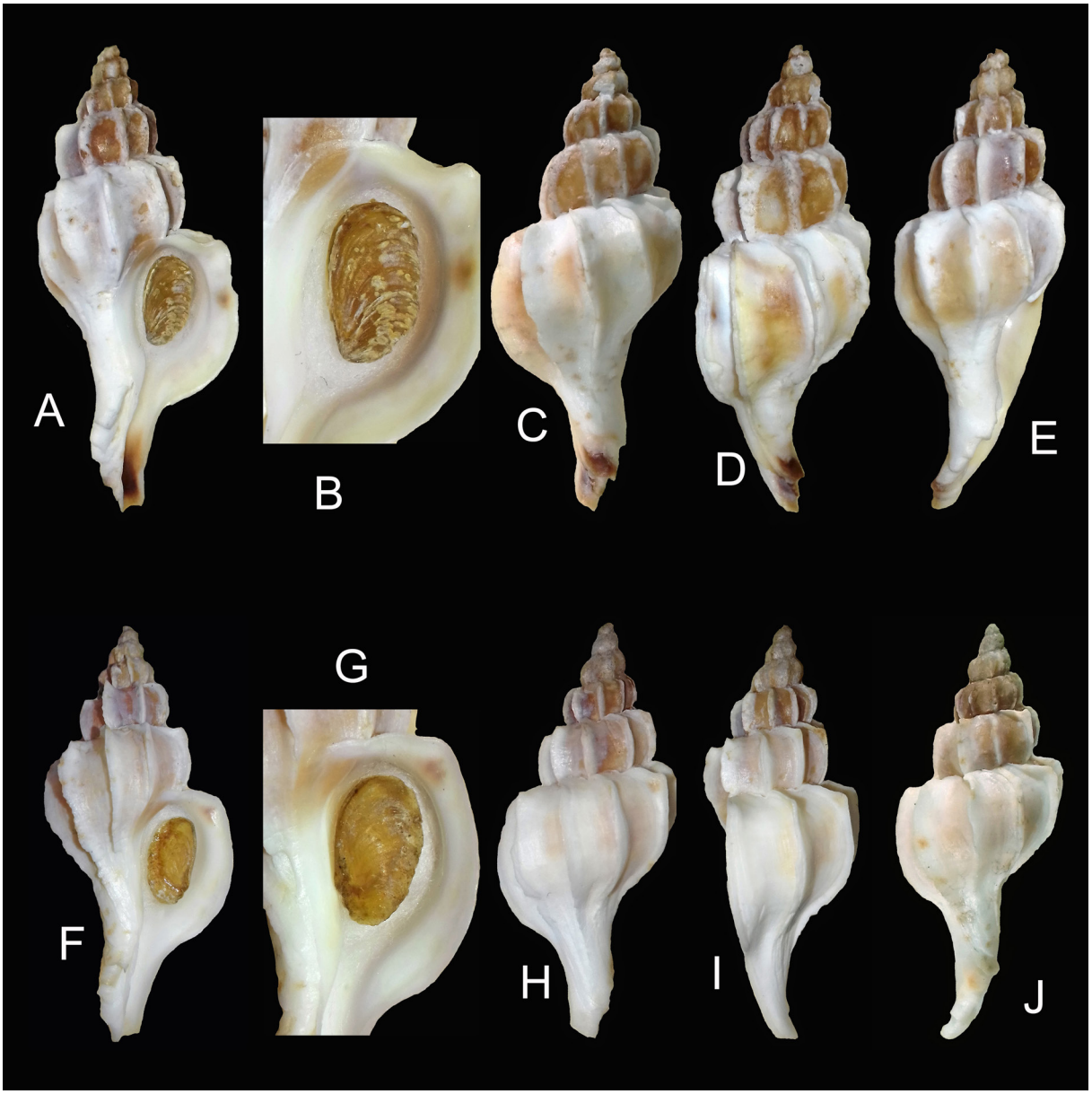

FIG. 2. *Boreotrophon* ***oparini*** sp. nov. **A–E**. Holotype ZMMU Lc-41237, 46.2 mm: ventral (A) dorsal (C), right (D) and left (E) views, B – aperture with operculum 9.1 mm x 4.8 mm. **F–J**. Paratype IBSS, 41.1 mm ventral (F) dorsal (H), right (I) and left (J) view, G – aperture with operculum 8.5 mm x 4.6 mm.

РИС. 2. *Boreotrophon* ***oparini*** sp. nov. **A–E**. Голотип ZMMU Lc-41237, 46.2 мм, ракурсы: вентральный (A) дорсальный (C), справа (D), слева (E), B – устье с крышечкой 9,1 мм x 4,8 мм. **F–J.** Паратип IBSS, 41,1 мм, ракурсы: вентральный (F), дорсальный (H), справа (I), слева (J), G – устье с крышечкой 8,5 мм x 4,6 мм.

canal is slightly turned left vs. backside in the new species, the shell is white vs. light cream to brown in *B.* ***oparini*** sp. nov. *B. alaskanus* Dall, 1902 differs by its white or greyish white color, stronger and fewer (7–8) axial lamellae projecting at shoulder, occasionally upturned. *B. cepula* (Sowerby, 1880) differs by its more uniformly paler colored shell, a smaller average size (21 mm), more rounded whorls and aperture, respectively shorter canal and more numerous axial lamellae (15–17) on the body whorl. The new species differs from the Boreal–Arctic *B. clathratus* by fewer axial lamellae (9–10 vs. 10–12 to 16–17), more slender general shell shape, and an oval elongate vs. almost round aperture. *B. clathratus* is quite variable because of the wide almost circumpolar distribution and depth interval from 0.5 m to more than 1200 m. Specimens from northwest Pacific named *Boreotrophon beringi* Dall, 1902, [Egorov, 1993, fig. 31 G, H; Kantor, Sysoev, 2006, pl. 63K] with a rather long siphonal canal differs from the new species by its canal turned left and by the absence of spotted color pattern and an aperture sometimes yellowish-brown to dark-brown colored. *B. egorovi* Houart, 1995 differs by its greenish–white shell,

Table 1 Main morphological characteristics of *Boreotrophon* ***oparini*** sp. nov. (measurements in mm).

Табл. 1 Основные морфологические характеристики *Boreotrophon* ***oparini*** sp. nov. (размеры в мм).

	SH	SW	SH/SW	HBW	LS	OH	OW	OH/OW	WC
Holotype	46.2	19,7	2.35	35.2	15.3	9.1	8.5	1.89	1.4
Paratype	41.1	17.5	2.35	30.0	12.1	4.8	4.6	1.85	1.2

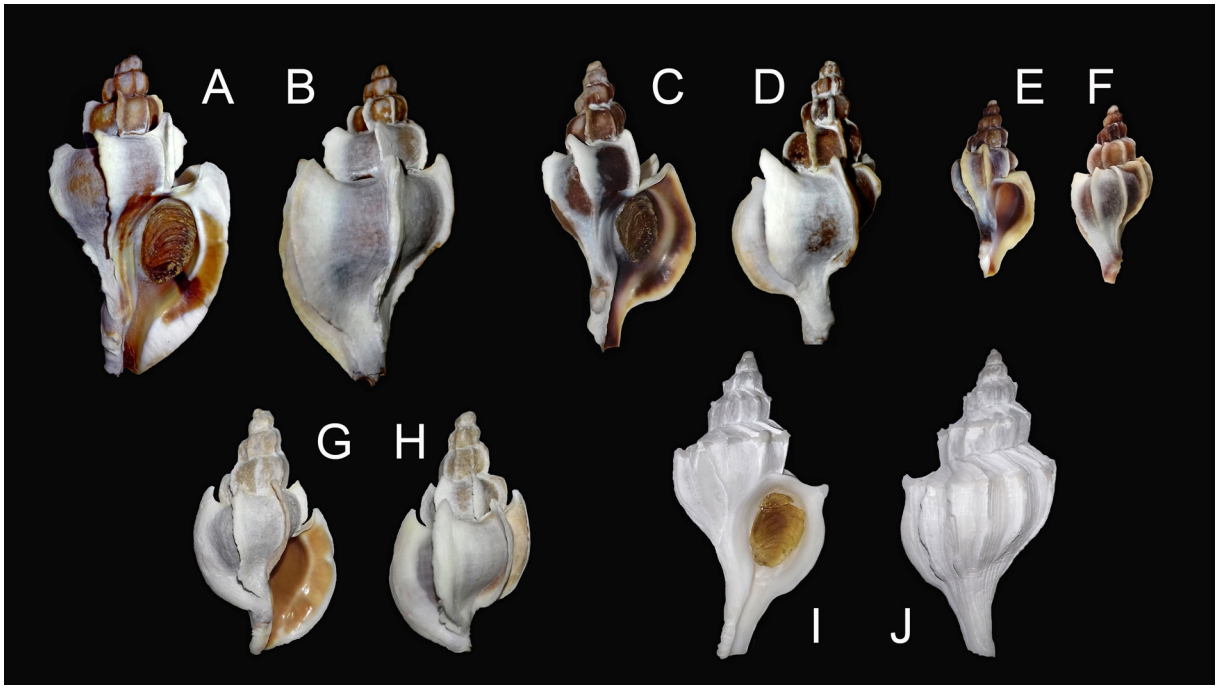

FIG. 3. *Boreotrophon candelabrum* (**A–H)** Primorye, depth 8–12 m (**A–F**): **A, B** – 43.2 mm, **C, D** – 39.9 mm, **E–F** – 24.0 mm; Kuril Is., depth 60 m (**G–H**) – 33.7 mm; *B. alborostratus* (**I–J**) Primorye, depth 140 m – 40.0 mm.

РИС. 3. *Boreotrophon candelabrum* (**A–H)** Приморье, глубина 8-12 м (**A–F**): **A, B** – 43,2 мм, **C, D** – 39,9 мм, **E–F** – 24,0 мм; Курильские о-ва, глубина 60 м (**G–H**) – 33,7 мм; *B. alborostratus* (**I–J**) Приморье, глубина 140 м – 40,0 мм.

broad rounded teleoconch whorls and by its white or brown aperture with white rim, the operculum is dark brown. *B. okhotensis* Egorov, 1993 differs by its very thick, broad and solid shell consisting of 4.5 greyish white whorls, with a shorter siphonal canal (1/4 of the total shell height) strongly curved to the left, more numerous axial lamellae (13 on the body whorl) and an operculum with dark brown spot in the center.

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