

BUSHIELLA (JUGARIA) BEATLESI SP. N.
(POLYCHAETA: SPIRORBIDAE) FROM THE KURILE
ISLANDS WITH REMARKS ON TAXONOMY,
MORPHOLOGY AND DISTRIBUTION
OF SOME OTHER *BUSHIELLA* SPECIES

Alexander V. Rzhavsky

Kamchatka Institute of the Ecology and Environment of the Far East Branch of the Russian
Academy of Sciences, Partizanskaja Str. 6, Petropavlovsk-Kamchatsky, 683000 Russia

ABSTRACT

Bushiella (B.) vitjazi Rzhavsky, 1988, is synonymised with *Bushiella (B.) asymmetrica* Rzhavsky, 1988. New records extend the known range of the latter to East Kamchatka shores, and of *Bushiella (B.) evoluta* (Bush, 1905) to West Spitsbergen. Specimens of *Bushiella (Jugaria) beatlesi* sp. n. were collected from the Pacific shore off Simushir Island (Kurile Islands) on tubes of *Nothria conchylega* (Polychaeta: Onuphidae) at 150 m depth. *Bushiella (J.) beatlesi* is closely related to *B. (J.) quadrangularis* (Bush, 1905) but differs in talon and tube morphology and smaller size (maximum whorl diameter no more than 1.5 mm when adult). In talon morphology and absence of calcification of the brood chamber, *B. (J.) beatlesi* is similar to *B. (B.) evoluta*, but differs in many other features. *Bushiella (Jugaria) acuticostalis* Rzhavsky, 1991 is first recorded from the Commander Islands and *Bushiella (Jugaria) similis* (Bush, 1905) from West Spitsbergen and Franz Joseph Land. Data on variations of tube and operculum morphology are given for *B. (B.) asymmetrica*, *B. (J.) acuticostalis*, *B. (J.) similis* and *B. (J.) quadrangularis*.

Key words: *Bushiella*, *Jugaria*, Spirorbidae.

INTRODUCTION

Studying several spirorbid collections from different regions, new data on the taxonomy, morphology and distribution of *Bushiella* species were obtained. The present paper records these data, including the description of a new species.

I thank Dr. G. N. Buzhinskaja and V. V. Potin (Zoological Institute, St.-Petersburg), and Dr. V. O. Mokievsky (Institute of Oceanology, Moscow) for placing specimens at my disposal. I am grateful to all workers who collected the material and to the George Soros Foundation, which funded my research.

MATERIAL AND METHODS

Specimens were originally located in the collections of the Zoological Institute of the Russian Academy of Sciences, St.-Petersburg (ZI), Kamchatka Institute of the Ecology and Environment of the Far East Branch of the Russian Academy of Sciences, Petropavlovsk-Kamchatsky (KIE), and Institute of Oceanology of the Russian Academy of Sciences, Moscow. These specimens are now deposited in the collections of ZI and KIE. Most of the worms are preserved in 70% alcohol, with some specimens on slides in Fore's liquid (an aqueous solution of chloral hydrate and gum arabic) for studying chaetal structure.

RESULTS

Genus *Bushiella* Knight-Jones, 1973

Subgenus *Bushiella* Knight-Jones, 1973

Bushiella (Bushiella) asymmetrica Rzhavsky, 1988

Fig. 1

Bushiella vitjazi: Rzhavsky 1988a: 867-869, fig. 2.

Bushiella asymmetrica: Rzhavsky 1988a: 865-867, fig. 1.

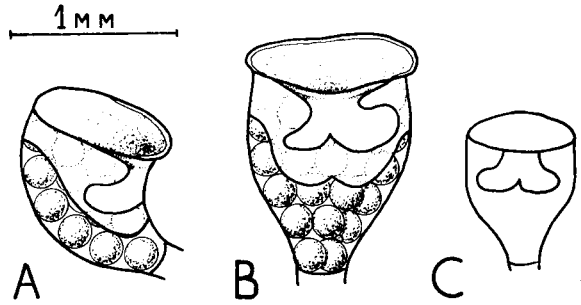
New records. R. V. "Nazarovsk" in 1988, Avachinskij Bay, East Kamchatka: St. 119, 52°53.6'N, 160°01'E; St. 114, 52°54.5'N, 160°03.4'E; St. 118, 52°53.6'N, 160°09.5'E (KIE, N°N° 1/2410, 2/2488, 2/2488 a, 3/2489 - 19 specimens).

Remarks. Descriptions of *Bushiella asymmetrica* and *B. vitjazi* Rzhavsky, 1988 were based on specimens of different age stages and extreme forms of individual variability in one species. The additional material clarifies this problem.

Tube usually conforms with original description for *B. asymmetrica*, and is rarely as described for *B. vitjazi* (see Rzhavsky 1988a, figs 1 A, B, 2 A, B). Primary operculum transparent, with flat distal plate (Fig. 1 C). Young specimens with mature operculum without embryos may have distal part of brood chamber domed (see Rzhavsky 1988a, fig. 1 V, G, D), but usually this is flat. All adults with embryos have distal part of brood chamber slightly concave (Fig. 1 A, B). Distal plate of primary operculum often forms a peripheral flange around the distal part of mature brood chamber (Fig. 1 B), but sometimes this flange may be absent or present only on the side of the talon (Fig. 1 A). Talon bilobed, symmetrical or asymmetrical (about 70% of specimens) (Fig. 1 B, C; see also Rzhavsky 1988a, figs 1 V, 2 V, G). Calcification around the talon distinct, often with grooved margin. Indistinct calcification in specimens originally described as *B. vitjazi* was probably a fixation artefact.

All other references to *B. asymmetrica* and *B. vitjazi* (i.e. Rzhavsky 1991, Knight-Jones et al. 1991) are based on the type material only.

Fig. 1. *Bushiella* (*B.*) *asymmetrica* Rzhavsky, 1988. A - lateral view of mature brood chamber with symmetrical talon and incomplete peripheral flange over the distal part. B - face view of mature brood chamber with asymmetrical talon and complete peripheral flange. C - face view of primary operculum with symmetrical talon.



Ecology. New material was collected at depths of 141-176 m, from inside empty shells of buccinids (Gastropoda) and the bivalve *Serripes groenlandica* (Bruguiere, 1789).

Distribution. North Kurile Islands, Sea of Okhotsk, East Kamchatka.

Bushiella (*Bushiella*) *evoluta* (Bush, 1905)

New records. Kole Bay, Is Fjord, West Spitsbergen (KIE, N°N° 4/890-9/895, 12/1992 - 23 specimens). R. V. "Vitjaz" in 1950, Kamchatskij Point and Olutorskij Bay, East Kamchatka: St. 523, 56°10.8'N, 163°32.1'E; St 558, 62°59.9'N, 178°15.7'E (KIE, N°N° 10/1990, 11/1991 - 5 specimens). R. V. "Nazarovsk" in 1988, Avachinskij and Kamchatskij Bays, East Kamchatka: 52°52'N, 158°49'E; 55°23'N, 161°51.4'E; 52°51.5'N, 159°19.5'E (KIE, N°N° 13/2411-15/2413).

Remarks. This species has been known from only a few records (Bush 1905, Knight-Jones 1984, Rzhavsky 1991, Knight-Jones et al. 1991). I suppose this arctic-boreal or amphiboreal species has been overlooked by collectors because of its specific place of settlement.

Ecology. New material was collected at depths of 3-18 and 75-116 m, from the inner sides of gastropod shells inhabited by hermit crabs.

Distribution. New Hampshire Bay, Newfoundland, West Spitsbergen, East Kamchatka from Avachinskij to Olutorskij Bay.

Subgenus *Jugaria* Knight-Jones, 1978

Bushiella (*Jugaria*) *beatlesi* sp.n.

Figs 2, 3

Holotype. ZI: N° 1/50382 - total preparation of the body on a slide in Fore's liquid. Tube damaged during preparation. Location: 6.1.85., St. 21 of 34th R. V. "Odisej", Pacific shore of Simushir Island (Kurile Islands), from tube of *Nothria con-*

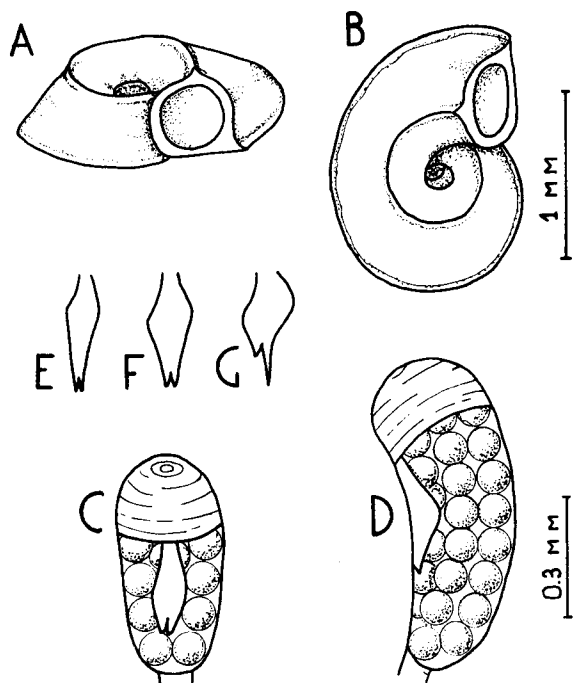


Fig. 2. *Bushiella (Jugaria) beatlesi* sp.n. A-B - tube. C-D - mature brood chamber, face and lateral view. E-G - variation of talon morphology.

chylega (Sars, 1865) (Polychaeta, Onuphidae). Coordinates and depth unknown.

Paratypes. ZI: N° 2/50383 - 24 specimens in alcohol, some without tubes. The locality is the same as holotype, from several tubes of *N. conchylega*; N° 2/50383 a - total preparation of three specimens on a slide in Fore's liquid, without tubes, the label is the same as holotype; N° 3/50384 - 1 specimen, without tube, in alcohol. Location: 14.1.85., St. 29 of 34th R. V. "Odissey", near Dushnaja Bay on the Pacific shore of Simushir Island (Kurile Islands), depth 150 m, from tube of *N. conchylega*. Coordinates unknown. KIE: N° 1/2405 - 10 specimens with tubes, in alcohol, the locality is the same as holotype.

Description. Tube sinistral, coiled in one plane, white, opaque, no more than 1.5 mm in coil diameter. One distinct median ridge and an inconspicuous peripheral flange are present (Fig. 2 A, B).

The body of fixed specimens is flesh-coloured, without pigmentation. Margins of thoracic membrane not fused dorsally over thoracic groove.

All specimens have mature brood chamber, usually with embryos. Distal plate of primary operculum fused to top of brood chamber. Distal part of brood chamber domed. Talon long, narrow, usually widening toward distally bifid end (Fig. 2 C, D). Sometimes talon may widen medially or basally (Fig. 2 E, F). One specimen with wide asymmetrical talon (Fig. 2 G). Calcification zone near talon absent, but probably this is a fixation artefact.

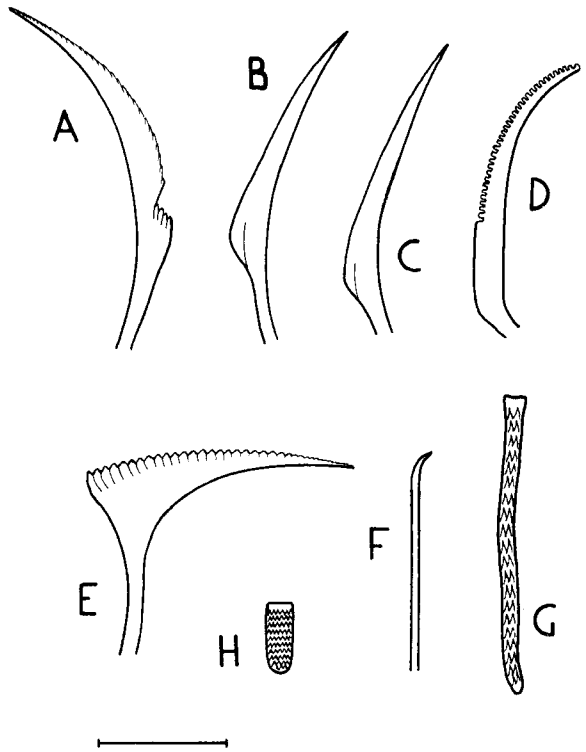


Fig. 3. *Bushiella (Jugaria) beatlesi* sp.n. A - collar chaeta. B-C - simple chaetae from 2nd and 3rd setigers. D - sickle chaeta from 3rd setiger. E - geniculate abdominal chaeta. F - hooked capillary abdominal chaeta. G - largest thoracic uncinus. H - abdominal uncinus. Scale bar: 0.025 mm.

Three thoracic setigers (two thoracic tori on concave side of body). Collar chaetae (Fig. 3 A) with proximal fin of teeth and finely serrated distal blade; accompanying capillary chaetae absent. Notochaetae of second and third setigers (Fig. 3 B, C) simple. Sickle chaetae also present in the third fascicle. Abdominal chaetae geniculate, coarsely serrated, and with optically dense projection extending beyond line of shaft (Fig. 3 E). One hooked capillary chaeta per fascicle present (Fig. 3 F).

Thoracic uncini very large, longer than blades of collar chaetae, with blunt anterior peg and two rows of teeth (Fig. 3 G). Abdominal uncini small, with blunt anterior peg and numerous longitudinal rows of teeth (Fig. 3 H). Abdominal tori distributed fairly symmetrically, largest of them in anterior half of abdomen.

Differential diagnosis. This species is closely related to *Bushiella (Jugaria) quadrangularis* (Bush, 1905) in having the distal part of the brood chamber domed, and very large thoracic uncini. The latter species, however, has a wider opercular talon with more pronounced wings, and the talon is usually diamond-shaped though it can be variable (see Knight-Jones et al. 1991). The widest talon of *B. (J.) beatlesi* may somewhat resemble that in *B. (J.) quadrangularis*, but its length far exceeds the width. Besides, *B. (J.) quadrangularis* tubes are up to 3 mm in coil di-

ameter when adult, and if only a single ridge is present, it is never median (see below).

Bushiella (J.) beatlesi is very similar to *B. (B.) evoluta* in structure of the talon and absence of calcification near the talon, but these species differ by many other features (tube and brood chamber morphology, collar chaetae structure) and ecology.

Etymology. The species is named after the musical rock group "The Beatles", whose songs were my early inspiration.

Ecology. One specimen was collected from 150 m depth; data for other specimens are unknown. Worms settle on the gravel tubes of *Nothria conchylega*. These onuphid tubes are very characteristic substrata for *Bushiella (Jugaria) kofiadii* (Rzhavsky, 1988), but the latter extends to the Arctic only exceptionally (Rzhavsky 1988b, 1991).

Distribution. Pacific shore of Simushir Island (Kurile Islands). Not known elsewhere.

Bushiella (Jugaria) acuticostalis Rzhavsky, 1991

New records. Monati Point, Bering Island, Commander Islands (KIE, N° 17/2079).

Remarks. The species was first described from three specimens, from the Sea of Okhotsk near Sakhalin. Extensive additional material from Atlasova Island (North Kurile Islands) was cited by Rzhavsky (1991) but not used for the description. Unlike the type material these specimens have calcification near the talon, which probably disappears in long preserved worms. Material also shows some variation in tube morphology; for example, tubes have three longitudinal ridges as a rule, but the outer ridge may be reduced or absent. On the other hand, some specimens have a slight fourth ridge towards the tube periphery. The specimens from hard substrata have low ridges in comparison with the type material (from hydrozoans).

Ecology. New material was collected from the tube of *Crucigera zygophora* (Johnson, 1901) (Polychaeta, Serpulidae), depth about 10 m.

Distribution. Sea of Okhotsk near Sakhalin, North Kurile and Commander Islands.

Bushiella (Jugaria) similis (Bush, 1905)

New records. Kole Bay, Is Fjord, West Spitsbergen (KIE, N°N° 26/1277, 27/1278 - 4 specimens. Guker Island, Franz Joseph Land (ZI - 2 specimens).

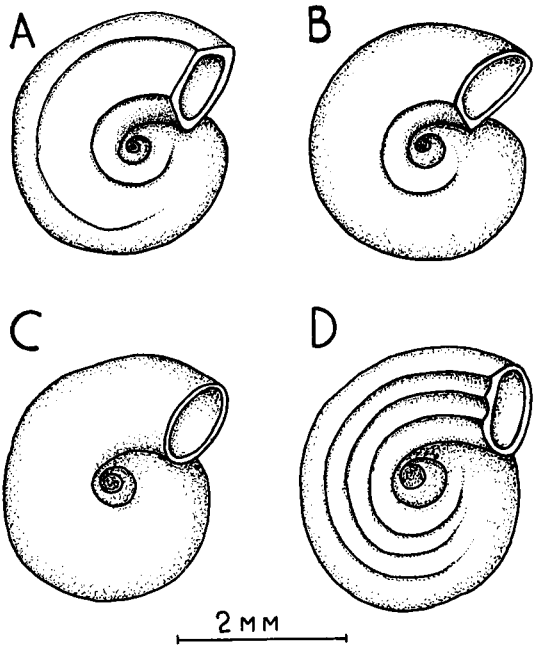


Fig. 4. *Bushiella (Jugaria) quadrangularis* (Bush, 1905). Variation of tube morphology. A - type form with two longitudinal ridges, giving subquadrangular cross section. B - tube with only inner ridge, resembling tube of *Bushiella (Jugaria) granulata*. C - tube without ridges and rounded in cross section, resembling *B. (J.) granulata* and *Bushiella (Jugaria) similis*. D - tube with three ridges which is also seen in young individuals of *Bushiella (B.) abnormis*.

Remarks. Tubes smooth or with one distinct median ridge, but always rounded in cross section. This is a widespread species in the northern hemisphere (Rzhavsky 1989, 1991). Possibly some records of "*Spirorbis granulatus*" from north west Europe may have involved confusion not only with *B. (J.) quadrangularis* (see Knight-Jones & Knight-Jones 1977, Knight-Jones et al. 1979) but with *B. (J.) similis* as well.

Ecology. New material was collected from gastropod shells inhabited by hermit crabs and from bryozoans, depth 20-25, 73 and 120 m.

Distribution. Sea of Japan, Sea of Okhotsk, East Kamchatka, Kurile and Commander Islands, Bering Sea, Kara Sea, Barents Sea, White Sea, Franz Joseph Land, West Spitsbergen, Alaska, San Francisco Bay.

Bushiella (Jugaria) quadrangularis (Bush, 1905)

Fig. 4

Remarks. This widespread species (Knight-Jones et al. 1979, 1991, Rzhavsky 1989) has various tube forms. Usually there is one longitudinal ridge towards the inside of the last whorl and another towards the periphery, giving a subquadrangular cross section. Such a tube is very characteristic of *B. (J.) quadrangularis* and was not seen in other species (Fig. 4 A). But the outer ridge is often indistinct or absent (Fig. 4 B), and the tube is then similar to the form typical of *B. (J.) granulata* Linne,

1758. Tubes may also be smooth and rounded in cross section (Fig. 4 C) like those of *B. (J.) similis* and *B. (J.) granulata*, or with three distinct ridges (Fig. 4 D), resembling young *Bushiella (Bushiella) abnormis* (Bush, 1905). All of these species are often intermixed and may be confused if only tube morphology is used to identify them.

REFERENCES

- Bush, K. J., 1905. Tubicolous annelids of the tribes Sabellides and Serpulides from the Pacific Ocean. - Harriman Alaska Exped. **12**: 169-355.
- Knight-Jones, P., 1984. A new species of *Protoleodora* (Spirorbidae, Polychaeta) from the Eastern U.S.S.R., with a brief revision of related genera. - Zool. J. Linn. Soc. **80** (2-3): 109-120.
- Knight-Jones, P. & E. W. Knight-Jones, 1977. Taxonomy and ecology of British Spirorbidae (Polychaeta). - J. mar. biol. Ass. U.K. **57** (2): 453-499.
- Knight-Jones, P., E. W. Knight-Jones & G. N. Buzhinskaja, 1991. Distribution and interrelationships of northern spirorbid genera. - Bull. Mar. Sci. **48** (2): 189-197.
- Knight-Jones, P., E. W. Knight-Jones & R. P. Dales, 1979. Spirorbidae (Polychaeta, Sedentaria) from Alaska to Panama. - J. Zool., Lond. **189** (4): 419-458.
- Rzhavsky, A. V., 1988a. Two new species of the genus *Bushiella* (Polychaeta: Spirorbidae). - Zoologicheskij zhurnal **67** (6): 865-869. (In Russian).
- Rzhavsky, A. V., 1988b. *Jugaria kofiadii* sp. n. (Polychaeta: Spirorbidae) from the Arctic Basin. - Zoologicheskij zhurnal **67** (6): 933-935. (In Russian).
- Rzhavsky, A. V., 1989. Spirorbidae (Polychaeta) off the East Kamchatka shores: 50-58. - In O. G. Kussakin (ed.): *Gidrobiologicheskie issledovaniya v Avachinskoj gube*. Akademia Nauk Press, Vladivostok. (In Russian).
- Rzhavsky, A. V., 1991. Composition of the genus *Bushiella* (Polychaeta: Spirorbidae) and distribution of its representatives in the seas of the USSR with description of a new species. - Zoologicheskij zhurnal **70** (3): 5-11. (In Russian).