To a species composition of subfamily Moelleriinae Hickman et McLean, 1990 (Mollusca: Gastropoda: Colloniidae) in the northwestern Pacific

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ABSTRACT. Two species of the subfamily Moelleriinae Hickman et McLean, 1990 – Moelleria costulata (Møller, 1842) and Spiromoelleria quadrae (Dall, 1897) – have been reported from the northwestern Pacific so far. The present paper clarifies their distribution in the region based on the museum collections and newly obtained material from the northwestern Pacific. Also, one more species, Spiromoelleria maculata (Golikov et Gulbin, 1978), which previously had been considered as a member of the genus Homalopoma Carpenter, 1864 (subfamily Colloniinae), is here suggested to be a member of Moelleriinae.

Introduction

Only three species had been known in the subfamily Moelleriinae Hickman et McLean, 1990 – Moelleria costulata (Møller, 1842), Spiromoelleria quadrae (Dall, 1897) and Spiromoelleria kachemakensis Baxter et McLean, 1984. Two of them have been reported from the northwestern Pacific so far – Moelleria costulata and Spiromoelleria quadrae [Golikov, Gulbin, 1978; Kantor, Sysoev, 2006; Sirensko et al., 2013].

All these species have a calcareous operculum and rhipidoglossate radula, as do the members of the genus Homalopoma Carpenter, 1864 (prior to the present work, the latter genus was placed in the subfamily Colloniinae Cossmann, 1916 [Schroeder, 2012]). But Moelleria Jefferys, 1865 and Spiromoelleria Baxter et McLean, 1984 differ from Homalopoma in its having an operculum with a multispiral pattern on its exterior surface, and having the operculum unable to retract deeper than flush with the apertural margin [Baxter, McLean, 1984] (compare Figs 1 A, E and Figs 2 A-B). In accordance with this, the species, which was earlier described as Homalopoma maculata Golikov et Gulbin, 1978 (Figs 2 C-D), should be removed from the genus Homalopoma, because its operculum has a multispiral pattern of the inner side, and it is unable to retract beyond the aperture.

The spiral sculpture of Homalopoma maculata is characteristic for Spiromoelleria, and Homalopoma maculata does not have the typical feature of the genus Moelleria – the coalescing axial sculpture (compare Figs 1 A, B and Figs 2 C-D). So in this paper we place Homalopoma maculata in the genus Spiromoelleria. Additionally, based on the new findings in the Sea of Japan, Okhotsk, Bering and Chukchi seas we clarify the distribution of the species of the subfamily Moelleriinae in the NW Pacific.

Materials and methods

The material described in the article is housed in the collections of the Zoological Institution of the Russian Academy of Sciences, Saint-Petersburg (ZISP) and was collected off eastern Kamchatka in

The shells were studied using MSP-2 stereomicroscope with DCM-130 digital camera. Scanning electron microphotographs of the radulae were taken with a FEI SEM Quanta 250. Radulae were examined with a DCM-130 digital camera. Scanning electronic microscope with DCM-130 digital camera. Scanning

**Abbreviations used:**

- H – shell height;
- KB PGI – Kamchatka Branch of Pacific Geographical Institute, Russian Academy of Sciences;
- LMBI – Laboratory of Macroecology and Biogeography of Invertebrates, Saint-Petersburg State University;
- USNM – National Museum of Natural History, Smithsonian Institution, Washington DC;
- ZISP – Zoological Institute, Russian Academy of Sciences;
- ZMUC – Zoological Museum of the University of Copenhagen, Denmark.

**Taxonomic description**

**Class Gastropoda**

**Subclass Vetigastropoda**

**Superfamily Phasianelloidea**

**Genus Moelleria**

**Type species:** *Margarita costulata* Moller, 1842 (by monotypy).

*Moelleria costulata* (Moller, 1842)  
(Figs 1 A-C, Fig. 3 (squares))


**Type material:**  

**Type locality:** West Greenland: “Baals River”, Julianehaab [Schioette, Warén, 1992].

**Material studied:** The Sea of Okhotsk, ZISP 54252/60, near Sakhalin Island, 49°01.0’N, 144°41.5’E, 75 m, R/V “Toporok”, 06.06.2014, st. 25, 1 alive. KB PGI, Kamchatka Bay, 55°10.0’N, 165°2.1’E, 200 m, R/V “MRTK-316”, 07.06.2013, st. 5, 2 alive. KB PGI, Kamchatka Bay, 55°30.0’N, 162°0.5’E, 250 m, R/V “MRTK-316”, 05.06.2013, st. 11, 1 alive. The Bering Sea, ZIN 46303/53, Korfa Bay, 16 m, R/V “Raduga”, SCUBA, 27.07.1975, 1 alive. The Chukchi Sea, ZIN 60808/62, 70°45.58’N, 175°32.0’W, 71.8 m, R/V “Professor Khromov”, st. 106, 18.08.2004, 1 alive. ZIN 60808/63, 71°23.73’N, 174°54.7’W, 69.7 m, R/V “Professor Khromov”, st. 62B, 21.08.2004, 1 alive. ZIN 61938/64, 68°20.04’N, 167°10.09’W, 30 m, R/V “Professor Khromov”, st. CS-17, 01.09.2012, 1 dead. The Barents Sea, LMBI, Murman Coast, Dolgaya Inlet, 69°10.23’N, 34°57.39’E, 13 m, R/V “Dalnie Zelentsy”, st. SS-2, 29.05.09, 19 alive (radula of 1 spec. studied with SEM); LMBI, Murman coast, Yarnyshnaya Inlet, 69°07.64’N, 36°02.01’E, 73 m, M/S “Viking-2”, st. 5-2, 19.09.12, 1 alive (radula studied with SEM); LMBI, Svalbard, Hopen, 76°11.042’N, 23°11.776’E, 49 m, R/V “Dalnie Zelentsy”, st. 20-2, 21.08.08, 24 alive (radula of 2 spec. studied with SEM).

**Remarks.** We observed the same variability in the shell sculpture of this species as MacGinitie [1959], who reported shell variation for individuals collected off Point Barrow, Alaska, the Chukchi Sea. Baxter and McLean [1984] wrote that the number of spiral cords on shell base varies from 0 to 9.

**Distribution.** Circumpolar in the Arctic Ocean. In the Atlantic distributed south to Maine, Greenland, Iceland, and Morocco. Alaskan distribution from Attu, Aleutian Islands, to Turner Bay, Taku Inlet, southeastern Alaska [Baxter, McLean, 1984]. The species was found in the northern-west Bering Sea (Korfa Bay) for the first time.

**Genus Spiromoelleria**

**Type species:** *Moelleria quadrae* Dall, 1897 (by original designation).

*Spiromoelleria quadrae* Dall, 1897  
(Figs 1 D-F, Fig. 3 (triangles))

*M. quadrae* Dall, 1897: 15, pl. 1, figs 14, 14a.  
*Moelleria quadrae*. – Abbott, 1974: 61; 183;  

Subfamily Moelleriinae (Gastropoda: Colloniidae) in the northwestern Pacific

FIG. 1. *Moelleria costulata* and *Spiromoelleria quadrae*. A-C. *Moelleria costulata*. A. ZISP 46303/53, Bering Sea, Korfa Bay, 16 m, R/V “Raduga”, SCUBA, 27.07.1975, H=1.9 mm. B. LMBI, Murman coast, Yarnyshnaya Inlet, 69°07.64'N, 36°02.01'E, 73 m, M/S “Viking-2”, st. 5-2, 19.09.12, H=5.3 mm; C. LMIBI, Murman Coast, Dolgaya Inlet, 69°10.23'N, 13 m, R/V “Dalnie Zelentsy”, st. 5S-2, 29.05.09, radula; D-F. *Spiromoelleria quadrae*. D. ZISP 58632/1, Kachemak Bay, 59°20.0'N, 151°36.0'W, 0-46 m, 1957-1979. H = 1.8 mm and 1.4 mm, respectively. E. ZISP 27600/1, Simushir Island, Krasnovataya rocks, 20 m, sealer “Krilatka”, st. 247, sample 608, 07.09.1970. H=1.5 mm. F. Yukon Island, Kachemak Bay intertidal, radula [from: Baxter, McLean, 1984: 221, fig. 3].
Spiromoelleria quadrae was collected near Midle Kurile Islands, Simushir Island, near Aleutian Islands, Attu and Amchitka Islands, near Kodiak Island, in Kachemak Bay, Prince William Sound, and Cumnshewa Inlet, British Columbia [Baxter, McLean, 1984; Sirenko et al., 2013].

Spiromoelleria maculata (Golikov et Gulbin, 1978) comb. nov.
(Figs 2 C-F, Fig. 3 (circles))

Homalopoma maculata Golikov, Gulbin, 1978: 181, fig. 7; Kantor, Sysoev, 2006:42, pl. 18 G-G; Gulbin, Chaban, 2012: 13; Sirenko et al., 2013: 152.

Type material: Holotype ZISP 27608/1.

Type locality: Pacific ocean, middle Kurile Islands, Ekarma Island, 1.5 nautical mile to the west of Cape Krugliy, 20 m, sealer “Krilatka”, st. 341, sample 898, 16.10.1971.

Material studied: The holotype. The Sea of Okhotsk, ZISP 38068/15, Shelikhova Bay, 100 m, R/V “Baidar”, st. 61, 27.08.1964, 1 dead. KB PGI, Near northwest Kamchatka, 359 m, R/V “TINRO” st. 83, sample 3 11.08.2013, 1 alive. KB PGI, Near northwest Kamchatka 364 m, R/V “TINRO” st. 75, sample 2, 11.08.2013, 1 alive. KB PGI, 57°27.0’N, 155°10.2’E, 253 m, R/V “Professor Probatoch” st. 75, sample 2, 15.08.2013, 1 alive. KB PGI, 58°12.6’N, 156°03.0’E, 359 m, R/V “Professor Probatoch” st. 83, sample 3, 11.08.2013, 1 alive. KB PGI, 55°14.4’N, 154°47.7’E, 101 m, R/V “Professor Probatoch”, st. 17, 01.08.2013, 1 alive. KB PGI, 57°58.5’N, 154°46.6’E, 384 m, R/V “Professor Kizevetter”, st. 80, 29.06.2014, 1 alive. KB PGI, 57°27.0’N, 155°10.0’E, 384 m, R/V “TINRO”, st. 66, 01.07.2015, 2 alive. Kurile Islands, ZISP 27603/4, Simushir Island, Brounta Bight, 15 m, sealer “Krilatka”, st. 209, sample 488, 25.08.1970, 2 alive. ZISP 27604/5, Simushir Island, Brounta Bight, 15 m, sealer “Krilatka”, st. 209, sample 490, 25.08.1970, 2 alive. ZISP 27601/2, Simushir Island, Srdniyiy Bight, 15 m, sealer “Krilatka”, st. 255, sample 630, 09.09.1970, 1 alive. ZISP 27602/3, Simushir Island, Srdniyiy Bight, 20 m, sealer “Krilatka”, st. 256, sample 632, 09.09.1970, 3 alive. ZISP 27606/7, Simushir Island, 3 nautical mile to north-east from Cape Polyniskyi, 15 m, sealer “Krilatka”, st. 284, sample 673, 09.09.1970, 1 alive. ZISP 27607/8, Makanrushi Island, 1 nautical mile to south from Cape Vecherniy, 20 m, sealer “Krilatka”, st. 325, sample 858, 10.09.1971, 1 alive. The Sea of Japan, ZISP 35905/11, Moneron Island, Chuprova Bight, 15-17 m, R/V “Maiskoe”, st. 4, 22.08.1972, 1 alive. ZISP 35906/12, Moneron Island, Kologerasa Bight, 50-70 m, R/V “Maiskoe”, st. 17, 25.08.1972, 1 alive. ZISP 35907/13, Moneron Island, 46°15.5’N, 141°15.6’E, 65-70 m, R/V “Maiskoe”, st. 34, 27.08.1972, 1 alive. ZISP 35908/14, Moneron Island, 46°16.7’N, 141°10.6’E, 115 m, R/V “Maiskoe”, st. 42, 30.08.1972, 1 alive. The Bering Sea, ZISP 48575/16, Commander Islands, Bering Island, 55°17.6’N, 166°37.8’E, 130-150 m, R/V “Rakitnoe”, st. 174, 21.09.1973, 1 alive. ZISP 33718/10, Kamchatka Peninsula, Otolutskiy Bay, 116 m, R/V “Raduga”, grab “Ocean” N2, 25.07.1975, 1 alive. ZISP 62086/17, Bering Strait, 65°50.20’N, 169°10.0’W, 44 m, R/V “Akmadik Korolet”, st. 78, 16.08.1988, 1 dead.

Description. We are giving a translation from Russian of the original description [Golikov, Gulbin, 1978] with additional comment on the operculum: “Shell small, low conical, with three quickly growing, prominent, rounded whorls, divided with distinct depressed suture. Spire low, crowded. Last whorl most prominent, evenly rounded and occupy 18/19 of shell height. Color of shell not uniform: spots and strips (often vertical) from light brown to dark brown on dirty-grey ground. Axial sculpture consists of irregularly placed deep growth lines. Spiral sculpture consists of distinct, slightly flattened ribs, interspaces as wide as the ribs. Ribs arranged more compactly on the shell base. There are about 20 ribs on the last whorl. Aperture round-
FIG. 2. Homalopoma amussitatum (Gould, 1861) and Spiromoelleria maculata. A-B. Homalopoma amussitatum ZISP 1739/26, Japan Sea, Posjet Bay, 5-7 m, 8.10.1965. A. shell, H= 7 mm. B. Operculum of the same exemplar. C-E. Spiromoelleria maculata. C. Holotype of Homalopoma maculata, ZISP 27608/1, H= 2 mm. D. ZISP 62086/17, Bering Strait, 65º50.2’N, 169º10.0’W, 44 m, R/V “Akademik Korolev”, st. 78, 16.08.1988, H= 1.8 mm. E. 57º58.5’N, 154º46.6’E, 384 m, R/V “Professor Kizevetter”, st. 80, 29.06.2014, H= 2.4 mm. F. KB PGI, 57º39.4’N, 155º57.6’E, 100 m, R/V “Professor Probatov”, st. 75, sample 2, 15.08.2013, radula.
ed, with closed peristome. Inner and outer lips of aperture thin, evenly rounded, imperceptibly transfer to each other. Umbilicus semicircular, wide, but not deep. Height of shell of holotype 2.0 mm, height of aperture 1.45 mm, width of aperture 1.4 mm.

Largest specimen, collected near Simushir Island in Broutona Bight at depth 15 m, on sandy and stony bottom with shell, having 2.5 mm in height, diameter of last whorl 3.1 mm, height of last whorl 2.25 mm, height of aperture 1.75 mm, width of aperture 1.65 mm.

Rachidian tooth of radula wide, almost square. Five lateral teeth; length of their blades increases from the middle of radula to edges. About 20 marginal teeth.”

Comparison of radulae of three species (Fig. 1C, F, 2F) shows some similarities and differences. Radulae of *Moelleria costulata* (Fig. 1C) and *Spiromoelleria quadrae* (Fig. 1F) have rachidian teeth with narrowed appendix in center of the top, whereas rachidian teeth of *Spiromoelleria maculata* (Fig. 2F) have no appendix. Lateral teeth of *Moelleria costulata* and *Spiromoelleria quadrae* have sharp distal part, whereas *Spiromoelleria maculata* has lateral teeth without distal part like *Homalopoma luridum* (Dall, 1885) [Hickman, McLean, 1990, Fig. 20A]. Fide Hickman and McLean [1984] the main difference of radulae of Coloniiniae from Moel-

**Remarks.** Careful examination of the type material of *Homalopoma maculata* revealed a mistake in the generic position of the species. It has a multispiral operculum, which is typical character for the subfamily Moelleriiniae, but not of the subfamily Colloniiniae which includes genus *Homalopoma*. Taking into consideration the multispiral operculum and spiral sculpture of *H. maculata*, we suggest it to be a member of *Spiromoelleria*.

*Spiromoelleria costulata* is very similar to Alaskan *S. kachemakensis* Baxter et McLean, 1984, but differs from it by having 20 spiral ribs on the last whorl (vs. 35-50 ribs in *S. kachemakensis*). Probably *S. kachemakensis* is endemic to the Gulf of Alaska, because Baxter and McLean [1984] reported that this species is absent near Kodiak Island and to the west.

**Distribution.** Previously *Spiromoelleria maculata* was collected in the Sea of Japan (near Moneron Island), near Middle Kurile Islands (Simushir, Ekarma, Makanrushi and Rasshua Islands), and near Commander Island [Golikov, Gulbin, 1978: 181–182; Kantor, Sysoev, 2006: 42; Gulbin, Chaban, 2012: 13; Sirenko et al., 2013: 152]. The species is mentioned for the first time from the Sea of Okhotsk and the Bering Sea (Olutorskiy Bay and the Bering Strait).

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**References**


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Subfamily Moelleriinae (Gastropoda: Colloniidae) in the northwestern Pacific


К видовому составу подсемейства Moelleriinae Hickman et McLean, 1990 (Mollusca: Gastropoda) в северо-западной Пацифике

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РЕЗЮМЕ. В северо-западной Пацифике ранее были известны только два представителя подсемейства Moelleriinae Hickman et McLean, 1990 – Moelleria costulata (Moller, 1842) и Spiromoelleria quadrae (Dall, 1897). В данной работе на основании изучения коллекционного материала и новых сборов произведено уточнение ареала этих видов, и в состав подсемейства Moelleriinae включен еще один вид – Spiromoelleria maculata (Golikov et Gulbin, 1978), который ранее считался представителем рода Homalopoma Carpenter (подсемейство Coloniinae), 1864.