

ASCIDIANS FROM THE NORTH-WESTERN PACIFIC REGION. 2. MOLGULIDAE

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ABSTRACT

The ascidians (Ascidiacea) collected during several expeditions to the NW. Pacific region were examined. Seven species of the family Molgulidae were found, of which *Molgula tzetlini* is described as a new species.

Key words: North-Western Pacific, new species, Molgulidae.

INTRODUCTION

Only 7 species of the family Molgulidae were collected during several expeditions to the Aleutian, Commander and Kurile Islands, Kamchatka, Bering Sea, Sea of Okhotsk and Sea of Japan.

Among them *Molgula retortiformis* is one of the commonest species, it was found in abundance along the coasts of East Kamchatka. *Pareugyrioides dalli* and *Eugyra glutinans* are also common on sandy bottoms of the Sea of Japan but rare in more northerly waters. *Molgula rotunda* is a very rare species that was originally described for a single specimen in 1914 by Oka and now only has another specimen, apparently belonging to this species, been found again. One new species was obtained in the present collections: *Molgula tzetlini* n.sp.

The following material was examined:

(A) R. V. "Lebed", 1954. North Kurile Islands (mainly Paramushir and Shumshu). Dredging. Coll. A. Spirina.

(B) R. V. "Ac. Oparin", 1986. Sea of Okhotsk and Kurile Islands. Dredging. Coll. A. Smirnov.

(C) R. V. "Ac. Oparin", 1988. Kurile Islands and Sea of Okhotsk. Dredging. Coll. E. N. Gruzov.

(D) R. V. "Ac. Oparin", 1991. Alaska, Aleutian, Commander and Kurile Islands, East Kamchatka. Dredging and SCUBA diving. Coll. A. Smirnov.

(E) Collection of the Far East State Sea Reservation (FESSR) from the Sea of

Japan. 1980-1991. SCUBA diving. The collection was kindly placed at my disposal by the director of FESSR Dr. A. Osolinsh.

(F) Collection of the Kamchatka Institute of the Ecology and Environment (KIEE). 1984-1992. Commander Islands, East Kamchatka and Atlasov Island (North Kurile group). SCUBA diving and dredging. Collectors: collaborators of the Lab. of Benthic Communities.

The collections are deposited: A, B, C, D - Zoological Institute (ZIN), St. Petersburg. E, F - Kamchatka Institute of the Ecology and Environment (KIEE), Petropavlovsk-Kamchatsky.

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Molgula griffithsii (MacLeay, 1825)

For synonymy see Van Name 1945: 374.

Material examined: (A) Kurile Islands, Paramushir: 50°13.7'N, 156°20.2'E, st. 173, 94 m, 9.8.1954, 3 specimens; 50°8.4'N, 156°25.3'E, st. 49, 71 m, 5.7.1954, 17 specimens. (F) Kamchatka, Avacha Bay: 53°03'N, 159°03'E, st. 22, 42 m, 26.5.1988, 5 specimens. Lopatka Point, 50 m, 13.7.1985, 1 specimen.

Distribution. "Circumpolar in the Arctic region" (Van Name 1945). In the North Pacific region this species occurs in Bering Sea, Sea of Okhotsk and Sea of Japan (Redikorzev 1916, Van Name 1945).

Molgula redikorzevi Oka, 1914

Molgula redikorzevi Oka 1914: 446; Nishikawa 1991: 167 with synonymy.

Material examined: (A) Kurile Islands, 4th Kurilian Strait, 49°51'N, 155°14.4'E, st. 164, 190-195 m, 8.8.1954, 5 specimens. (B) Sea of Okhotsk, Academy Bay, 53°41.3'N, 137°50.5'E, st. 39, 18 m, 1.8.1986, 22 specimens.

Remarks. In the present study I follow Nishikawa (1991) in regarding *M. redikorzevi* as being distinct from *M. griffithsii*, but with some reservations. All the specimens from the Sea of Okhotsk (collection B) have conical projections up to 1-1.5 mm tall and 1.5-2 mm in diameter distributed over the test surface. Such projections occur also in some specimens of *M. griffithsii*, see, for example, *M. crystallina* var. *tuberculata* Redikorzev (Redikorzev 1908) - one more feature connecting these two closely related species. *M. redikorzevi* and *M. griffithsii* are separated only by different degrees of development and position of testis, but, as was noted by Nishikawa (1991), intermediate forms are very few, and I have never seen any specimens from NW Pacific with an intermediately-developed gonad.

Distribution. Kamchatka, Sea of Okhotsk, Northern part of the Sea of Japan (Oka

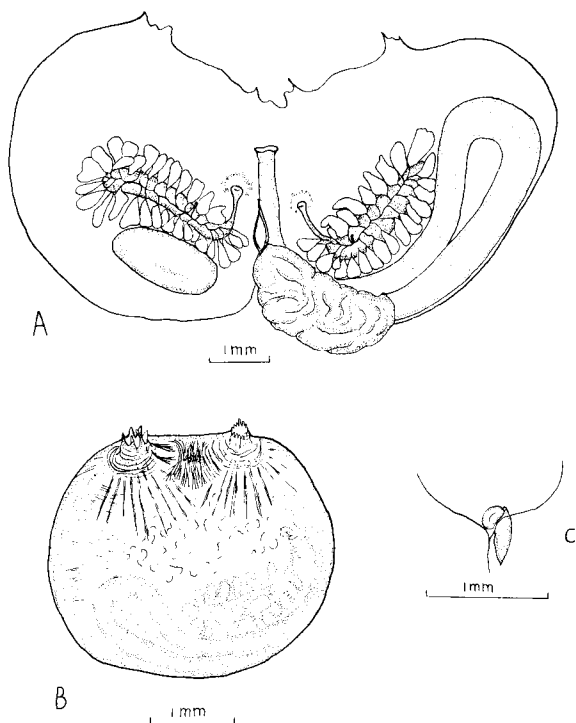


Fig. 1. *Molgula tzetlini* n.sp. (Holotype). A, inner side of the body; B, left side of the mantle body; C, dorsal tubercle and ganglion.

1914, Redikorzev 1916), North Kurile Islands (present study), Okhotsk Sea, coast of Hokkaido (Nishikawa 1991).

Molgula tzetlini n.sp.

Fig. 1

Material examined: (F) Medny (Cooper) Island, Bering Sea coast, Korabelny Point, intertidal zone, under a stone, 2 specimens, 30.7.1992, coll. A. Michailov and K. Sanamyan. Holotype - KIEE 1/516, paratype - KIEE 2/517.

Description. Body nearly globular, 7 mm (holotype) and 5 mm (paratype) in diameter. Siphons very short, but clearly visible, situated terminally. Test surface covered with minute hemispherical projections. Test colorless and transparent, furnished with few sand grains.

Branchial aperture 6-lobed, atrial 4-lobed; each lobe of atrial siphon divided into 4-6 pointed lobules. Both vela developed, though not extensively. Mantle musculature composed of fine circular muscle fibers around siphons, and thick bundles radiating from siphons extending down to anterior half or one-third of body. Area over dorsal ganglion completely covered with short transverse muscles. Two parallel bunches of muscle fibers extending from branchial siphon to

neural complex area. Two longitudinal rows of short, fine, transverse muscles along endostyle on each side. Eight large and 8 small tentacles, alternating; branched, rarely in 2 orders. Dorsal tubercle with a longitudinal slightly curved slit, placed near neural ganglion. Dorsal lamina with plain margin. Seven branchial folds on each side, all folds well developed except one ventral-most fold in each side represented by only 1-2 longitudinal vessels. Arrangement of longitudinal vessels in holotype as follows:

R: D0(5)0(6)0(6)0(6)0(5)0(5)0(2)0E

L: D0(5)0(5)0(5)0(6)0(5)0(3)0(1)0E

Five transverse vessels; 8 longitudinal rows of infundibula, ventral-most row with 12, others each with 6 infundibula. All infundibula prominent except those of dorsal- and ventral-most rows; dorsal-most row free from vessels and represented by small rudimentary infundibula. Apex of some infundibula indistinctly divided into two summits. Stigmata relatively long, each make 0.5-1 turn, radial parastigmatic vessels numerous.

First intestinal loop long and narrow, with open area terminally (Fig. 1 A); second loop widely open, with very long rectum. Anus smooth-edged. Liver voluminous, well-developed, plicated but not papillated.

One gonad on each side, elongated and nearly straight; left one in second intestinal loop, right along anterior margin of renal sac. Each gonad composed of central ovary and large marginal testicular follicles. Oviduct relatively long, opening on dorsal side, near rectum. Vas deferens situated along middle of mesial surface of ovary, opening on top of minute papillae on surface; one papilla in each gonad in paratype, one on left side and two on right in holotype (Fig. 1 A). Ring of minute projections on inner body wall around oviduct opening.

Remarks. The new species seems very similar to *Molgula primitiva* Redikorzev in the 7 branchial folds, deep second intestinal loop with long rectum, and the shape, position and structure of the gonad. But *M. primitiva* has "dorsal lamina with deeply serrated margin and bear about 20 long languets of various size" (Redikorzev 1941), liver developed only on ventral side of the stomach, while *M. tzetlini* has plain-edged dorsal lamina and well-developed liver completely covering the stomach. Further, *M. primitiva* has many more oral tentacles (60 instead of 16 in the new species), and relatively long siphons.

Among other North Pacific species, *M. tzetlini* resembles specimens collected from Hakodate and referred to as *M. xenophora* Oka by Tokioka (1967), especially in the arrangement of body muscles. These specimens differ somewhat from typical *M. xenophora* in the arrangement of muscles and were included only provisionally in the synonymy of *M. xenophora* by Nishikawa (1991). *M. tzetlini* differs from the Hakodate specimens and typical *M. xenophora* in having a more or less smooth

test, a smaller number of relatively large testicular follicles and a smaller number of apertures of vas deferens.

The east Pacific species, *M. pugetiensis* Herdman seems also to be related to *M. tzetlini*. But *M. pugetiensis* has its test surface covered with hairs and sand; the gonads of *M. pugetiensis* are more compact, elliptical in outline and not elongated, the testicular follicles are smaller and more numerous and are distributed less regularly around the ovary than in *M. tzetlini*. Further, according to descriptions given by Huntsman (1912) and Van Name (1945), *M. pugetiensis* has 6-8 male openings in each gonad, instead of 1-2 in the new species. Although the presence or absence of sand incrustation of the test may be due to different habitat conditions (*M. tzetlini* was found on rocky bottom), the differences in the structure of gonads seems to have taxonomic significance.

In having a smooth test, small size of the body and a general structure of the gonad with 1-2 male openings, *M. tzetlini* resembles also *M. citrina* Alder and Hancock from arctic and Atlantic waters. Based on a number of specimens of *M. citrina* from the White Sea in the KIEE collection I can make the following distinctions between the two species: *M. citrina* has a compact gonad with a very long oviduct and small, branched, grape-like male follicles, whereas in *M. tzetlini* the oviduct is shorter, and the male follicles are relatively large, not branched; *M. citrina* has a large dorsal tubercle with a horseshoe-shaped groove with the opening directed to the right. The dorsal tubercle of *M. citrina* seems constant in shape and differs from the dorsal tubercle of the new species.

Hitherto, only *M. eobia* Redikorzev and *M. retortiformis* Verrill have been known from the Commander Islands and both species differ markedly from *M. tzetlini*: *M. eobia* has small oval or roundish stigmata and a short rectum, *M. retortiformis* has ovary and testis separated.

Etymology. The species is named after Dr. Alexander B. Tzetlin.

Molgula sp. cf. *rotunda* Oka, 1914

Fig. 2

Molgula rotunda Oka 1914: 448; Redikorzev 1916: 83.

Material examined: (A) Kurile Islands, 4th Kurilian Strait, st. 164, 49°51'N, 155°14.3'E, 190-195 m, 8.8.1954, 1 specimen.

Description. Body nearly globular, 14 mm in diameter. Siphons situated terminally, but indistinct. Test thin, transparent; surface with numerous hair-like processes, densely covered with sand and hydrozoan colonies.

Mantle musculature composed of radial and circular siphonal muscle fibers. Detail structure of body muscles can not be observed because of poor preservation. About 14 tentacles branched in 2 orders. Ciliated groove C-shaped, open

posteriorly. Seven branchial folds on each side. Longitudinal vessels on right side arranged as follow:

D0(11)0(11)0(11)0(10)0(10)0(5)0(3)0E.

Stigmata irregularly interrupted. Five transverse vessels; seven longitudinal and transverse rows of nearly flat infundibula.

First intestinal loop long, with bottom part containing an open area, second loop widely open. Anus bilobed. Liver irregularly plicated longitudinally. Right gonad straight, parallel to elongated renal sac, with terminal short oviduct curved ventrad (Fig. 2 A). Left gonad situated in second loop and U-shaped; oviduct on tip of postero-ventral branch. Each gonad composed of central ovary filled with eggs, and peripheral testis. Testicular follicles situated mainly along dorsal side of each gonad, each follicle divided into several lobes distally. Common sperm duct running along mesial surface of ovary with 2 male openings on right gonad and 1 on left.

Mature eggs found in peribranchial cavity.

Remarks. The present specimen accords very well with Oka's (1914) original, and so far single, description in many features including the body size, the external appearance, the shape of the ciliated groove, the arrangement of the gut loop, and especially in the remarkably recurved gonad on the left side and the peculiar orientation of the oviduct on the right. However, the present specimen is markedly distinguishable from *M. rotunda* by the number of branchial folds. *M. rotunda* has only 6 folds on each side and fewer (4-5) vessels in each fold. This difference in the number of branchial folds is regarded to be of certain taxonomic significance for the specific discrimination of *Molgula*.

The original description of this species was based on a single specimen from Kamchatka waters; in the present collection also, only one specimen occurs. Therefore, I propose here to call the present specimen *Molgula* sp. cf. *rotunda*, rather than to attempt to establish a new species status for it.

Molgula retortiformis Verrill, 1871

For synonymy see Van Name 1945: 422.

Material examined: (A) Kurile Islands: 50°2.6'N, 155°36.1'E, st. 154, east of Paramushir Isl., 59 m, 6.8.1954, 1 specimen; 50°7.8'N, 156°2.8'E, Kruzenschtern Point, st. 168, 69-72 m, sand, 9.8.1954, 1 specimen. (D) South Kamchatka: 50°40.8'N, 156°42.3'E, 61 m, sand, 3.9.1991, 1 specimen. Kurile Islands: 50°39.5'N, 156°43'E, Shumshu Isl., st. 58, 66 m, sand, 3.9.1991, 1 specimen. (F) Kamchatka, Litke Strait: 59°07'30"N, 163°55'E, st. 384, 27 m, 23.9.1988, 3 specimens. Korfa Bay: 60°03'N, 165°57'E, st. 407, 43 m, mud, stones, 18.9.1988, 1 specimen; 60°09'30"N, 165°43'E, st. 406, 33 m, 2 specimens. Kronotsky Bay:

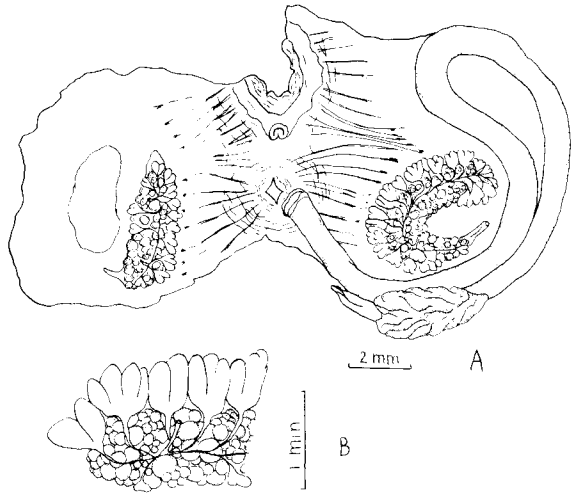


Fig. 2. *Molgula* sp. cf. *rotunda*. A, inner side of the body; B, distal part of the right gonad.

53°04'8"N, 159°31'2"E, st. 65, 58 m, muddy sand, 25.5.1988, 2 specimens; 53°51'6"N, 159°58'8"E, st. 140, 45 m, 12.5.1988, 2 specimens; 54°27'5"N, 160°59'E, st. 126, 43m, stones, 14.5.1988, 1 specimen; 54°29'N, 161°03'2"E, st. 132, 34 m, 14.5.1988, 1 specimen; 53°47'N, 160°02'9"E, st. 154, 62 m, 12.5.1988, 1 specimen; 53°41'N, 160°04'E, st. 141, 75 m, sand and small stones, 11.5.1988, 1 specimen; Expedition Rock, 12 m, 3.9.1985, 4 specimens. Avacha Bay: 53°05'8"N, 159°38'1"E, st. 39, 50 m, muddy sand, 25.5.1988, 7 specimens; Staritchkov Isl., 7 m, large stones, 7.8.1985, 100 specimens; Russia Bay, 4 m, 14.7.1985, 5 specimens; Nalichev Point, 5-11 m, rock, stones, 14.9.1988, 9 specimens. South Kamchatka: Krestovy Point, 11 m, rock, 10.8.1985, 42 specimens. Kurile Islands: Shumshu Isl., Kekkurny Point, 20 m, without data, 5 specimens.

Remarks. This species is well known, and is one of the commonest ascidians in East Kamchatka waters, although our material from the Commander Islands lacks this species completely.

Distribution. NE. coast of N. America, Greenland, Iceland, Spitzbergen, Barents Sea, White Sea, Siberian waters. Kamchatka, Alaska, Sea of Okhotsk (Redikorzev 1916, 1941, Millar 1966).

Eugyra glutinans (Moeller, 1842)

For synonymy see Van Name 1945: 433; Tokioka 1953: 23.

Material examined: (E) Sea of Japan, Peter the Great Bay, 32 m, muddy sand, 2.6.1985, 60 specimens; 13.3.1985, 60 specimens.

Distribution. "A true circumpolar species" (Van Name 1945). Bering Sea, Sea of

Okhotsk, Sea of Japan (Redikorzev 1916, 1941, Nishikawa 1991), Aleutian Islands (Ritter 1913), California (Van Name 1945).

Pareugyrioides dalli (Ritter, 1913)

Fig. 3

Eugyrioides dalli Ritter 1913: 441.

For synonymy see Van Name 1945: 431 and Nishikawa 1991: 154.

Material examined: (A) Kurile Islands, Paramushir Isl., 50°01'N, 155°18.8'E, st. 100, 27 m, sand, 20.7.1954, 1 specimen. (D) Kurile Islands, Shumchu Isl., Pacific coast, 50°39.5'N, 156°43'E, st. 58, 66 m, 3.9.1991, 1 specimen. (E) Sea of Japan, Peter the Great Bay, 20 m, 2.8.1982, 6 specimens; 37 m, 5.9.1988, 27 specimens; 24 m, 28.8.1980, 7 specimens. (F) 16 specimens without labels but apparently from the South Sachalin.

Remarks. All the specimens, 5-35 mm long and sand-encrusted, agree well with the previous descriptions of *P. dalli*, especially the very detailed one given by Redikorzev (1916) for specimens referred to by him as *P. japonica* Hartmeyer but transferred to *P. dalli* by Nishikawa (1984, 1991). Van Name (1945, p. 432, fig. 317) shows that the right ovary is nearly straight but curved only a little, describing that "its somewhat narrowed posterior end turned up dorsally". In the present material, and the material of Redikorzev (1916), the right ovary is turned up at a right angle; Ritter's (1913) original description lacks information on this feature.

A 35 mm specimen (collection D) is similar to the original description of *P. bostrychobranchus* Redikorzev (Redikorzev 1941) from the Sea of Okhotsk and Bering Sea in the existence of large secondary infundibula and the ovary completely covered with the testis. *P. bostrychobranchus* was regarded as a synonym of *P. dalli* by Nishikawa (1991) - a view to which I concurred.

Distribution. Aleutian Islands and Bering Sea (Ritter 1913), Bering Strait (Van Name 1945), North Kurile Islands (present study), Sea of Okhotsk, Okhotsk coast of South Kamchatka and Peter the Great Bay (Redikorzev 1916, 1941, present study).

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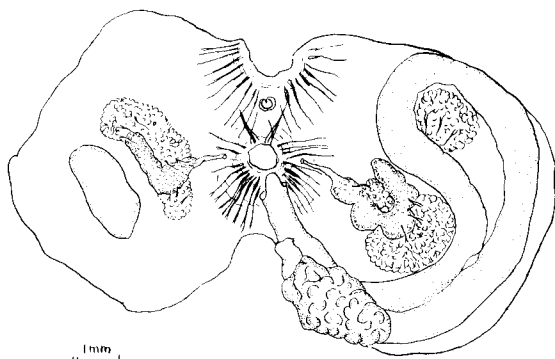


Fig. 3. *Pareugyrioides dalli*, inner side of the body.

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