

ASCIDIANS FROM THE NORTH-WESTERN PACIFIC REGION. 5. PHLEBOBRANCHIA.

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ABSTRACT

Among the 16 species of phlebobranch ascidians collected in the NW Pacific area between the Aleutian and South Kurile Islands only *Ascidia callosa* Stimpson and *Chelyosoma orientale* Redikorzev were found in a number of locations. A large material of *Agnezia himeboja* Oka was collected around Atlasov Island. Most of the other species were represented only by one or a few specimens. The material from deeper waters (80 to 500 m) included *Ascidia zyogasima* Tokioka and three new species: *Ciona gefesti* n.sp., *Ciona sheikoi* n.sp. and *Corynascidia vinogradovae* n.sp. Redescriptive notes are presented for *Megalodicopia hians* Oka, *Chelyosoma inaequale* Redikorzev, *Chelyosoma columbianum* Huntsman and *Corynascidia herdmanni* Ritter, all of which were previously inadequately known and seldomly recorded.

Key words: North-Western Pacific, Cionidae, Ascidiidae, Perophoridae, Agnesiidae, Corellidae, Octacnemidae.

INTRODUCTION

The ascidian fauna of the waters around the Aleutian to South Kurile Islands in the NW Pacific is poorly known. The present paper deals with 16 species of the order Phlebobranchia from material collected mainly by workers of the Zoological Institute and Kamchatka Institute of Ecology. Among these *Ascidia callosa* Stimpson, 1852 was most common, followed by *Chelyosoma orientale* Redikorzev, 1911. A third species represented in our collections by many specimens, *Agnezia himeboja* Oka, 1915 was found only in shallow water around Atlasov Island, where the substratum is light volcanic slag, with particles about 1-3mm. Other species are represented only by few specimens, mostly from depths of 80 to 500m, and some previously known from very few specimens and records (*Megalodicopia hians* Oka, 1918, *Ascidia zyogasima* Tokioka, 1962, *Chelyosoma columbianum* Huntsman, 1912, *Chelyosoma inaequale* Redikorzev, 1913) or only from original descriptions based on a single specimen, (*Corynascidia herdmanni* Ritter, 1913).

Especially interesting is material collected by Dr. Boris Sheiko during his sur-

vey in 1994 on the fishing vessel *Gefest* from the depth 300-800m on rocky bottoms, where traditional collecting methods, such as dredging or trawling, are usually not possible. Ascidians, usually in good condition, were found clinging to knots or hooks of fishery rope (used for catching sea perch). They belong mostly to the families Styelidae and Molgulidae (descriptions will appear in the future), although there are two phlebobranch species, *Ascidia zyogasima* and *Ciona gefesti* n.sp. The latter closely resembles *C. pomponiae* Monniot & Monniot, 1989, described from about the same depth on a rocky bottom near the Galapagos Islands, where, as in the present case, dredging was not possible.

The following material was examined:

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

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

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

(D) R.V. *Academic 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.

(F) Collection of the Kamchatka Institute of the Ecology and Environment (KIE). 1984-1994. Commander Islands, East Kamchatka and Atlasov Island (North Kurile Group). SCUBA diving and dredging. Collectors: collaborators of the Lab. of Benthic Communities. Specimens collected by Dr. B. Sheiko: F.V. *Gefest*, East Kamchatka, 1994; R.V. *Volcanolog*, Sea of Okhotsk, 1995.

Collections A-D (above) are in the Zoological Institute, St. Petersburg (ZIN), and collections E, F – Kamchatka Institute of the Ecology and Environment, Petropavlovsk-Kamchatsky (KIE).

I am grateful to Dr. B. Sheiko for the ascidians collected by him in the Bering Sea and Sea of Okhotsk.

This work was partly supported by personal grant No. 95-04-1113a from the Russian Foundation of the Fundamental Researches.

Family Cionidae

In the present paper I follow the traditional view and place the family Cionidae in the order Phlebobranchia rather than in the order Aplousobranchia.

Ciona gefesti n.sp.

Fig. 1, A-C

Material examined. – (F) F.V. *Gefest*, Bering Sea, near Karaginsky Island, 58°56.3'N, 164°55.9'E – 58°59.3'N, 165°02.5'E, 400-480m, 10.7.1994, 1 speci-

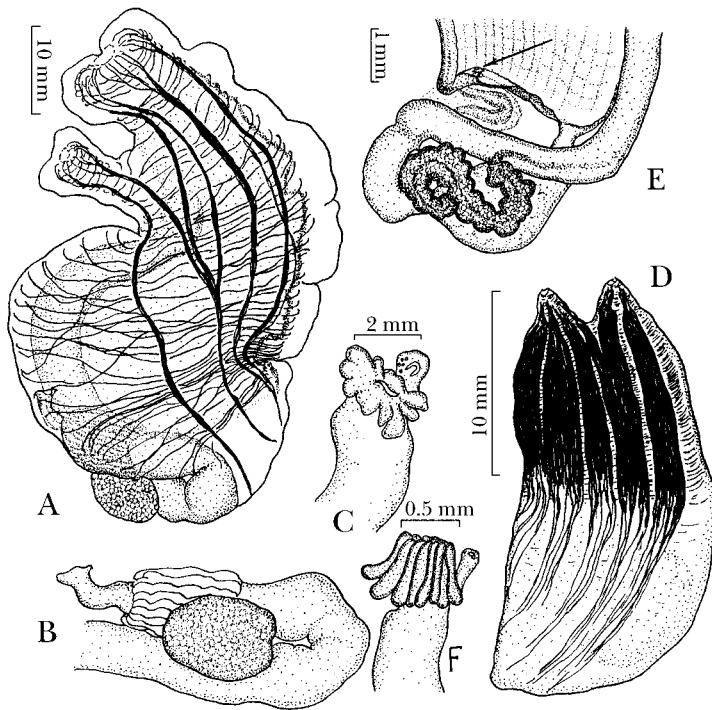


Fig. 1. A-C: *Ciona gefesti* n.sp., holotype. – A, animal without tunic, right side; B, gut loop and gonad; C, anal margin and gonoduct openings. – D-F: *Ciona sheikoi* n.sp., holotype. – D, animal without tunic, left side; E, gut loop, gonad and part of branchial sac, position of pharyngeo-epicardic openings marked by arrow; F, anal margin and gonoduct opening.

men. Collector B. Sheiko. Holotype KIE 1/673. In preservative, the body was found out of the tunic, although it was collected in good condition (B. Sheiko, *pers.comm.*). It may have separated from the tunic during fixation.

Description. – Contracted body 5.2cm long, but the non-contractile tunic is 12–15cm. Test very soft, gelatinous, nearly transparent and colorless, without foreign matter. Body wall thin, colorless. Siphons well developed, plain edged, close to each other, oral siphon terminal, atrial siphon subterminal, dorsal. Muscles represented by 6 longitudinal ribbons on each side (two of which originate on the atrial siphon and four on the oral siphon), and about 60 thin, widely spaced transverse fibers. The ventral ribbon of the atrial siphon and the two most dorsal ribbons of the oral siphon merge halfway down the body and continue to the posterior end as one muscle. The two ventral muscles of the oral siphon merge only at the posterior end of the body.

About 30 large oral tentacles are on the edge of a wide velum. Peripharyngeal band consists of anterior high and posterior low laminae and make a dor-

sal V. The dorsal tubercle has a longitudinal slit-like opening; the ganglion is large, directly under the dorsal tubercle. Neural gland indiscernible. Dorsal lamina represented by about 45 extremely long languets. Transverse branchial vessels of three orders, papillae high and flattened, parastigmatic vessels present. Twenty eight inner longitudinal vessels on left and 26 or 27 on right. Fifteen to 20 stigmata per mesh. Endostylar appendage absent. Pharyngeo-epi-cardiac openings in retropharyngeal groove halfway between endostyle and oesophageal opening.

Oesophagus short. Cylindrical stomach has well defined longitudinal folds, it is clearly demarcated from oesophagus and intestine. Intestine makes a narrow, straight loop under branchial sac; rectum long, anal margin lobed. Pyloric gland indiscernible. Compact oval gonad in gut loop. Single C-shaped female and several small male apertures near anus (Fig. 1, C).

A large number of spherical bodies are attached to the wall of branchial sac, each containing a single parasitic copepod.

Remarks. – *Ciona gefesti* n.sp. is very similar to *Ciona pomponiae* Monniot & Monniot, 1989 based on a single specimen from the Galapagos Islands and collected at about the same depth (between 300 and 800m). The differences between these two species are only to be found in the structure of the digestive tract, the stomach of *C. pomponiae* not having well defined folds and not being so clearly demarcated from the intestine as in *C. gefesti*; *C. pomponiae* also has a smooth anus border and a well developed pyloric gland.

The intraspecific variation in these features and their taxonomic significance can not be assessed – both species being known from a single specimen. Nevertheless it seems better to establish a new species for the present specimen because of the great geographical distance from the location of *C. pomponiae*.

Ciona mollis Ritter, 1907 also resembles the present species in several features (including folded stomach) but differs in the general shape of the digestive tract and in the presence of circular muscle fibers only on siphons.

Ciona sheikoi n.sp.

Fig. 1, D-F

Material examined. – Holotype (KIE 1/877) – (D) Shumshu Island (North Kurile Islands), 50°38.1'N, 156°50.5'E, 80m, 3.9.1991, sandy bottom. Paratypes (KIE 2/878) – same data, 12 specimens.

Description. – Holotype. Body 5.5cm in height, 1.2cm in diameter anteriorly and 2cm posteriorly. Test soft, whitish, free from foreign matter except small area on posterior end. A number of papillae are on the tunic of the enlarged posterior end, each papilla about 0.8mm in diameter and 1.5-2mm in length.

Contracted body removed from tunic 2.3cm in height, deep red. Short conical siphons both terminal. Longitudinal muscles are represented by four strong

ribbons originating from the oral siphon and two from the atrial siphon. Most dorsal ribbons of oral and ventral one of atrial siphon merge anteriorly, and continue as a single band to the posterior end of the body. The longitudinal muscles are wide anteriorly but are thin posteriorly and have thin well separated muscle fibers (Fig. 1, D). Transverse muscles form an almost continuous inner layer, thicker anteriorly than posteriorly.

About 26 tentacles in three or four orders. Peripharyngeal band consists of two equal laminae, dorsal V not developed. Large dorsal tubercle has horse-shoe opening with inrolled horns, open interval on right. Large spherical ganglion. Neural gland indiscernible. Dorsal lamina represented by 55 long languets. No intermediate transverse branchial vessels, parastigmatic vessels present. About 17 longitudinal vessels on right and 14 or 15 on left. Large flattened papillae on longitudinal vessels. Five or six short stigmata per mesh. Endostylar appendix absent. Pair of pharyngeo-epicardiac openings in retropharyngeal groove close to endostyle (Fig. 1,E).

Intestine makes a wide horizontal loop posterior to the branchial sac. Stomach large, globular, smooth-walled. Rectum long, straight. Anal margin with long cylindrical lobes. Long, cylindrical, S-shaped gonad in gut loop, gonoducts along rectum, empty, male openings indiscernible, oviduct opens near anus.

Paratypes. Twelve specimens 1 to 5cm long, contracted bodies 0.5 to 2cm. Usually 4 longitudinal muscle ribbons in middle part of the body (as in holotype), but sometimes 6. Body of all specimens clearly divided into an anterior part with strong muscles (deeply red in colour) and a more delicate, sac-like posterior part with gut loop and with weak muscles (but no constriction between these parts). Gonad S-shaped or C-shaped, but in all cases long and curved. Other features as described above.

Remarks. – The present species lacks a constriction between the branchial sac and posterior part of the body, has longitudinal muscle ribbons and a horizontal gut loop. This are characteristics of *Ciona*, and not of *Rhopalaea*.

According to Hoshino & Nishikawa (1985) the waters around Japan are inhabited by two species of the genus *Ciona*: *C. savignyi* Herdman, 1882 and *C. intestinalis* Linné, 1767. The former species has a pair of pharyngeo-epicardiac openings close to the oesophageal opening, whereas in *C. sheikoi* n.sp. and *C. intestinalis* they are close to the endostyle. *C. intestinalis* has an endostylar appendix; this is absent in the new species.

C. gefesti n.sp. differs from *C. sheikoi* n.sp. in having a folded stomach wall, a compact gonad, thin muscles, and a different colour. The muscle differences could not be explained only by their state of contraction.

Further, *C. sheikoi* can be clearly separated from all other species belonging to *Ciona* by its thick longitudinal mantle muscles, long and remarkably curved gonad and well defined cylindrical lobes around anus.

Redikorzev (1941) reported a specimen as *C. intestinalis* from the Bering Sea,

58-62m and (excluding the present records) this is the single known record of *Ciona* from the waters north of Japan. The identification is uncertain.

The species is named after the collector, Dr. Boris Sheiko.

Family Ascidiidae

Ascidia callosa Stimpson, 1852

Ascidia callosa Stimpson, 1852: 228. For synonymy: see Abbott, 1961.

Material examined. – (A) Kurile Islands, Paramushir Island, 49°52.5'N, 155°26'E, st.98, 130-145m, no date, 1 spec. (B) Kurile Islands, 47°33.5'N, 152°48.4'E, st.97, 139-160m, stones, 25.7.1986, 1 spec. (D) Bering Sea near Bering Island, 55°34.2'N, 165°16'E, st.45, 65m, 24.8.1991, 2 spec. (F) East Kamchatka, Russia Bay, 6m, 5.8.1985, 30 spec.; Rock of Expedition, 12m, 3.9.1985, 2 spec.; Avacha Bay, 10m, stones, 8.8.1990, 4 spec.; Karaginsky Island, 19.8.1988, 2 spec. Commander Islands, Bering Island, Tolsty Point, st.241, 242, 5m, rock, 9.8.1991, 8 spec.; Vchodnoy Rif Point, st.159, 160, 1m, 1.7.1991, 14 spec. Medny Island, 22 specimens from Pacific and Bering Sea coasts, summer 1992, from 0 to 25m. Kurile Islands, Atlasov Island, Lava Point, 18m, 1 spec.

Remarks. – This is a very common species in Arctic waters and the northern Pacific. Trason (1964), for example, reported that *A. callosa*, *Boltenia echinata* (L.), and *B. ovifera* (L.) made up almost 50% of the ascidians collected from Arctic waters of Canada. Among solitary ascidians only *A. callosa*, *Styela clavata* (Pallas, 1774), and *Dendrodoa aggregata* (Rathke, 1806) are found in abundance in Commander Islands. The species is also common in East Kamchatka, although not so abundant as in Commander Islands. Only two records of *A. callosa* are from the Sea of Japan: Skalkin (1959) from South Sakhalin and Redikorzev (1941), the latter without exact locality.

Distribution. – Norway, Sweden, Spitsbergen, Greenland, all Canadian coasts, from Alaska to Puget Sound, Bering Sea and Sea of Okhotsk, and apparently northern part of Sea of Japan (Redikorzev 1941; Van Name 1945).

Ascidia gemmata Sluiter, 1895

Ascidia gemmata Sluiter, 1895: 177; Kott 1985: 37 (with synonymy); Nishikawa 1991: 42.

Material examined. – (E) Sea of Japan, Bolshou Pelis Island, 27.7.1986, 1 spec.

Remarks. – The single specimen in bad condition was identified as *A. gemmata* owing to the posterior position of atrial siphon, the structure of visceral mass, and the absence of intermediate papillae on the longitudinal vessels, although more detail examination can not be made.

Distribution. – Western Pacific, from Sea of Japan to Australia. For full list of localities: see Nishikawa (1991).

Ascidia paratropa (Huntsman, 1912)

For synonymy: see Van Name (1945) and Abbott & Newberry (1980)

Material examined. – (D) Alaska Gulf, near Kodiak Island, 58°22.4'N, 150°56.8'W, 61m, 12.08.1991, sand, 1 spec.

Remarks. – The single specimen 7cm in height was readily identified as *A. paratropa*, having large and thick tubercles on the test and a similar internal structure. The present specimen has an opaque, brown body wall. The arrangement of muscles was not determined.

Distribution. – Pacific coasts of North America from Aleutian Islands to at least southern Monterey, California (Abbott & Newberry 1980).

Ascidia prunum Müller, 1776

For synonymy: see Van Name (1945).

Material examined. – (A) Kurile Islands, Paramushir Island, 49°1.7'N, 156°4.7'E, st.97, 156-165m, 19.7.1954, 1 spec.; st.174, 130m, stone, 10.8.1954, 1 spec.; 49°52.7'N, 156°29'E, st.596, 289-370m, 7.7.1954, 1 spec.; st.91, 150-152m, muddy sand, 18.7.1954, 1 spec.; 50°24.5'N, 156°46.6'E, st.136, 118m, 3.8.1954, 1 spec. (C) Kurile Islands, Onecotan Island, 49°21.2'N, 154°9.9'E, st.70, 310m, 29.6.1988, 1 spec.

Remarks. – This species much resembles *A. callosa* in body form and structure of voluminous visceral mass, but it can be clearly separated from *A. callosa* having many more internal longitudinal vessels. Van Name (1945) reports that even large specimens of *A. callosa* have never more than 25 or 26 longitudinal vessels on the right side of the branchial sac. I have examined many specimens of *A. callosa* and never found more than 20-22 longitudinal vessels on one side (in specimen 40mm long without tunic). The present specimens of *A. prunum* have 46-80 longitudinal vessels on right side and 36-60 on the left side.

The reported specimens of *A. prunum* are relatively large (35-45mm for specimens removed from the tunic) and are all dredged from depths between 118 and 310m. *A. zyogasima* Tokioka (see below) also was found from nearly the same depths and has, like *A. prunum*, a large number of longitudinal branchial vessels, but differs in having a small globular stomach, a long rectum and in the general shape of the visceral mass.

Distribution. – Van Name (1945) refers to the species as belonging to the Arctic and northern regions and especially abundant in the Old World waters. In the Pacific it was earlier recorded only from British Columbia (Van Name 1945).

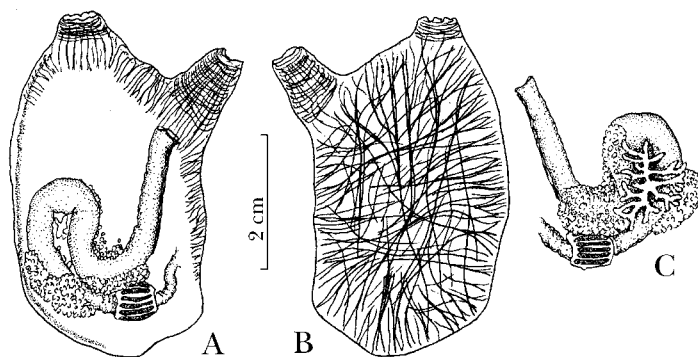


Fig. 2. *Ascidia zyogasima*
– A, left and B, right
side of the mantle body;
C, gut and gonad.

Ascidia zyogasima Tokioka, 1962

Fig. 2

Ascidia zyogasima Tokioka, 1962: 278; Nishikawa 1991: 51 (with synonymy).

Material examined. – (D) Commander Island, east of Medny Islands, st.3, 54°12'N, 162°32'E, 328m, 2.8.1991, 1 spec.; st.6, 54°15.2'N, 168°41.6'E, 242m, 2.8.1991, 1 spec. (F) F.V. *Gefest*. Bering sea, near Commander Islands, 55°34.9'N, 164°50.9'E, 400-600m, 1.7.1994, 1 spec., collector Dr. Boris Sheiko.

Redescription. – Specimens 18x25mm, 25x40mm (material (D)) and 28x35mm (F). Test thin, soft, transparent, surface smooth, with a few bryozoan colonies on surface. Branchial siphon terminal, atrial siphon in 25mm and 30mm long specimens situated at level of anterior one third of the dorsum; in a 40mm specimen atrial siphon located more anteriorly.

Body wall thin. Muscles arrangement (Fig.2) conforms basically with original description (Tokioka 1962), except only in the absence of long and more or less regular longitudinal muscles on right side shown by Tokioka (1962: fig.11(34)). About 35 branchial tentacles. Dorsal tubercle C-shaped, open anteriorly. The large specimen from (D) has 78 longitudinal vessels on right side and 55 on left, the small specimen has about 62 on right and 55 on left side. Intermediate papillae present.

Stomach small, globular or short cylindrical, folded. Visceral mass occupies posterior half of body. Long rectum ends near base of atrial siphon, beyond level of anterior end of primary intestinal loop.

Well developed testis in posterior end of visceral mass, between stomach and intestine and in secondary intestinal loop. Dendroid ovary has branches on both sides.

Remarks. – The present specimens differ from Tokioka's (1962) description in the position of the visceral mass which occupies more than half of the body length, the relative position of the anterior end of the first intestinal loop and

anus (in Tokioka's fig.11 they are approximately at same level), the ovary in present specimens has branches on both sides, whereas the original description refers to branches only on one side; there are also some difference in the muscles. Nevertheless, the structure of intestinal loop with small plicated stomach, the muscles and the especially high number of longitudinal vessels, the general shape of the body and the smooth test of the present specimens conform with the original description of *A. zyogasima*.

The original description of this species was based on a single specimen from 300-450m, and the present specimens were dredged from similar depths (see above). The present record of this species from waters off Commander Islands is surprising, the previous records being from Sagami Bay (Japan) and Korea Strait.

Distribution. – Sagami Bay (Japan) (Tokioka 1962), Korea Strait (see Nishikawa 1991) and Bering Sea, Commander Islands (present study).

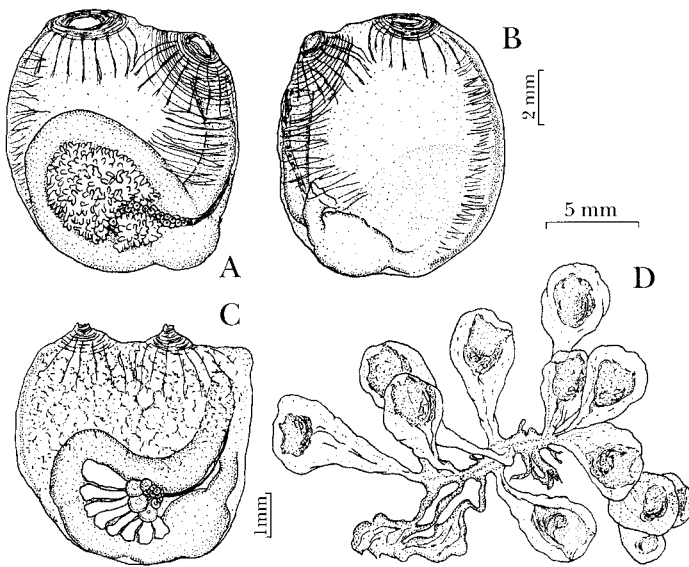


Fig. 3. A & B: *Agnezia himeboja*. – A, left and B, right side of the mantle body. – C & D: *Perophora japonica*. – C, left side of the mantle body and D, colony.

Family Perophoridae

Perophora japonica Oka, 1927

Fig. 3, C,D

Perophora japonica Oka, 1927: 558; Nishikawa 1991: 33.

Material examined. – (E) Sea of Japan, Peter the Great Bay, Furugelm Island, 12.7.1988, 1 colony.

Redescription. – Single 2cm long colony with 12 zooids connected only by stolons. Largest zooid about 5mm high. Fine circular siphonal muscles. Few short longitudinal (or radial) muscles originating on siphons and intersiphonal area (Fig. 3,C). Body wall with dense meshwork of opaque cells as described by Nishikawa (1991). Four rows of about 27-30 stigmata per row. Nine incomplete longitudinal vessels on each side.

Gonad in gut loop, well developed. Up to 8 long, club-shaped testis follicles and a sac-like ovary with a number of eggs of different sizes.

Remarks. – The present specimens conform well to previous descriptions, especially that of Nishikawa (1991) in the structure of muscles, branchial sac and reticulated body wall. Unfortunately I had no chance to examine Redikorzev's (1941) specimens of *P. annectens* Ritter from Peter the Great Bay and Possjet Bay to compare them with the present material from Peter the Great Bay. Nishikawa (1991) stated that Redikorzev rightly identified his material as *P. annectens* on the basis of colony structure, although zooids are more similar to *P. japonica*.

Distribution. – Sea of Japan and Pacific coasts of Japan, Peter the Great Bay, Korea (Nishikawa 1991).

Family Agneziidae

Agnezia himeboja (Oka, 1915)

Fig. 3, A,B

Agnezia himeboja Oka, 1915: 1; Nishikawa 1991: 59 (synonymy).

Agnezia sabulosa Oka, 1929: 152.

Material examined. – (F) Kurile Islands, Atlasov Island, Vladimir Point and Sian-drion Point, 6-24m, 14.8.1989, slag, about 250 spec.

Redescription. – Specimens 5-12mm. Surface smooth, without incrusting matter. Mantle musculature consists of radial and circular siphonal muscles, better developed on atrial siphon, and series of fine transverse muscles on each side of body along dorso- and ventromedian lines. Five dorsal languets and 5 transverse vessels each with 4-6 papillae, 12 transverse rows of infundibula, 10 infundibula per row.

Remarks. – The name *Agnezia* was proposed by Monniot & Monniot (1991) for *Agnesia* Michaelsen, 1898, a junior homonym of *Agnesia* Koninck, 1883 (Mollusca, Gastropoda, Palaeozoic).

Unusually abundant at Atlasov Island. In places where the bottom consists mainly of light volcanic slag we found up to 150 specimens per square meter.

Distribution. – Coasts of Japan (see Nishikawa 1991), Atlasov Island (present study).

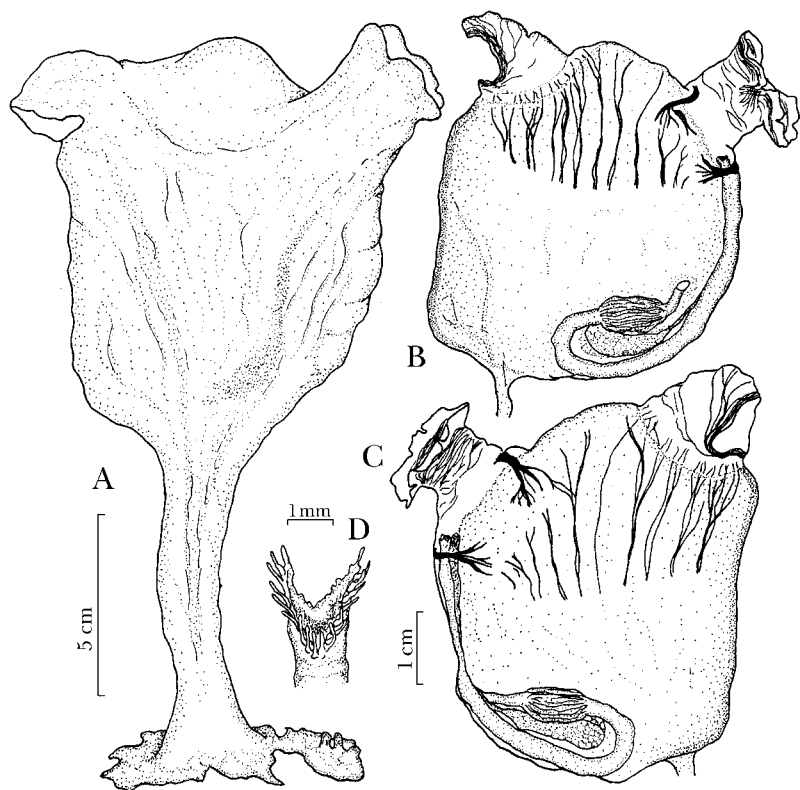


Fig. 4. *Corynascidia herdmani*. – A, external appearance; B, left and C, right side of the mantle body; D, anal margin.

Corynascidia herdmani Ritter, 1913

Fig. 4

Corynascidia herdmani Ritter, 1913: 491.

Material examined. – (D) Commander Islands, near Medny Island, 54°11.8'N, 168°36.5'E, 508m, 2.8.1991, 3 spec.

Redescription. – Specimens 20, 16, 9cm in height, pedunculated. Peduncle about 1.5cm in diameter, more or less cylindrical, expanding abruptly where it is attached to the body. Test thin, very soft, colorless and transparent. Branchial siphon with ventrally directed opening, plain-edged. Atrial aperture has 5 or 6 equal lobes around the rim. Body flattened laterally, nearly rectangular in outline. Musculature composed of thin circular siphonal muscles, two short very strong transverse muscles across the midline dorsal and ventral to the base of atrial siphon and 8-9 bundles of longitudinal fibers on each side of upper third

to half of body. About 90 branchial tentacles. More longitudinal branchial vessels than number of spiral stigmata in one transverse row. Largest specimen has about 48-50 stigmata spirals in row on left and 47-50 spirals on right and about 65 longitudinal vessels on left and 70 on right. Owing to the thin and soft body wall it is difficult to recognise whether the gut loop is displaced to the right side or not. Anal rim has 20-30 long flattened languets.

Remarks. – This species was known only from Ritter's (1913) original description based on a single specimen collected from 1040m depth in the Bering Sea, near Unalaska Island. Ritter (1913: 491) described the body shape of his specimen as elongate and "quite regular cylindrical". Although this is different from the present specimens, it may not be a significant difference when the species is so soft and shapeless. The only important difference between the present specimens and the holotype is in the structure of the anus, which was described as having a smooth margin. In the here reported specimens the anal rim has a number of very distinct, long lobes. This difference may be significant, but in all other respects the three specimens agree quite well with the original description. A re-examination of the holotype of *C. herdmanni* is necessary to confirm my identification.

Distribution. – Bering Sea: Unalaska Island (Ritter 1913), Commander Islands (present study).

Corynascidia vinogradovae n.sp.

Figs 5, 6

Material examined. – (D) Commander Islands, near Medny Island, 54°12.0'N, 168°32.0'E, 328m, 2.8.1991, 1 spec. (Holotype KIE 1/876).

Description. – Body 5 cm in height, 4cm wide, sessile, upright, attached by posterior end to a Hyalospongia sp. Test very thin and soft, colorless and transparent. Branchial aperture on a short siphon, terminal, with 5 indistinct lobes. Atrial aperture dorsal, subterminal, with 6 wide distinct lobes. Body wall very thin and transparent. Fine circular muscles on siphons, short transverse dorsal muscles posterior to atrial siphon and across dorsal surface between siphons (Fig. 6, B-C). About 80 branchial tentacles. Peribranchial area narrow. Dorsal tubercle approximately C-shaped with open interval turned to the right; ganglion narrow and long. Neural gland indiscernible. Dorsal lamina represented by 30 languets. Stigmata in rectangular spirals. In some parts of branchial sac they are more or less regular (Fig. 6,A), stigmata interrupted here by fine radial parastigmatic vessels only in a few places, and thus reminiscent of a *Corella* sp., but in other parts interruptions are more numerous. Largest spirals make up to 7 turns. Longitudinal vessels on high papillae. There are 45 longitudinal vessels and about 32 stigmata spirals per row on left side of branchial sac and 47 and 37 respectively on right. Gut loop behind branchial sac, distinctly displaced to

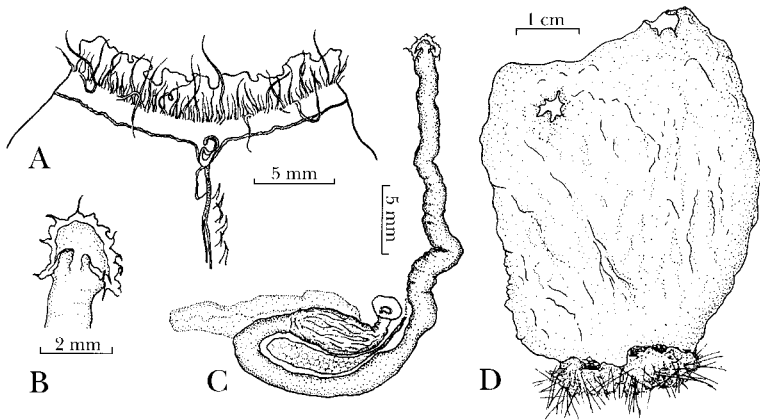


Fig. 5. *Corynascidia vinogradovae* n.sp., holotype. – A, branchial tentacles, ganglion, dorsal tubercle and dorsal languets; B, anus; C, gut, gonad and heart; D, external appearance.

right side, at right angles to rectum. Stomach long, with indistinct longitudinal folds. Rectum straight and vertical, anus V-shaped with papillated margin (Fig. 5,B) directly under atrial orifice. Gonad long and club-shaped, slightly expanded at proximal end, not fully matured, situated in gut loop. Voluminous heart on right side, near gut loop (Fig. 5,C).

Remarks. – In internal structure the genus *Corynascidia* much resembles *Corella*. Accordingly Van Name (1945: 215) believed it “perhaps worthy only subgeneric status”. Recently Monniot & Monniot (1991) showed that *Corynascidia* differs quite distinctly from *Corella* in having a higher number of longitudinal vessels than of stigmatic spirals, this character placing *Corynascidia* in the family Agneziidae.

Six species of *Corynascidia* are known. *C. herdmani* Ritter, 1913, *C. suhmi* Herdman, 1882 and *C. hartmeyer* Monniot & Monniot, 1994 are all pedunculated, thus differing from the sessile *C. vinogradovae*.

C. alta Monniot & Monniot, 1991 has weak muscles and a unique 3-lobed structure near the anus.

C. translucida (Monniot, 1969) and *Corynascidia* sp. (Monniot & Monniot, 1987) differ in structure of branchial sac and body muscles.

C. cubare Monniot & Monniot, 1994 differs in body muscles, well developed on right side in this species, and in form of gut loop.

C. sedens Sluiter, 1904 differs in body muscles, developed mainly between siphons. According to Monniot & Monniot (1991) *C. sedens* is a Corellidae species

Corelloides molle Oka, 1926 was dredged not far from the type locality of the present species and may be related to it. The differences are in the structure of the branchial sac and the number of branchial tentacles, but a more detailed

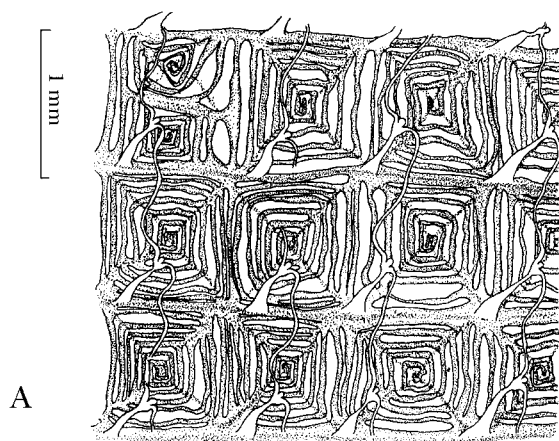
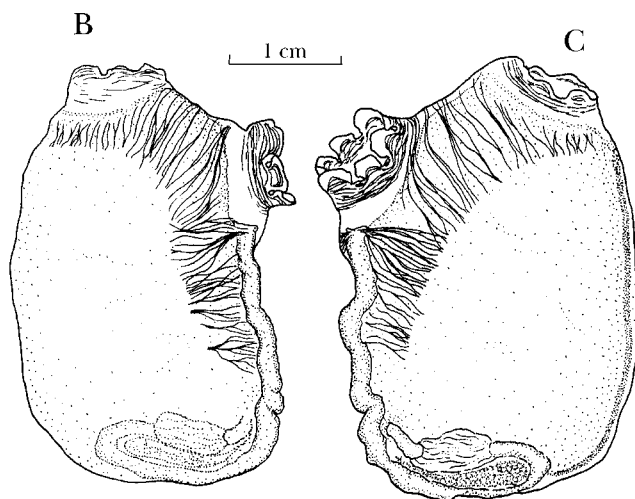


Fig. 6. *Corynascidia vinogradovae* n.sp., holotype. – A, part of branchial sac with most regular stigmata; B, left and C, right side of the mantle body.



comparison is hard to make because Oka's (1926) description is brief and lacks figures.

Family Corellidae

Chelyosoma columbianum Huntsman, 1912

Fig. 7

For synonymy: see Van Name (1945).

Material examined. – (D) Commander Islands, east of Medny Island, 54°12'N, 168°32'E, st.3, 328m, 2.8.1991, 1 spec.

Redescription. – Upright body about 2cm high, attached by its posterior end to a

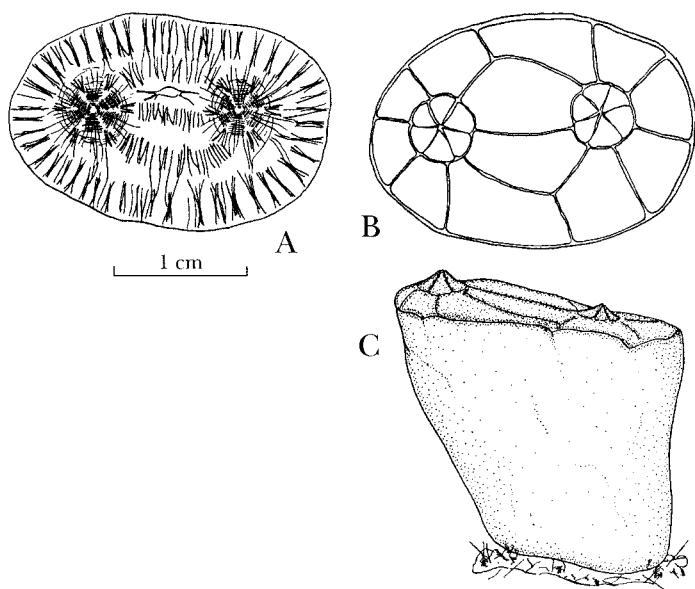


Fig. 7. *Chelyosoma columbianum*. – A, muscles; B, disk; C, external appearance.

Hyalospongia, disk 22mm in largest diameter. Test very thin and quite transparent. Disk has 2 central plates, 10 marginal ones and 6 siphonal plates around each aperture. Plates without growth lines.

Muscular system composed of complicated siphonal muscles, and a row of thin muscle fibers connecting the two central plates with the lateral ones. Muscles connecting adjacent marginal plates are less well developed.

Fifty large branchial tentacles alternate with 50 small, papilla-like ones. Triangular dorsal tubercle narrowed posteriorly and flattened anteriorly with transverse slit-like opening directed to the oral orifice. Large elongated ganglion half way between siphons. Stigmata in uninterrupted spirals, each makes 3-4 turns.

Remarks. – The single specimen available somewhat differs from description of *C. columbianum* in lacking intermediate plates and having a more elongate upright body. It resembles *C. productum* Stimpson, 1864, in these features. It has been assigned to *C. columbianum* because of the series of short muscles connecting the two central plates.

Distribution. – British Columbia (Huntsman 1912), Strait of Juan de Fuca (Ritter 1913), Commander Islands (present study).

Chelyosoma inaequale Redikorzev, 1913

Chelyosoma inaequale Redikorzev, 1913: 206; 1941: 199. Van Name 1945: 209.

Material examined. – (F) Sea of Okhotsk, Bolshou Shantar Island, 10m,

27.07.1995, 8 specimens from 2.5 to 7cm in greatest diameter of the disk. Collector B. Sheiko.

Remarks. – The present specimens conform well to original description and may be easily distinguished from all other *Chelyosoma* spp. by absence of horny plates on the disk.

Distribution. – Chukchi Sea, between Gerold and Vrangal Islands (Redikorzev 1941), Alaskan coast north of Bering Strait (Van Name 1945), Sea of Okhotsk, Shantar Islands (Redikorzev 1913; 1941; present study).

Chelyosoma macleayanum Broderip & Sowerby, 1830

For synonymy: see Van Name (1945: 205).

Material examined. – (A) Kurile Islands, Paramushir Island, 49°43.6'N, 156°16.7'E, st.80, 170-175m, 14.7.1954, 1 spec.

Remarks. – Externally this species may be confused with young samples of *C. orientale* Redikorzev, both having a single central plate and 7-10(12) marginal ones, but *C. orientale* has oval stigmata irregularly distributed on the branchial sac, whereas *C. macleayanum* always has spiral-shaped stigmata.

Distribution. – Circumpolar in Arctic regions but occurring very rarely. In the NW Pacific only one specimen was recorded from central part of the Sea of Okhotsk, 9 specimens from Russian coasts of the Sea of Japan (Redikorzev 1941), and one specimen from Kurile Islands (present study).

Chelyosoma orientale Redikorzev, 1911

Chelyosoma orientale Redikorzev, 1911: 146.

Material examined. – (F) East Kamchatka, Korfa Bay, 59°40'N, 165°55'E, st.492, 102-103m, 21.9.1988, 1 spec. Litke Strait, 58°57.5'N, 163°27'E, st.465, 56m, 23.9.1988, 1 spec.; 58°58'N, 164°29'E, st.464, 53m, 23.9.1988, 2 spec.; 59°5.2'N, 163°41'E, st.461, 49m, mud, gravel, 23.9.1988, 1 spec. Kronotsky Bay, 53°46'N, 160°13.5'E, st.172, 100m, muddy sand, 12.5.1988, 3 spec. Avacha Bay, 52°51'N, 159°23'E, st.1, 116m, 27.5.1988, 1 spec.; 52°54.4'N, 159°13.1'E, st.47, 92m, 27.3.1988, 1 spec.; 52°58'N, 159°11'E, st.59, 66m, 5.5.1988, 1 spec.; 52°52'N, 159°17'E, st.101, 111m, 27.5.1988, 1 spec.

Remarks. – *C. orientale* differs from other *Chelyosoma* species in its extremely hard tunic, well developed growth lines on the plates and unique structure of the branchial sac with irregular stigmata and without transverse vessels.

Distribution. – Chukchi Sea, Bering Sea, Sea of Okhotsk and Sea of Japan (Redikorzev 1941), SE end of Sakhalin (Nishikawa 1991) and East Kamchatka (present study).

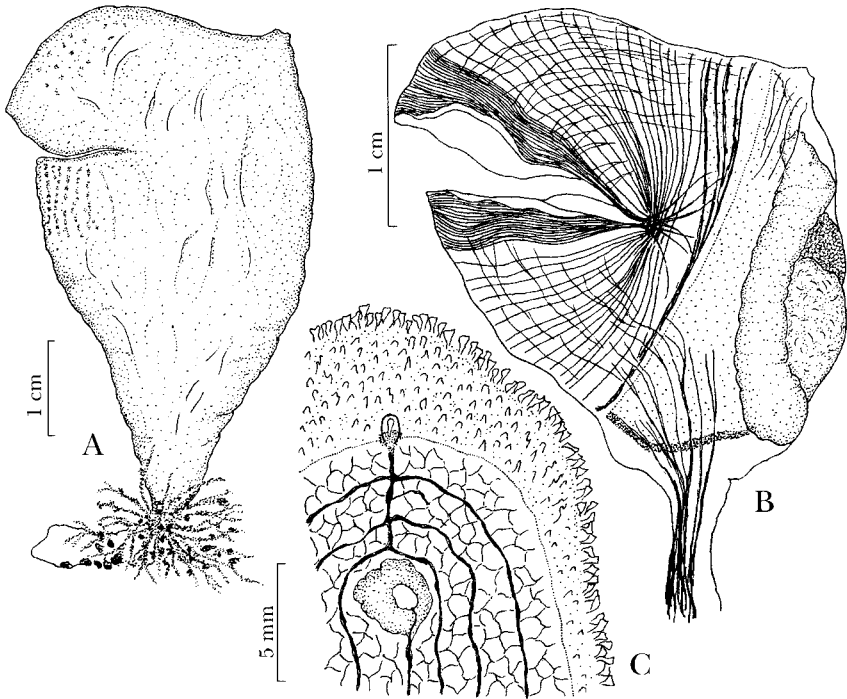


Fig. 8. *Megalodicopia hians*. – A, external appearance; B, body removed from the tunic; C, anterior part of branchial sac and peribranchial area.

Family Octacnemidae

Megalodicopia hians Oka, 1918

Fig. 8

Megalodicopia hians Oka, 1918: 399; Tokioka 1953: 235.

Not *Megalodicopia hians*: Kott 1969: 88.

? *Benthascidia michaelsoni*: Redikorzev 1941: 202. (Not Ritter 1907).

Material examined. – (D) South Kurile Islands, st.94, 43°10.2'N, 146°18.2'E, 535m, 10.9.1991, muddy sand, 1 specimen.

Redescription. – Specimen 6 cm high, gradually tapering to the base of the peduncle. Peduncle about 1.5cm high, not distinctly demarcated from body. Test thin (0.5-0.8mm), transparent, surface smooth except for minute projections partly covered by mud and arranged in several longitudinal rows on ventral lip. Hair-like processes only on attachment area at base of stalk. Atrial siphon small, terminal, oral siphon represented by two large lips.

Circular muscle fibers of oral siphon crowded around the margin of each lip.

They are regularly spaced and less crowded over most of the lips behind the margin except at the corners (where the lips meet) where the muscles are gathered together. Radial muscles on lips are thin and irregular. A number of short thick muscles radiate from lip corners. Fine radial and circular fibers on the atrial siphon. A continuous circular ribbon of muscle fibers encircles body at the level of the oral tentacles although the muscle fibers that make up this ribbon are widely spaced on the dorsal side of the body. Strong longitudinal muscles on ventral and lateral sides of the peduncle originate on the ventral part of body; there are no muscles on the dorsal side of peduncle.

Oral tentacles numerous, leaf-shaped. The space between the tentacular ring and the branchial sac is about 5-6mm dorsally, and about 2 mm laterally and ventrally. Numerous sensory papillae between tentacles and peripharyngeal groove dorsally, and few low inconspicuous papillae or irregular elevations ventrally and laterally. Peripharyngeal groove very close to branchial sac, dorsal V absent. Dorsal tubercle has a simple small longitudinal slit. Spherical ganglion close to dorsal tubercle.

Branchial sac cone-shaped, with three well developed transverse vessels on each side and a net of smaller vessels. Retropharyngeal band long, endostyle short. Numerous small, oval or rectangular, irregularly distributed stigmata.

Gut forms a simple loop; large stomach has a smooth wall. Massive gonad with dorsal ovary and ventral testes are in gut loop.

Remarks. – According to Monniot & Monniot (1978), the specimen from the Sea of Okhotsk described by Redikorzev (1941) as *Benthascidia michaelsoni* differs from the type specimen of *B. michaelsoni* Ritter, and belongs to the family Octacnemidae. Redikorzev's description conforms generally to present specimen in shape, arrangement of body muscles (although they are extremely weak), presence of well developed oblique muscles on the peduncle, and other features, except, possibly, the structure of the branchial sac, that has an irregular net of anastomosing vessels, arising on single stronger longitudinal one (Redikorzev 1941). According to his pl. 1: fig. 4 this single stronger longitudinal vessel might be in fact a retropharyngeal band. According to Vinogradova (1969), the internal organs of Redikorzev's specimen were lost, and this feature can not be clarified. Nevertheless, it is highly possible that Redikorzev's specimen belongs to *Megalodicopia hians*. Weak development of the body muscles might be connected with its small size.

The record of *M. hians* from the Weddell Sea, Antarctica by Kott (1969) is dubious. It is described as having about the same size as the present specimen, but has "very few muscles on the body itself", and the lips of the oral siphon are distinctly separated from the nearly spherical body, whereas in the present specimen, as also in the specimens described by Oka (1918) and Tokioka (1953), there is no constriction between lips and body. Kott's specimen has "single wide transverse vessel across middle of the branchial sac" and the general structure

of the branchial sac, (according to Kott's fig.118) differs from that of the present specimen. The Antarctic specimen was damaged posteriorly, and presence of a muscular peduncle was not detected certainly. Further, it seemingly lacks tentacles and sensory papillae. Also, it is unlikely that the range of *M. hians* extends to the Antarctica. Thus, this record is here excluded from synonymy of *Megalodicopia hians*.

Distribution. – Sea of Japan (Oka 1918), Sagami Bay (Tokioka 1953), South Kurile Islands (present study), ? Sea of Okhotsk (Redikorzhev 1941).

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