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Shallow-water Ascidians from Matua Island (central Kuril Islands, NW Pacific)

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Abstract

Fifteen species of ascidians were identified in the material collected at Matua Island. Two species are new, *Botryllus flavus* **n. sp.** and *Distaplia matua* **n. sp.** The first species occurs also at Kamchatka waters, while the second is probably an endemic of Kuril Islands. The genus *Macrenteron* Redikorzev, 1927 is synonymized with *Aplidium* Savigny, 1816 and a new name *Aplidium macrenteron* nom. nov. is proposed for its type species.

Key words: Tunicata, Ascidiacea, Kuril Islands, Matua Island, NW Pacific

Introduction

Kuril Islands is a long (about 1300 km) chain of islands which continue from the southern tip of Kamchatka Peninsula to the north-east side of Hokkaido and separate Sea of Okhotsk from Pacific Ocean. These islands are divided into three groups: north Kuril Islands, central Kuril Islands and south Kuril Islands. Matua is a most northern island of the central Kuril Islands group (Figure 1). Ascidians from the central Kuril Islands were almost totally not known previously. In August 2016 one of us (N. Sanamyan) took part in 20-th Kuril-Kamchatka Expedition of Russian Geographic Society to Matua Island and had chance to collect samples of marine invertebrates, with a special attention to some groups including ascidians. In general, the first impression was that the macrofauna of Matua Island differs significantly from the fauna of much better investigated waters of east coast of Kamchatka. Large filter-feeding invertebrates, e.g. giant anemones of the genus *Metridium*, or large holothurians of the genus *Cucumaria*, which are abundant in the waters around Kamchatka, where they constitute a significant eye-catching component of the benthic communities, were completely absent at Matua Island. It may be connected with a very clear water around central Kuril Islands which is almost free from particulate material. Ascidians are not especially abundant and represented mostly by colonial species. Three solitary species were recorded, but only one of them, *Styela clavata* (Pallas, 1774), was more or less common. Colonial species were represented by relatively small colonies, smaller than the colonies of the same species in Kamchatka waters. Some of recorded species, e.g. both species of *Distaplia*, are known only from north and central Kuril Islands and do not occur elsewhere. Water temperature in August was 2°C.

Material and methods

Most samples were collected by SCUBA, down to 17 m depth and preserved in 4% seawater formalin on the surfacing. Nearly all collected specimens were photographed in vivo to document colour, form and structure of colonies. All described specimens are deposited in the Kamchatka Branch of the Pacific Geographical Institute (KBPGI). All underwater photos were taken by N. Sanamyan. All specimens, if not stated otherwise, were collected by N. Sanamyan.

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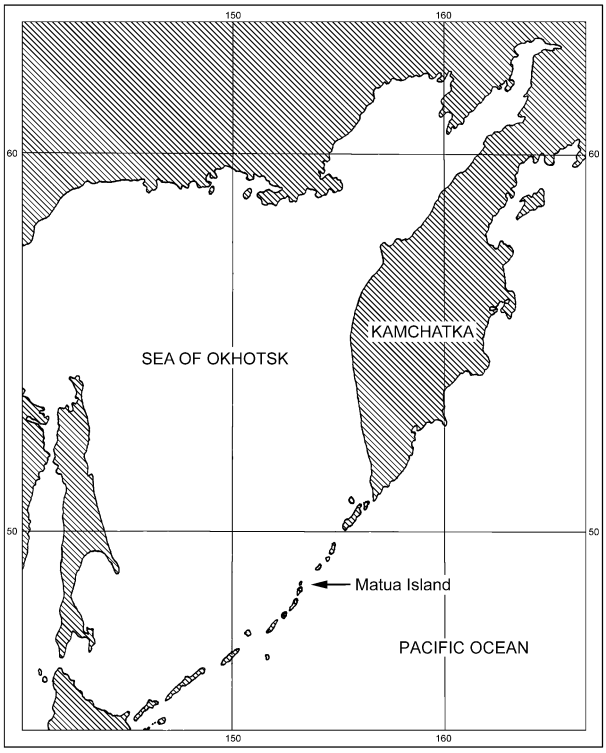

FIGURE 1. Location of Matua Island in NW Pacific.

Descriptions

Ascidia callosa Stimpson, 1852

(Figure 2)

Ascidia callosa Stimpson, 1852: 228. Lambert & Sanamyan, 2001: 1772 (synonymy).

Material examined. Matua Island, Point Kluv, 16 m, one specimen (#177).

Description. The single collected specimen is small, about 10 mm long, attached by a whole left side (Figure 2A). The test is thick and soft, semitransparent, the body is clearly visible through it. Its surface in preservative is finely wrinkled, almost smooth, covered by filamentous diatoms, giving an impression of test hairs, but actually neither test hairs, nor papillae are present.

The body removed from the test is oval in outline, with the terminal branchial siphon and the atrial siphon placed in one-third of the body length distant from it along the dorsal side. The muscles form an irregular dense network on the right side of the body but absent on the left. The branchial tentacles are not numerous, about 17, in two size ranges. Prepharyngeal band is composed of two blades, it forms very shallow, almost not discernible V around minute dorsal tubercle, which is hard to detect. The branchial sac has 18 internal longitudinal vessels on the right and 16 on the left (Figure 2D). Intermediate branchial papillae are present but not everywhere. The dorsal lamina is high. The transverse branchial vessels continue to the dorsal lamina and project from its rim, giving it a ribbed appearance. The visceral mass occupies most part of the left side. The stomach is short, oval, located at postero-ventral part of the body. Voluminous intestine makes narrow closed loop along the whole ventral mid line, its pole is located almost behind the branchial siphon. The secondary loop is also narrow and closed. The rectum is straight, not long, and the anus is bi-lobed, with a plain margin. The ovary consist of a main tubule, running in the primary gut loop along its axis, and numerous, mostly perpendicular side branches spread over ascending and descending limbs of the gut loop (Figure 2C). Whole visceral mass is covered by numerous renal vesicles.

Remarks. *Ascidia callosa* is a single species of the family Ascidiidae occurring in diver-accessible depths (down to about 40 m) in a wide NW Pacific region from Commander Islands, through Kamchatka waters, where it

is quite common, to at least central Kuril Islands. In NE Pacific, at Alaska coasts, *A. callosa* coexists with a similar, but distinct species *A. columbiana* (Huntsman, 1912) (see Lambert & Sanamyan, 2001).

Sanamyan (1998) reported *Ascidia prunum* Muller, 1776 from north Kuril Islands, but these specimens come from greater depths (118–370 m). The identity of that material needs confirmation but it is certainly not conspecific with *A. callosa* having much more internal longitudinal branchial vessels.

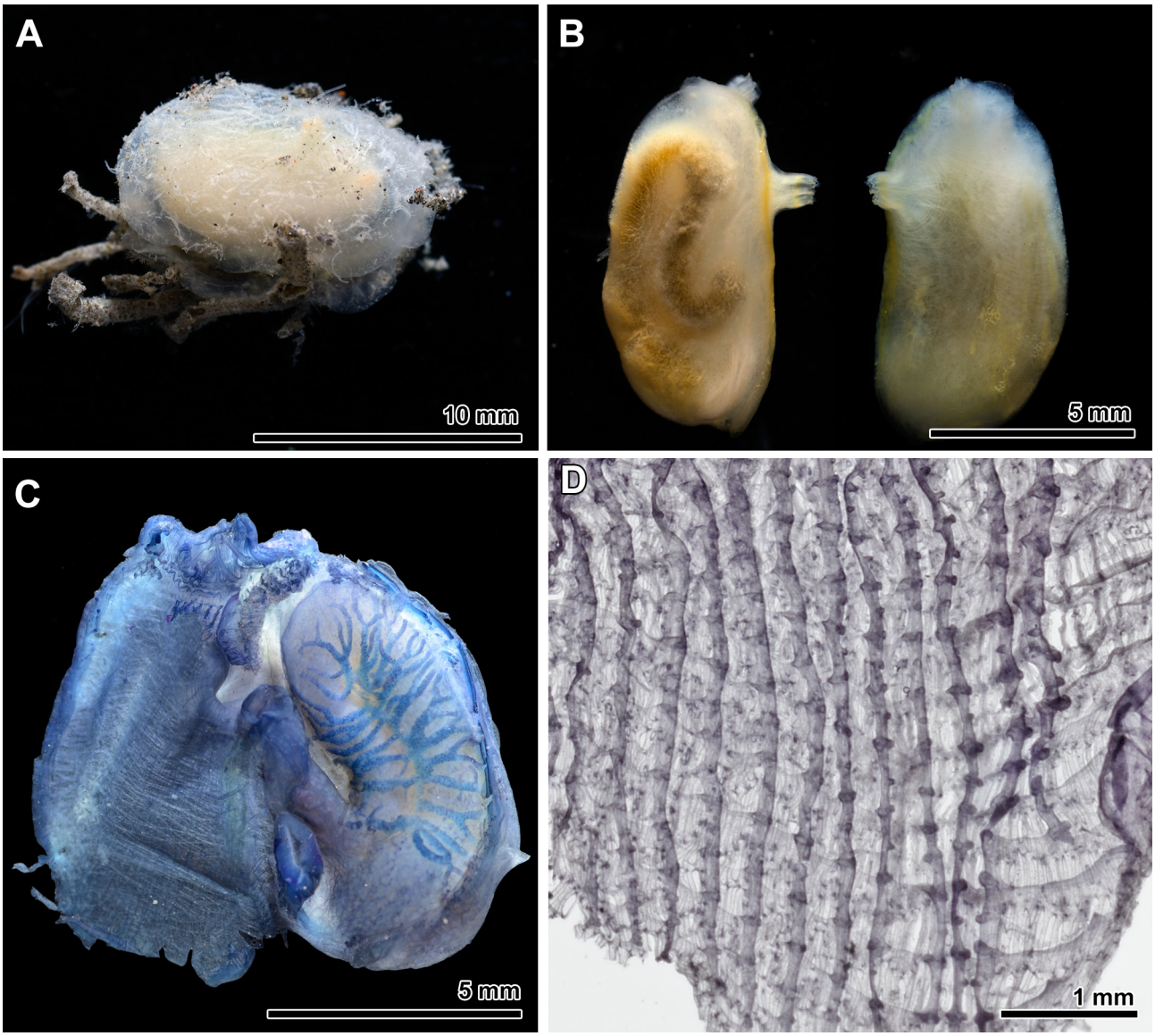

FIGURE 2. *Ascidia callosa*. A, intact specimen; B, specimen with test removed; C, specimen opened ventrally; D, branchial sac.

***Dendrodoa aggregata* (Rathke, 1806)**
(Figure 3)

Ascidia aggregata Rathke, 1806: 11.
Dendrodoa aggregata: Van Name, 1945: 275 (synonymy). Nishikawa, 1991: 127. Sanamyan, 2000: 72.

Material examined. Matua Island, Point Crocodile, 11m, four specimens (#165); Point Kluv, 16 m, one juvenile specimen (#165).

Description. Most specimens are strongly damaged and contracted (Figure 3A). The description of internal characters is based on one small undamaged specimen.

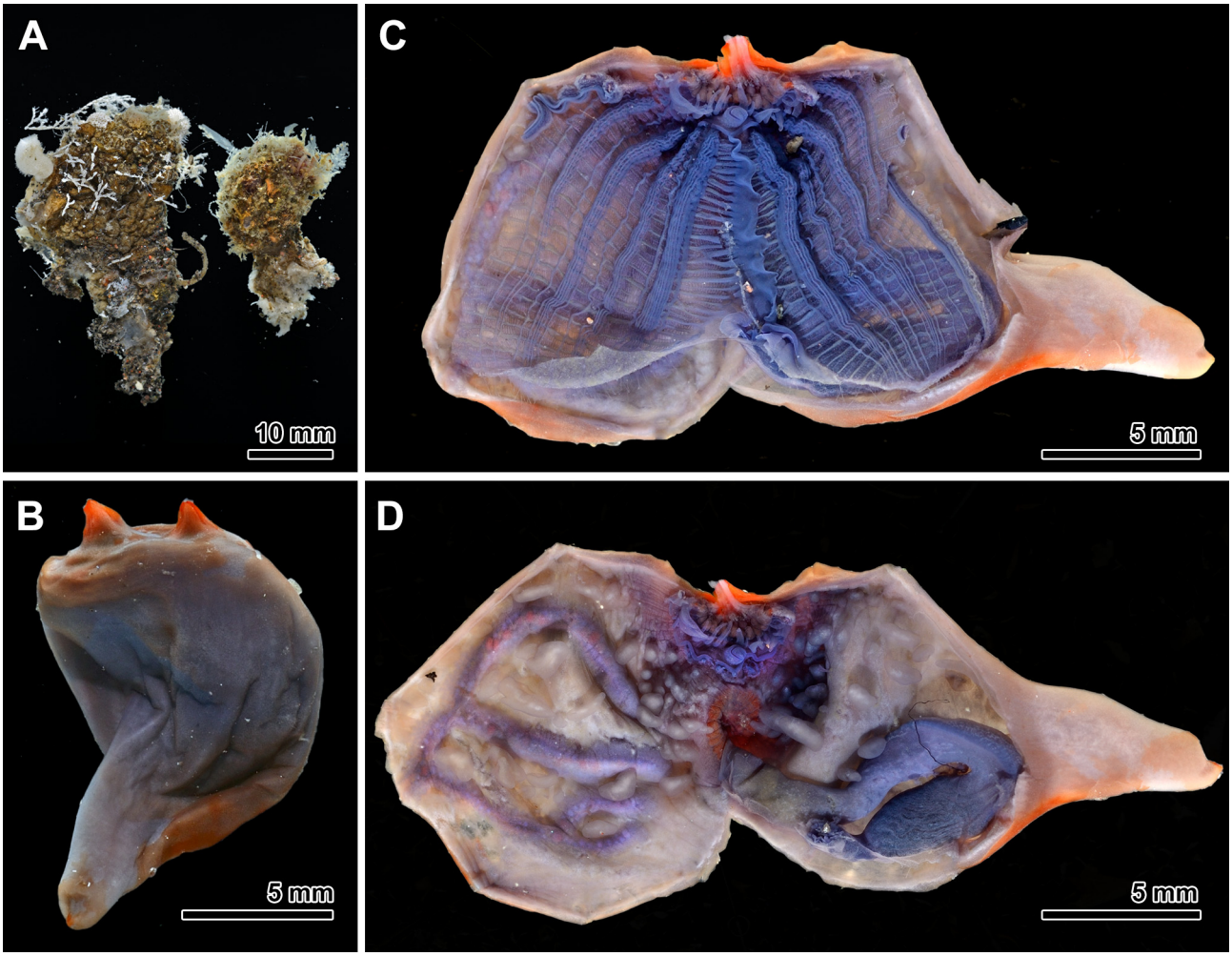

FIGURE 3. *Dendrodoa aggregata*. A, intact specimens; B, specimen with test removed; C, specimen opened ventrally; D, same, with branchial sac removed.

The specimens grow in a tight aggregate of several specimens. The test is heavily covered by sponges, bryozoans and sand particles. Limits between the specimens and siphons of individual ascidians cannot be recognized on the preserved material and as a whole the material looks like a lump of stones mixed with sand and epibionts, rather like a solitary ascidians.

The body removed from the tunic is sac-like, sometimes with a short peduncle, opaque and dark, with a strong brownish-violet tint and blotches of red in freshly preserved specimens (Figure 3B). The siphons are short and terminal, situated close to each other, four-lobed and bright red. About 25 branchial tentacles are present, a half of them are large and other are very small, alternating with the larger ones. Cloacal tentacles are short and filiform, about 30 in number. Large prominent dorsal tubercle has a C-shaped slit with the open interval directed obliquely to the left. The prepharyngeal band is composed of a single thick and high lamella running on some distance from the ring of tentacles and making wide shallow V around the dorsal tubercle. High dorsal lamina has a plain margin. Internal longitudinal vessels on anterior part of the branchial sac of dissected specimen are distributed as follow: EN1(5)1(7)1(5)0(8)0DL0(10)1(4)1(6)1(4)1. In the proximal part of the branchial sac (closer to the bottom) the most ventral folds on each side disappear and the total number of longitudinal vessels is fewer (Figure 3C). The gut forms narrow J-shaped loop, secondary loop widely open. The stomach is voluminous, about twice as long as wide, poorly demarcated from the intestine, with a small caecum. Its internal wall has longitudinal plications, but they are not well visible from the exterior. The rectum is short, opens just under the atrial siphon. Anal margin bi-lobed, smooth. One branched tubular gonad is on the right side of the body only. It is somewhat embedded to the body wall. In the examined specimen the gonad consists of three branches, posterior branch is divided in two (Figure 3D). Endocarps, of various sizes, are numerous and distributed over the whole inner body wall.

Most internal organs, including the tentacles, branchial sac, gut loop and gonad have a strong violet tint (Figures 3B–D show its natural colour, the specimen is not stained).

Remarks. The record is within the known range of *Dendrodoa aggregata*. The gonad with only three branches is atypical for this species and that is attributed to the small size of the examined specimen. A gonad with three branches is characteristic for *D. pulchella* (Verrill, 1871). However, *D. pulchella* typically has smooth thin test, smaller stomach (although this character is variable) and more numerous tentacles. Both species are common in N Pacific, and, in particular, in waters around Kamchatka, but *D. pulchella* typically occurs somewhat deeper, it is not present in our material from East Kamchatka and Bering Sea collected by divers, but is abundant in trawl samples, while *D. aggegata* is common in diver accessible depths too.

Styela clavata **(Pallas, 1774)**

(Figures 4, 5)

Ascidia clavata Pallas, 1774: 25.
Katatropa clavata: Redikorzev, 1916: 204; 1941: 85.
Styela clavata: Van Name, 1945: 316 (and synonymy); Sanamyan, 2000: 68.
Botryorchis clava: Redikorzev, 1941: 187 (part).
Styela greeleyi Ritter, 1899: 516.
Not *Styela yakutatensis* Ritter, 1901: 239.

Material examined. Matua Island, Point Kluv and Point Crocodile, several tens of specimens in eight lots, collected from intertidal zone to 16 m.

Description. Collected specimens range from several millimeters to about 8 см long (Figure 4A). The elongated cylindrical body tapers either gradually, or rather abruptly, to a thin firm stalk attached to substratum. In general the stalk attains about a half length of the body, but may be much shorter or much longer in some specimens. The test is firm, leathery, in the preserved specimens typically longitudinally wrinkled and furrowed. Epibionts (mostly bryozoans and algae) may present on the test, especially on older individuals and especially on the stalk, but usually not in great quantity. Living specimens are uniformly red, the colour is retained in formaline for years.

Branchial and atrial apertures are on the short siphons located on the top of the body, close together. The branchial siphon is directed upward, the atrial curved down and opens downward. The test on the inner surface of the siphons is covered by crowded spines. The spines are narrow and elongated, with sharply pointed tips and with flat oval base, about 50 μm long and 10 μm wide at the base (Figure 4E). Thin parallel longitudinal lines are visible inside each spine.

Body wall is muscular, almost opaque (Figure 4B). About 15 large branchial tentacles regularly alternating with the same number of small tentacles are present. The dorsal tubercle slit is C shaped directed to the left and with the horns rolled inside (Figure 5B). The prepharyngeal band consists of a single lamina running in a close proximity to a ring of tentacles and making shallow V around the dorsal tubercle. The neural ganglion is close to the dorsal tubercle. High dorsal lamina has plain edge. The branchial sac has four rather low folds, the internal longitudinal vessels in dissected specimen are distributed as follow: EN2(7)4(12)4(8)3(17)1DL(14)4(8)4(7)5(7)3EN. Stigmata straight and long, each row is crossed by a parastigmatic vessel.

Gut forms vertical S-shaped loop (Figure 4C). The short oesophagus, at the posterior end of the body, is curved at almost 180° before to enter the stomach. The stomach is cylindrical and large, somewhat shorter than a half of the body length. It is lying more or less parallel to the longitudinal axis of the body, its internal wall has at least 30 well defined regular parallel longitudinal folds. Intestine bends posteriorly, forming tight closed primary loop. The secondary loop is open anteriorly, the rectum is long and straight. Anal border has well defined round lobes, about 15 were counted in dissected specimen.

Two gonads are on the each side of the body. Ovaries are straight, not long, with ventrally bent distal ends. They are parallel to each other and to the longitudinal axis of the body. On each side of the body one ovary lies along the longitudinal midline and is located in the posterior half of the body, while another ovary, lying closer to the endostyle, is located more anteriorly (closer to siphons). The oviducts are short. Numerous male follicles surround each ovary from the sides and posteriorly. They are long, cylindrical, sausage-shaped, not branched,

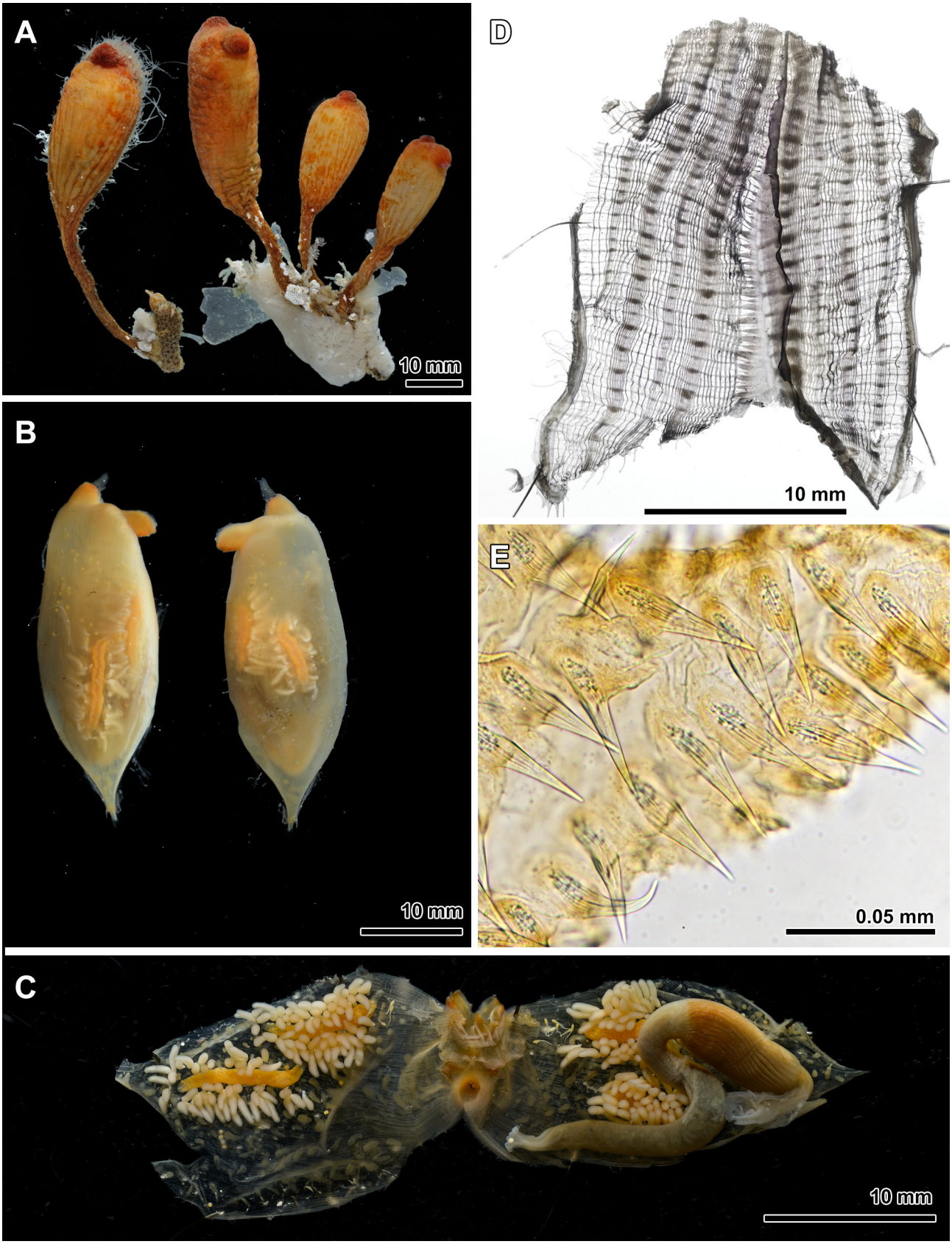

FIGURE 4. *Styela clavata*. A, intact specimens; B, specimen with test removed; C, specimen opened ventrally; D, branchial sac; E, siphonal spines.

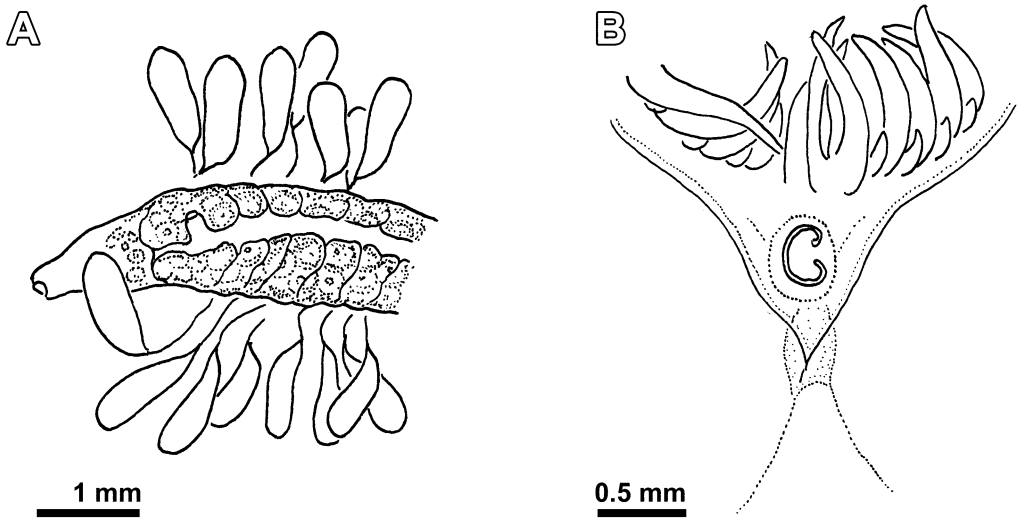

FIGURE 5. *Styela clavata*. A, distal part of gonad; B, tentacles, dorsal tubercle, ganglion.

freely projecting for their whole length into the peribranchial cavity being attached to the body wall, on some distance from the ovary, by their narrow distal ends only. Wide common sperm duct runs along the mesial surface of each ovary and ends in a short male papilla in the anterior part of the ovary (Figure 5A).

The endocarps are numerous. In the form they resemble male follicles (sausage-shaped, attached by narrow ends) but are smaller.

The specimens occurs solitarily or in groups of several individuals, but do not form dense settlements.

Remarks. Although original description of this species lacks any information on its internal features there is no doubt in its identity, the exterior of this species is very characteristic and it is the most common solitary ascidian on the east coasts of Kamchatka (type locality of the species). In NW Pacific *Styela clavata* has been mistaken several times with another species, *Styela clava* Herdman, 1881 (e.g. by Redikorzev, 1941). These two species have similar appearance and similar names but nothing in common in their internal features, and, contrary to the statement of Redikorzev (1941), based on erroneous identification (see remarks under *S. clava* in Sanamyan, 2000) their geographical ranges do not overlap. The distribution of *S. clavata* is probably limited by Bering Sea, east coast of Kamchatka, and extends to the south to at least to central Kuril Islands.

Styela greeleyi from Pribilof Islands (Bering Sea) is a well established synonym. Van Name (1945: 318) expressed an opinion that *S. yakutatensis* Ritter, 1901, another externally similar species known from Yakutat Bay, southern Alaska, and Vancouver Island may be conspecific, but kept them separate. According to him *S. yakutatensis* has lobed male follicles (he, however, doubted that this is a valid feature separating it from *S. clavata*) and probably different shape of the siphonal spines ("very short and squarely truncated"). At our opinion both features, if correctly reported, especially the shape of the spines, may be significant, so we refuse from including *S. yakutatensis* in the synonymy of *S. clavata*.

***Botryllus flavus* n. sp.**

(Figures 6, 7)

Botryllus sp. Sanamyan, 2000: 76.
Botryllus magnus: Sanamyan & Sanamyan, 2010: 245 (Kamchatka).
Not *B. magnus* Ritter, 1901: 255 (Alaska). Sanamyan, 2000: 76 (Commander Islands).

Material examined. Holotype: KBPGI 1449/1, Kuril Islands, Matua Island, Point Kluv, 17 m, 25.08.2016. Paratypes: KBPGI 1450/2, Matua Island, Point Kluv, 15 m, 26.08.2016, one colony.

Additional material examined. Pacific coast of Kamchatka, Starichkov Island, 28.07.2004, 19 m, one colony (Figures 6C, D); 21.09.2004, 20 m, one colony; Kuril Islands, Atlasova Island, 17 m, 26.07.1989, one colony.

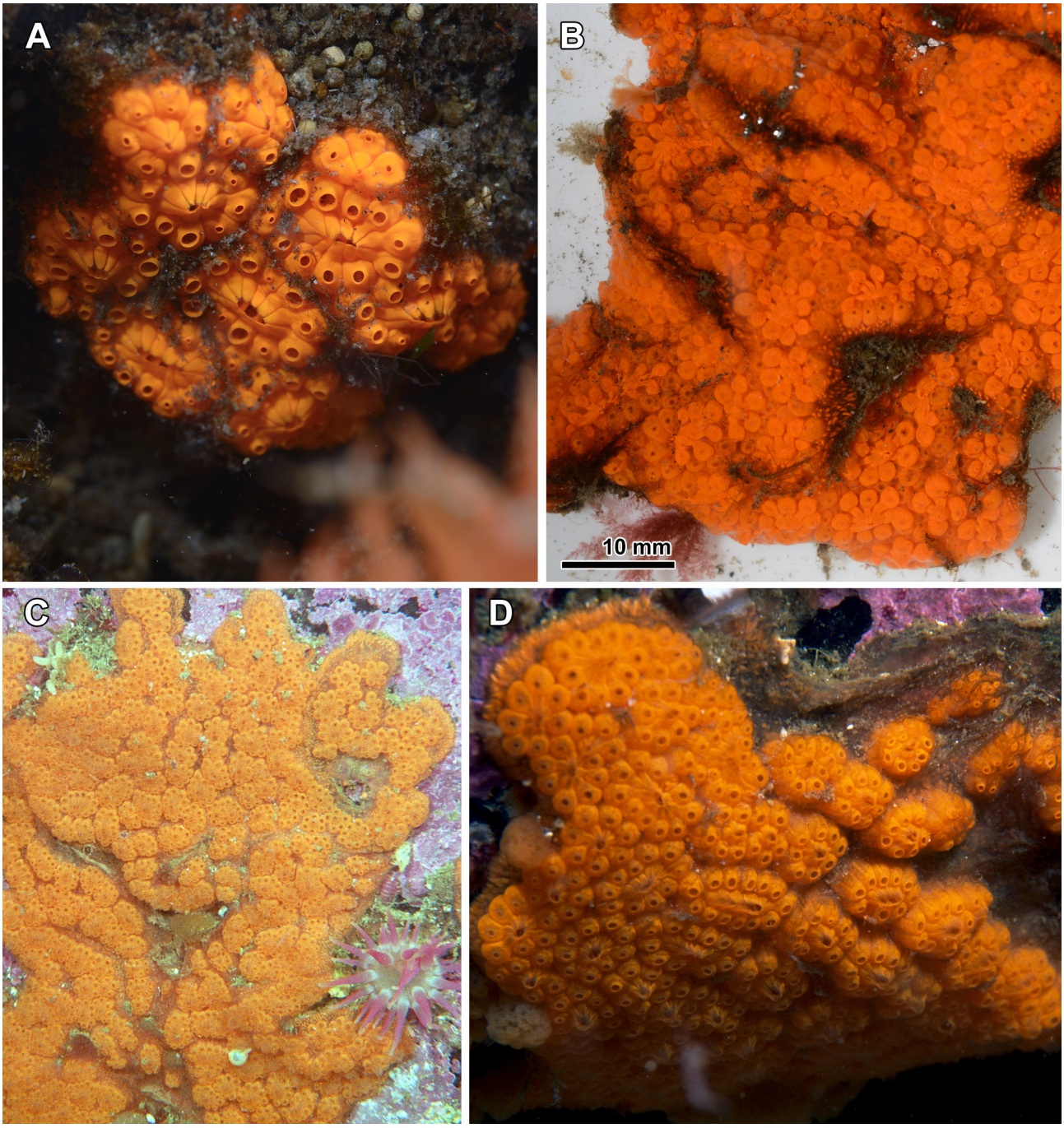

FIGURE 6. *Botryllus flavus* **n. sp.**, colonies. A, paratype KBPGI 1450/2; B, holotype KBPGI 1449/1; C and D, specimens from Kamchatka.

Description. The species forms extensive sheets encrusting stones. The colony of the holotype is 8 x 5 cm in extent and from 5 to 10 mm thick (preserved). The surface is clear, sometimes with some sediment attached on the periphery of the colony or between the systems, but usually free from foreign matter (Figure 6). The common tissue of the colony may be depressed between some systems, or even completely reduced between some groups of systems, so that the colony usually is not represented by one large continuous sheet but looks rather like a group of several large and small sheets joined together (Figures 6C, D). Numerous elongated crowded ampullae are present on the periphery and, in a lesser quantity, between the systems in colonies from Kamchatka (Figure 6C, D); in the colonies from Matua Island (the type material) they are sparse. The colouration of live specimens is very constant. All recorded colonies are yellow with a reddish tint underwater. The colour is monotonous, there are no any colour markings over zooids, etc., as often seen on some other *Botryllus* species. Upon collecting, on the air, live colonies

quickly become deep-orange or bright red probably because of oxidation of the pigment they contain. In formaline they also become red, then the red pigment is washed out, and during several weeks the fluid become deep dirty-reddish and the colony loses deep colour.

Perfectly preserved, not contracted zooids are somewhat larger than 3 mm in height (in holotype). They are upright, standing perpendicular to the surface of the colony. The systems are circular or oval, of "*schlosseri*" type (see Brunetti, 2009), clearly visible on the surface of colony, each may contain as many as 13 or 14 zooids, but often the number of zooids in a system is less than ten. Branchial openings are on short circular (not lobed) siphons which in live colonies arise slightly over the surface of the colony (Figure 6A). Atrial orifices are small, on the end of sometimes rather long atrial siphon. Atrial siphons of all zooids belonging to one system open independently into a small central cloacal cavity.

The oral tentacles are eight in number, four of which are longer (two lateral, dorsal and ventral) and four shorter (Figure 7B).The branchial sac has 15 or 16 rows of stigmata, often 15 on the right and 16 on the left. The second row of stigmata, on both sides of the branchial sac, is not complete. An example of distribution of stigmata between three internal longitudinal vessels, counted in the middle of the branchial sac is follow: 12-9-6-6-DL-7-6-7–10.

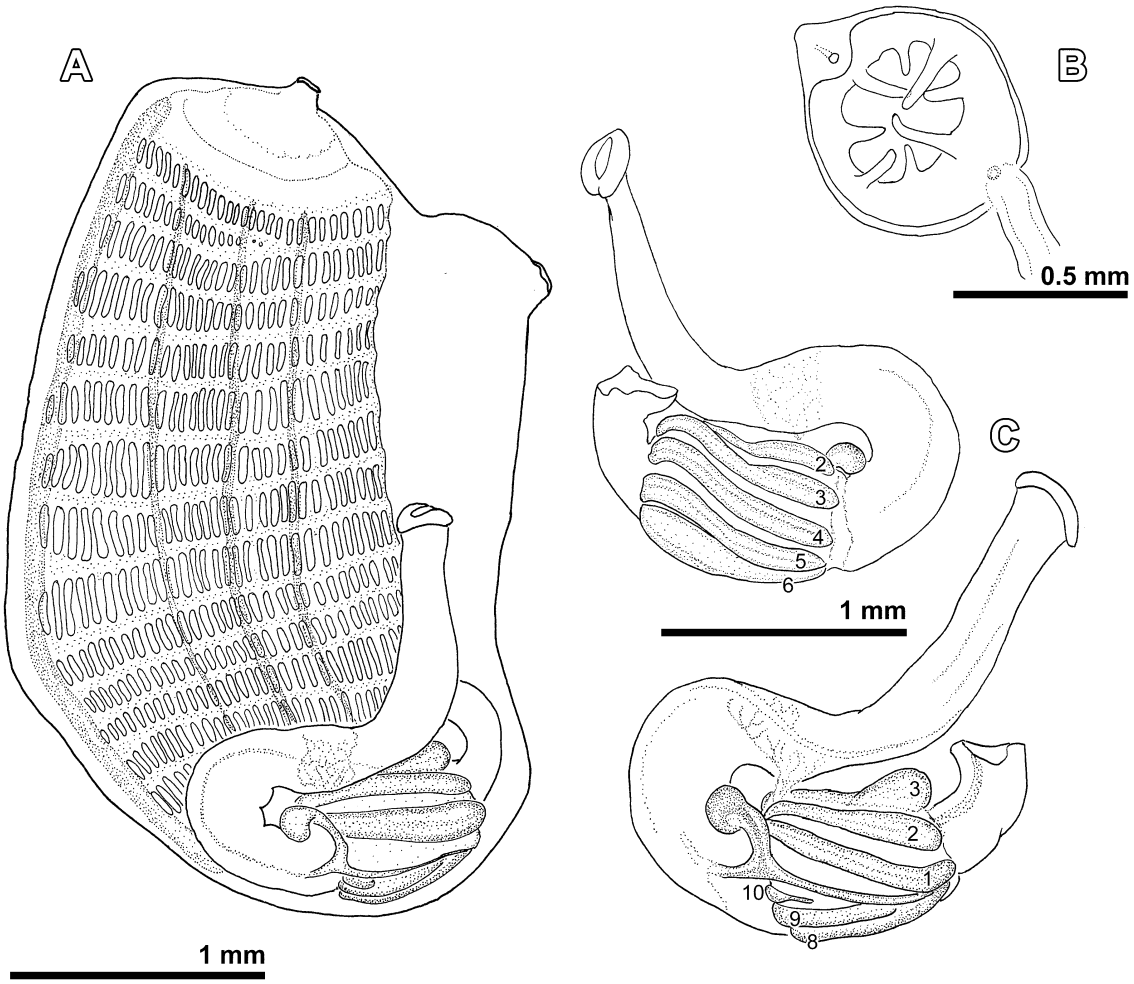

FIGURE 7. *Botryllus flavus* **n. sp.** A, zooid; B, tentacles; C, gut loop.

The stomach is short, cylindrical, both its ends (pyloric and cardiac) are of about the same diameter. Longitudinal stomach folds are prominent, not swollen on the cardiac end, run diagonally, ten in number (the typhlosolis not counted), of which fold #9 (see Figure 7C) is always short and does not reach cardiac end of the stomach, and the fold #10 is rudimentary and not always present. The typhlosolis extends over the pyloric end of

the stomach. The caecum, arising from the typhlosolis on the level of pyloric end of the stomach is rather long, about half length of the stomach, bent, and swollen into a spherical ampulla at the end. The secondary loop is widely open, the short straight rectum makes an obtuse angle with the intestine. The anus is bilobed, with the smooth margin.

In all colonies examined the zooids of the first (filtering) generation contain no gonads. In the holotype the colony contains also small zooids of the second, and attached to them minute zooids of the third generation. The latter contain up to five ova on each side of the body. Male gonads were not detected. Colonies contain no larvae.

Remarks. This is the only known Botryllid species occurring in the region from east coats of Kamchatka to north and central Kuril islands. It was reported previously from Pacific coast of Kamchatka by Sanamyan & Sanamyan (2010) as *Botryllus magnus* and from Paramushir Island (north Kuril Islands), as *Botryllus* sp. by Sanamyan (2000).

Botryllus magnus was originally described by Ritter (1901) from Kodiak and Popof Islands, Alaska. Van Name (1945) inclined to believe that *B. magnus* (reported by him as *Botrylloides magnum*), is identical with northern and Arctic species *Botrylloides aureum* Sars, 1851, but we do not support this view: the shape of the systems is an obvious and valid character separating *Botrylloides aureum* from *Botryllus magnus*. A colony reported as *Botryllus magnus* by Sanamyan (2000) from Commander Islands is probably identified correctly: the colony, the shape of system and the zooids are similar with those described by Ritter (1901).

Zooids of *Botryllus flavus* **n. sp.** differ from *B. magnus* in the following points: 1) The secondary gut loop in *B. flavus* **n. sp.** is widely open, while in *B. magnus* it is more narrow (the intestine makes a sharp angle with the rectum, as figured by Ritter, 1901, Figure 36 or described as "narrow and nearly closed" by Sanamyan, 2000: 76). 2) The branchial sac of *B. magnus* from Commander Islands and from Alaska has 11–13 rows of stigmata, while 15 or 16 rows are present in *B. flavus* **n. sp.** 3) The specimen of *B. magnus* from Commander Island has the second row of stigmata complete (a feature not described for the specimens from Alaska), while in *B. flavus* **n. sp.** the second row is not complete on both sides of the branchial sac. 4) Both Ritter (1901) and Sanamyan (2000) reported 16 tentacles for *B. magnus*. The presence of 16 tentacles in the material from Commander Islands was confirmed by reexamination, the first two cycles of tentacles (4+4) are distributed in the same way as described above for *B. flavus* **n. sp.**, but *B. magnus* has also a third ring of eight small tentacles. We cannot decide at this point if this is a valid species specific feature. Finally, the two species appear to have different colour. Ritter (1901) specially pointed that his colonies showed practically no variation in colour from colony to colony. All his colonies were "dusky purple", probably of the same colour as Sanamyan's (2000) material from Commander Islands (described as dark blue in live) although it is not known if Ritter's description applied to live or to preserved specimens. *Botryllus flavus* **n. sp.**, on the other hand, is always uniformly bright yellow-reddish, the species is not abundant but not rare in Kamchatka waters and we had many chances to observe colonies underwater during many years of diving activity, no color variations were encountered.

Several botryllids were described or are know from more southern and warmer waters along Pacific coasts of Russia and Japan, but none of them is similar with *B. flavus* **n. sp.**, and none of them occurs in central Kuril Islands or in Kamchatka waters.

Placentela crystallina Redikorzev, 1913
(Figure 8)

Placentela crystallina Redikorzev, 1913: 212. Nishikawa, 1984: 39. Sanamyan, 1998: 134.
Homoedistoma michaelseni Redikorzev, 1927: 376.

Material examined. Matua Island, Point Kluv, 16–17 m, collected at 25–28.08.2016, three colonies (#153, 160, 169).

Description. All colonies are small, the largest is 3 cm long, and all are represented by a single head on rather high peduncle and contain from two to five zooids only. The most conspicuous part of colony is a transparent head containing thoraces of the zooids. In the head the zooids are oriented in such a way, that their branchial openings open on the sides of the head and the atrial openings open independently from each other closer to the top of the head (Figure 8B). The atrial openings have six equal prominent round lobes, the branchial openings also have six lobes, but the dorsal lobe is larger than other, which are low.

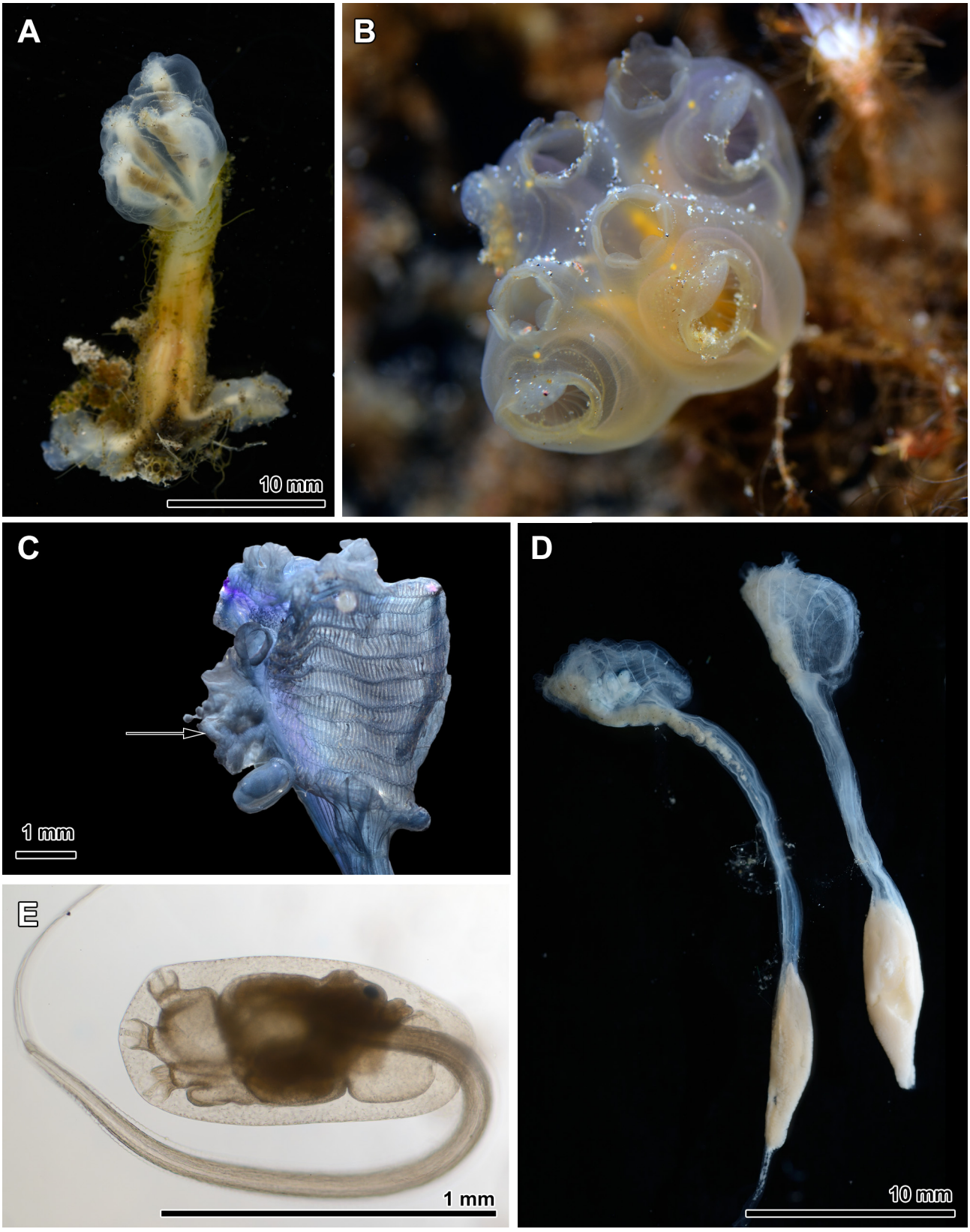

FIGURE 8. *Placentela crystallina*. A, preserved colony; B, live specimen underwater; C, detail of thorax, body wall removed from the right side, arrow shows placental membrane; D, zooids; E, larva.

The zooids are large and characteristic for this species. They have wide, but relatively short branchial sac with 10 rows of stigmata and about 40 stigmata per row on each side. The abdomen is very long, the stomach is in its posterior end which is filled by parenchymatous tissue. The postabdomen and gonads not present in the material

examined, however several zooids contained larvae attached to a placental membrane in the right side of the thorax (Figure 8C, D). The fully developed larva has a trunk 1.1 mm long. It has thee adhesive organs arranged in a vertical row and has no vesicles or ampullae (Figure 8E).

Remarks. In the Sea of Okhotsk and in Kamchatka waters this species may form large, 20 cm and more, heavily branching, tree-like colonies, but all specimens recorded in Matua Island are very small, although some contain fully developed larvae.

The genus *Homoedistoma* Redikorzev, 1927 is a synonym, its type species, *H. michaelseni* Redikorzev, 1927 is conspecific with *Placentela crystallina* (see Sanamyan, 1993, type revision).

Aplidiopsis pannosum (Ritter, 1899)

(Figure 9)

Polyclinum pannosum Ritter, 1899: 519
Polyclinum globosum Ritter, 1899: 518
Aplidiopsis pannosum: Van Name, 1945: 67. Tokioka, 1960: 194. Nishikawa, 1990: 80. Sanamyan, 1998: 107.
Aplidiopsis helenae Redikorzev, 1927: 382

Material examined. Matua Island, Point Kluv, 16 m, 24.08.2016, one colony, collector E. Drashev (#150); 16 m, 23.08.2016, two colonies (#159, 161).

FIGURE 9. *Aplidiopsis pannosum*. A, zooids; B, preserved colony; C, larva.

Description. The colonies are thick potato-like dirty brown irregular masses, often embracing stems of algae (e.g. *Agarum*) (Figure 9B). The surface sometimes has sparse sand grains but in general is more or less clear. The test is tough, firm, cartilaginous, opaque, the zooids are not visible from the exterior. The zooids are arranged into circular systems. They are about 8 mm long in somewhat contracted condition. The branchial siphon is short and has six pointed lobes. The atrial lip is long and wide, always simple. The thoracic muscles, about eight or ten in number, are fine, weak, and probably not expand to the abdomen, there is no discernible ventral band of muscles in abdomen, which occurs in some other species of this and related genera. The branchial sac has 16 rows of stigmata with about 15 stigmata in each row on each side. The stigmata are short, small, or even oval, especially closer to the endostyle on both sides of the branchial sac. The abdomen is shorter than the thorax, the shape of the gut loop is characteristic for the genus with the oesophagus bent ventrally at the right angle to enter the smooth-walled asymmetric stomach. The post-stomach differentiation of the intestine is pronounced and well defined (Figure 9A). The postabdomen is attached to the left side of the abdomen by a narrow neck and filled by parenchymatous tissue in the zooids examined.

Numerous larvae are incubated in the atrial cavity. The trunk is about 0.9 mm long. Three adhesive organs alternate with four median ampullae. Large lateral ampullae are in two rows anteriorly (one row on each side). Two groups of vesicles, dorsal and postero-ventral, are on each side of the larval trunk. This feature is rather characteristic for the genus.

Remarks. The species is common in NW Pacific. Although many colonies were studied previously, the material is insufficient to decide if all of them are conspecific: the variations of the shapes of colony and the number of rows of stigmata seems to be a little too big for a single species (see Sanamyan, 1998). Shallow-water potato-like dirty yellowish brown or grey colonies, we had chance to document underwater during several recent years at Kamchatka (Sanamyan & Sanamyan, 2010), appear to be certainly conspecific with the material from Matua Island described here. On the other hand, a single available photo of this species from Commander Islands shows vivid bright red colony (see Sanamyan &Sanamyan, 2015).

Aplidium eborinum Sanamyan et Sanamyan, 2011

(Figures 10A, B)

Aplidium eborinum Sanamyan & Sanamyan, 2011: 46.

Material examined. Matua Island, Point Kluv, 15 m, 25.08.2016, two colonies and fragments (#156, 157).

Description. The specimens form irregular small colonies composed of several separated of fused lobes (Figure 10B). In live the colonies are colourless, whitish, the superficial layer of the test contains crowded white pigment granules which make the colony opaque. Inner layers of the test are transparent and soft. Large common cloacal openings are on the top of low elevations on the upper surface of colony. Zooids are probably arranged in rows along the cloacal canals converging to common cloacal opening, but this is not quite clear on existing photographs of live colonies.

The zooids are up to 11 mm long with the thorax and abdomen attaining up to 5 mm in better expanded zooids. The branchial siphon is short, six lobed. The atrial languet is simple and short, issued from the upper rim of the atrial opening, which is very small in contracted zooids. The branchial sac has 12 rows of stigmata with 18 or 19 stigmata per row counted in the middle part of the branchial sac (on each side). The stomach is barrel shaped, with 12–14 regular and prominent longitudinal folds. Some zooids have incubated eggs in the atrial cavity, but no developed larvae were found.

Remarks. The species was known previously only from Kamchatka waters. The colonies from Matua Island are smaller than the colonies from Kamchatka and have less evident systems: in the specimens from Kamchatka the zooids are arranged into distinct double rows along the cloacal canals which are clearly visible in live colonies (see Sanamyan & Sanamyan, 2011, Figure 5). Also, the type specimens from Kamchatka have a bit larger branchial sac (14 rows of stigmata) and slightly more numerous stomach folds (13–15). All these differences are considered here as connected with the smaller size of colonies from Matua Island, however, the identification remains not very reliable and should be confirmed on a material containing larvae.

FIGURE 10. A and B, *Aplidium eborinum*: A, zooids; B, colony. C, *Aplidium* sp., colony.

***Aplidium* sp.**
(Figure 10C)

Material examined. Matua Island, Point Kluv, 15 m, 25.08.2016 and 26.08.2016, two colonies and fragments (#163, 179); Point Crocodile, 15 m, 19.08.2016 one colony (#158).

Remarks. All colonies are very small and zooids are strongly contracted and the species cannot be identified precisely. The general shape and colour of the colony on the underwater photograph (Figure 10C) reminiscent those of *Aplidium eborinum*. The zooids have about 11 or 12 rows of stigmata and 9 or 10 prominent longitudinal stomach folds. They are much smaller than those of *A. eborinum* but this may be because they are too strongly contracted. The preserved colonies resemble the specimens from Kamchatka identified by Sanamyan (1998) as *A. sagamiense* (Tokioka, 1967), but zooids have more rows of stigmata. *Aplidium sagamiense*: Sanamyan (1998) is, most probably, wrongly identified, this species inhabits warmer waters, (originally described from Sagami Bay, Japan) and it is hard to believe it may occur in cold waters around Kamchatka and north and central groups of Kuril Islands.

***Aplidium macrenteron* nom. nov. for *Macrenteron ritteri* Redikorzev, 1927**
(Figure 11)

Macrenteron ritteri Redikorzev, 1927: 379. Sanamyan, 1998: 105.

Material examined. Matua Island, Point Kluv, 16 m, 24.08.2016, one colony (#162).

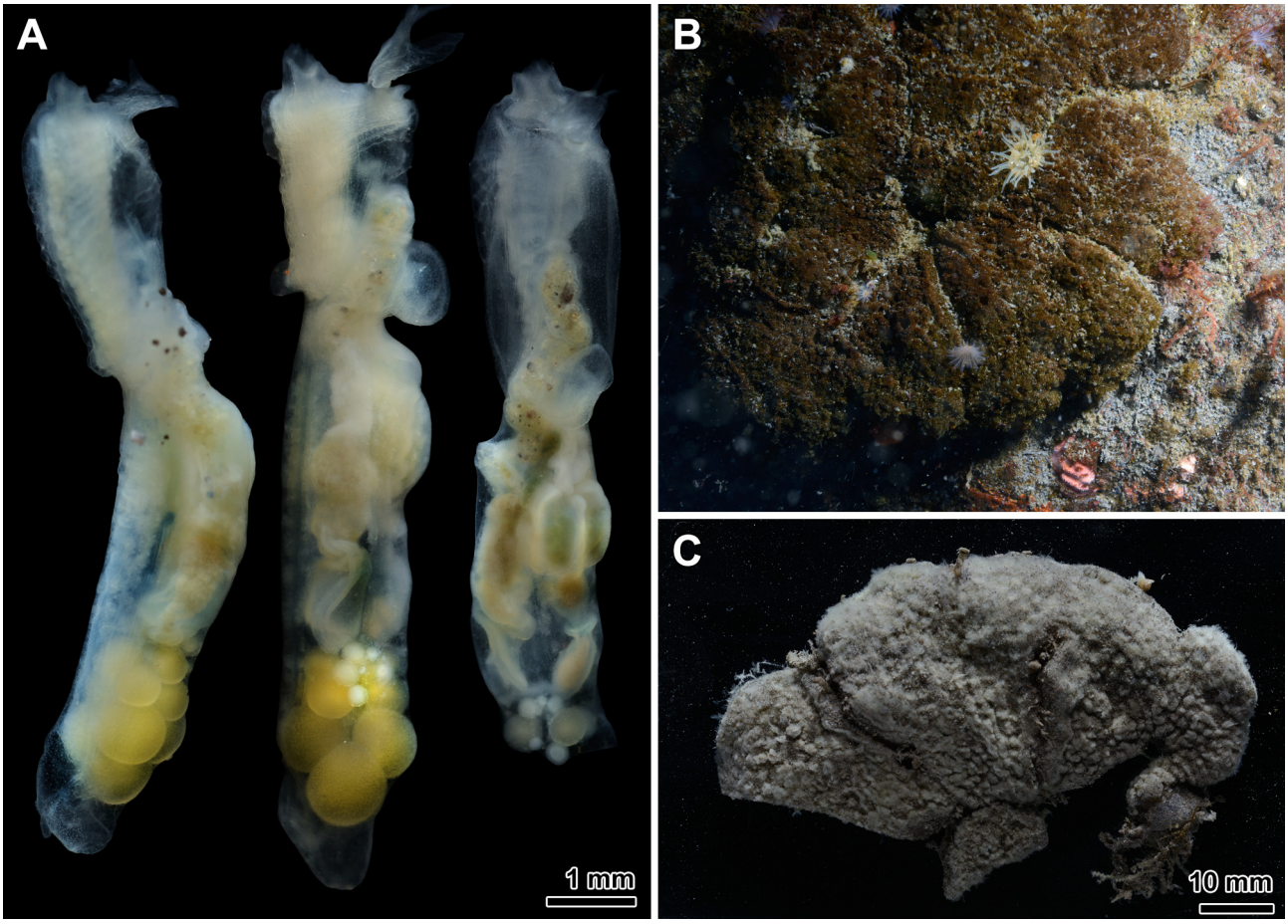

FIGURE 11. *Aplidium macrenteron* nom. nov. A, zooids; B, colony underwater; C, preserved colony.

Description. The colony is a flat sandy mass, 8 cm in greatest diameter and about 1 cm thick, attached to a stone by a whole lower surface. The surface and the inner layers of the test contain large amount of sand making the colony extremely cryptic despite its large size. The upper surface is flat, the common cloacal openings are numerous but hard to see and the systems of zooids cannot be recognized even on the underwater photographs of live colonies.

The zooids, about 8 mm in somewhat contracted state, stand within the colony vertically and parallel to each other. Longitudinal thoracic muscles are thin, about 12 in number, expand to abdomen and postabdomen as two ventral bands of crowded muscles, which are not strong. Discernible transverse muscles present on the anterior (upper) end of the thorax. The branchial siphon is short, and although it has usual 6 lobes, the lobes are not well defined and often irregular. The atrial languet issued from the upper rim of the small atrial opening. The atrial languet may be wide with three long lobes, or narrow and simple (in zooids from the same colony). The branchial sac has 13 rows of about 20 stigmata on each side. The abdomen is short and straight, the stomach is in its middle part, with five prominent widely separated longitudinal folds. The postabdomen is a direct continuation of the abdomen (no constriction between them) and shorter than the abdomen. It contains a group of large ova and a compact bunch of small testis follicles situated immediately below the pole of the gut loop. The heart is in the end of the postabdomen.

Remarks. Most previously recorded specimens of this species had strongly developed epicards extending down from the bottom of the branchial sac along the ventral side of zooid through the whole length of abdomen and postabdomen and usually filled by pink parenchymatous tissue. Redikorzev (1927) misinterpreted them with the heard and created a new genus *Macrenteron* for this species. Sanamyan (1998) recognized that the heart in this species is in the end of postabdomen, as in all related species of Polyclinidae, but thought the genus may be separated from *Aplidium* by unusually well developed epicardium. The present colony contains well developed zooids in which epicardium is not filled by parenchyma and is not conspicuous. The zooids certainly are of *Aplidium* type and the genus *Macrenteron* is synonymized with *Aplidium* here. The name *Aplidium ritteri* is, however, preoccupied by *Aplidium ritteri* (Sluiter, 1895), so a new replacement name *Aplidium macrenteron* nom. nov. is proposed here for this species.

***Distaplia alaidi* Sanamyan, 1993**

(Figure 12)

Distaplia alaidi Sanamyan, 1993: 170.

Material examined. Matua Island, Point Kluv, 15 m, several specimens in two lots (#77, 157).

Description. Colony consist of one, two, or rarely three spherical or oval heads, up to 1.5 cm diameter, but usually less than 1 cm, supported on a thin, no more than 4 mm diameter, long (up to 4 cm) stalk. The stalk is sharply demarcated from the head. Its basal part creeps along the branches of hydroids and bryozoans to which it is attached. In formaline the colonies are opaque white, soft, with zooids indistinctly visible from the exterior. The surface is clear, some sand grains occasionally present on the stalks. Underwater photographs (Figures 12B–D) reveal the peculiar structure of the colonies, totally obscured on preserved specimens. Each head contains a single system of zooids. A single large cloacal opening is on the top of each head. Its diameter is rather large and attains one third of the diameter of the head (in live state). The margin of the cloacal cavity is surrounded by the prominent round lobes, about 10 of them may be counted on some photographs. The cloacal cavity is very spacious, thoraces of almost all zooids in the head, with all four rows of stigmata completely exposed into the common cloacal cavity, can be easily seen through the cloacal opening. The zooids in the head stand almost vertically, with their dorsal sides facing to the axis of the colony. Branchial openings of individual zooids open on the surface of the upper half of the head, each opening is on the top of unusually long and wide thin-walled plain-edged siphon rising above the surface of the head and bent down (ventrally) (Figure 12D).

Zooids, with significantly contracted thoraces (in formaline) are about 6 mm long. The stigmata are very long, about 26 counted in the middle rows on each side of the branchial sac. Each row is crossed by a thick parastigmatic vessel. Four rows of stigmata are not grouped by two (as in *Sycozoa*). The stomach is large, voluminous, asymmetrical, with its ventral side being longer than the dorsal, clearly demarcated from the intestine, contrasting

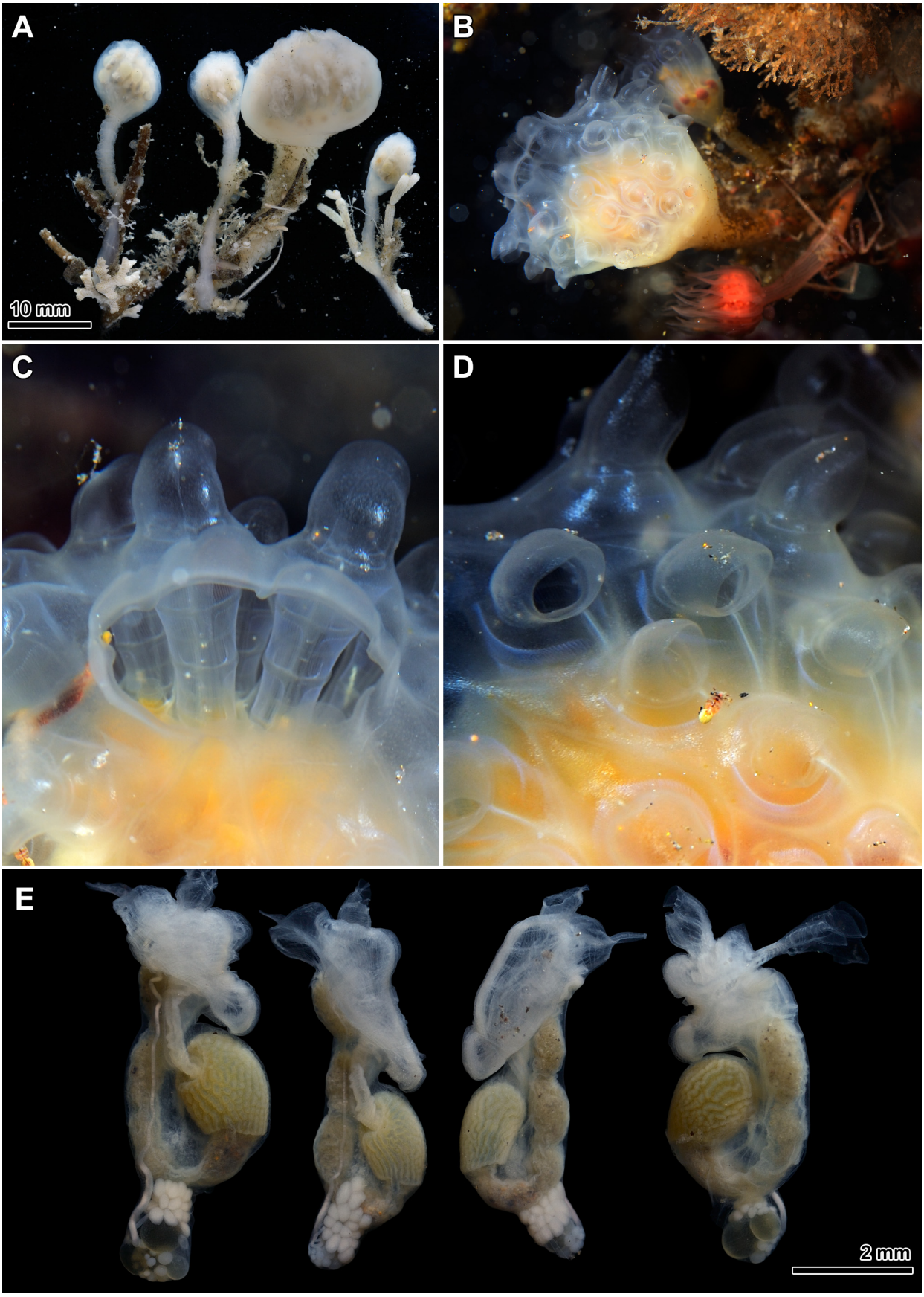

FIGURE 12. *Distaplia alaidi*. A, preserved colonies; B, colony underwater; C and D, the same colony, enlarged to show details of cloacal opening and orientation of branchial siphons; E, zooids.

deep-red in live specimens (visible on a smaller colony on Figure 12B). Stomach wall presents small rounded swellings (or areolations) sometimes fused together and arranged in irregular longitudinal lines (Figure 12E). Gonads, consisting of rather numerous male follicles and several large ova are in the sack protruding from the posterior end of the abdomen. The examined colony contained numerous long brood-pouches located at the base of the colony head, below the zooids. The brood pouches are connected with the zooids by very long narrow connective, which is longer than the length of the zooid and easily tear when the zooids are extracted. They contain from one to five developing eggs in a single row, but no larvae were found.

Remarks. The species was known previously only from original description based on two specimens from Atlasova Island (which belongs to north Kuril group of islands). Sanamyan (1993), having only preserved specimens, failed to recognize the structure of the systems and a peculiar shape of the colony with long ventrally bent branchial siphons protruding from the colony surface. Current record from central Kuril Islands, where it is probably not rare, extends its known geographic range to the south. The species most probably is an endemic for Kuril Islands—during many years of investigation we saw no similar colonies in Kamchatka waters, and nothing similar is known from more southern locations. The species cannot be confused with any other *Distaplia* species or other colonial ascidian known from the region.

***Distaplia matua* n. sp.**
(Figure 13)

Material examined. Holotype: KBPGI 1451/1, Kuril Islands, Matua Island, Point Kluv, 15 m, 25.08.2016. Paratypes: KBPGI 1452/2, Matua Island, Point Kluv, 15 m, 22.08.2016, one colony and KBPGI 1453/3, same locality, 26.08.2016, one colony.

Description. The holotype (in formaline) is a dirty-brown, dark and an almost flat crust with glossy shinning surface, about 6 cm in diameter and up to 10 mm thick (Figure 13D). The test is firm, cartilaginous, not spongy in consistence, opaque, free from foreign particles on surface and inside. Position of each zooid is marked by branchial openings, but zooids are not visible through the test and the systems are not recognizable. In live the colonies look completely different (Figures 12A–C). They form low, wide, reddish or, sometimes, carmin red cushions, attached to substratum by the whole wide lower surface. The branchial openings of zooids are large and crowded, six-lobed, distributed evenly along the whole surface of the colony. Common cloacal openings are on the tops of short and wide siphons, situated, sometimes, on the slightly raised parts of the colony (Figure 12A). Common cloacal siphons have lobed margin.

The zooids, with strongly contracted thoraces, are about 3.5 mm long. They are deep-brown, or sometimes black-brown, opaque. The branchial siphon, when not contracted, is conspicuous, with six short lobes. Atrial opening is wide, in live all four rows of stigmata are exposed to the cloacal cavity, in contracted zooids it may be slit like. The longitudinal thoracic muscles are very numerous, crowded and difficult to count, approximately about 30 on each side. The circular muscles on the branchial siphons are well developed. The branchial tentacles usually, but probably not always, are distributed in a following way: three tentacles of the first size order are the longest (one dorsal and two ventro-lateral), between them are inserted three medium sized tentacles of the second size order, and there are several minute tentacles of the third size order. The stigmata are in four rows grouped by two (as in *Sycozoa*). We counted about 14–17 stigmata in the middle rows but about 18–19 in the first row. The parastigmatic vessels are not discernible and probably absent. The oesophagus is long, its distal end bent at almost right angle to enter the stomach. The compact asymmetric obliquely oriented stomach is in the posterior half of the abdomen, on some distance from its posterior end. Stomach wall has numerous (about 20 or more) rather regular longitudinal folds (Figure 12E). The subdivision of the intestine is not pronounced and obscured by opaque wall of zooid. The gastric reservoir is present. The gonad is in the abdomen on the right side of the gut loop, not in the protruding sac, contains several (up to 10 were counted) oval male follicles, and one to three ova. Several zooids have minute brood pouch which just start to develop and contains no ova yet. The colonies contain no larvae.

Remarks. The species of the genus *Distaplia*, known from the region include: one species, *D. alaidi*, known from Kurile Islands only, two species, *D. rzhavskii* Sanamyan, 1993 and a species recorded as *Distaplia* sp. aff. *clavata* (Sars, 1851) by Sanamyan (1993) known from Kamchatka waters, and one species, *D. dubia* (Oka, 1927) from Sea of Japan.

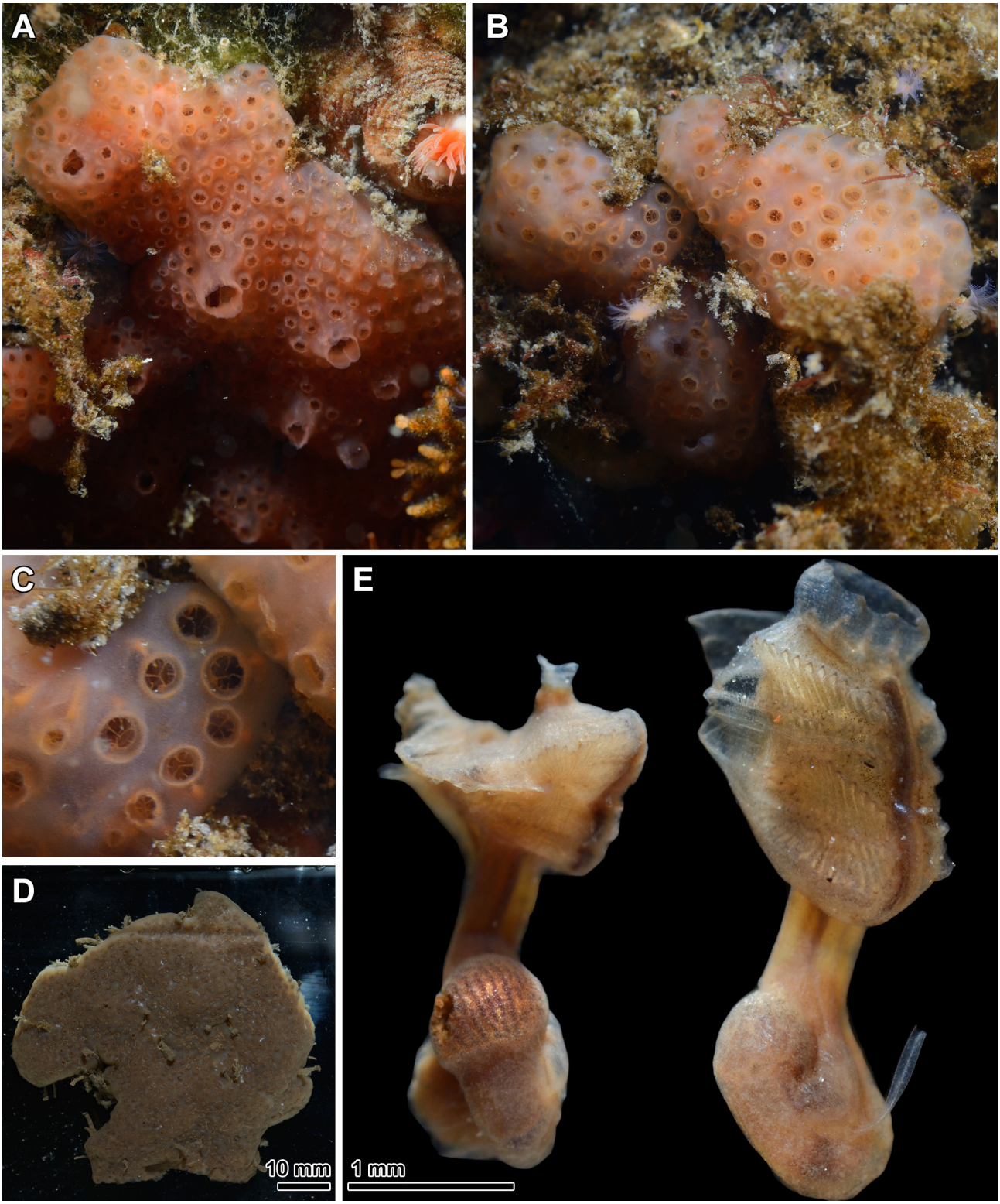

FIGURE 13. *Distaplia matua* **n. sp.** A, holotype KBPGI 1451/1; B, paratype KBPGI 1452/2; C, the same colony, enlarged view of branchial siphons; D, holotype, preserved; E, zooids.

Distaplia dubia is very common on sea algae in the vicinity of Vladivostok. *Distaplia unigermis* Ivanova-Kazas, 1965 is probably its synonym. We had chance to examine many colonies of *D. dubia*, they are either whitish or greenish, small, often composed of several separated systems (exactly as figured by Nishikawa, 1990, Figure 9) and in overall are very different from the present species. In the preservative they remain whitish and not become deep-brown as *D. matua* **n. sp.**

Distaplia rzhavskii has a colony composed of several closely placed upright lobes. Sanamyan (1993) pointed to transverse thoracic muscles as to a significant taxonomic feature of this species, but this may be connected with a way thoraces contracted during fixation and should be confirmed. The shape of the colony, however seems to be distinctive. Also, *D. rzhavskii* has areolated stomach, rather than longitudinally folded in *D. matua* **n. sp.**

Distaplia sp. aff. *clavata*: Sanamyan, 1993 has massive colony attached by a small point. Most probably it has no relation with *D. clavata* (Sars, 1851) and the colony, as well as the zooids with areolated stomach, differ distinctly from *D. matua* **n. sp.**

The species from Alaska, *D. alaskensis* Lambert et Sanamyan, 2001, also has different colony, composed of club shaped lobes and different zooids with finely areolated stomach.

Distaplia matua **n. sp.** appears to be most closely related to *Distaplia colligans* Sluiter, 1932, which also inhabits cold waters but in a geographically distant region, Magellan Islands and Antarctic Peninsula. The colonies of this species are flat, encrusting and dramatically change colour from bright yellow in live to deep-brown or almost black in preservative (see Sanamyan, Schories, 2003). The zooids have fine longitudinal plications on the stomach wall.

Didemnidae spp.

The collected material contains four species of didemnid ascidians, tentatively identified as *Polysyncraton crassum* Redikorzev, 1913, *P. asperum* Romanov, 1989, *Didemnum caudiculatum* Romanov, 1989 and *D. trispirale* Romanov, 1989. They will be described in a separate publication.

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