Three related *Aplidium* species from the Southern Kurile Islands (Ascidiacea: Polyclinidae)

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Aplidium glabrum (Verrill, 1871) (= *Amaroucium vinogradovae* Beniaminson, 1974 syn. n.), *A. tenuicaudum* (Beniaminson, 1974) and *A. confusum* sp. n. are described and their distinguishing characters are discussed.

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Introduction

The genus *Aplidium* is well represented in the Northern Pacific. The taxonomic status and degree of intraspecific variation of many species of this genus are still unclear, and the inadequate descriptions exacerbate the problem. Several species of this genus were described from the Kurile Islands by Beniaminson (1974, 1975). Her descriptions are incomplete and lack necessary information on some significant characters, such as the number of stomach plicae and morphology of larvae. The present study is based mainly on samples from Southern Kurile Islands received from Academician O.G. Kussakin for identification and also on a few additional specimens from Kamchatka. It is important that many colonies of the genus *Aplidium* in this material have fully developed larvae, and the species are separated mainly by the structure of their larvae and other minor features of zooids and colony, such as the form of atrial languet, presence or absence of a small amount of sand grains on the colony surface. Three species belonging to the genus *Aplidium* were identified in this material. The material is kept in the Kamchatka Institute of Ecology and Environment, Petropavlovsk-Kamchatsky (KIE).

Aplidium confusum sp. n.

(Fig. 1)

Holotype. (KIE 1/1009), Southern Kurile Islands, Polonskogo Island, Moryakov Bay, intertidal, collector O. Kussakin.

Paratypes (KIE 2/1010 – 5/1013): same data, 1 colony; Polonskogo Island, Severny Point, 22.VII.1987, intertidal, 7 colonies; Shikotan Island, Krabovaya Bay, 31.VIII.1997, intertidal, 1 colony; Yury Island, Katernaya Bay, 8.VIII.1987, 8 specimens.

Description. Colony of holotype is an oval flat-topped mass 40 × 29 mm in extent and 10 mm in height attached to substratum by a small area on its lower surface and composed of several closely adjoining lobes, whose limits are more distinctly seen on the sides of colony. Small colonies, 5-20 mm in diameter, almost spherical; heads attached to substratum by narrow area on their lower surface or by short peduncle-like extension of the test. Some colonies consist of several such heads arising from a common test (Fig. 1C). Surface of the test smooth and free from sand, few sand grains only on attachment area. No embedded sand. Test soft and nearly colourless or pale reddish, transparent; reddish zooids distinctly seen through it. Several cloacal openings observed. Zooids apparently arranged in double rows, but true form of the systems cannot be determined.

Zooids vertical and crowded, 5-8 mm long, with thorax and abdomen of about equal length; together they are about 3 mm long; postabdomen up to 5 mm long. There are 6 ordinary oral lobes and a simple atrial languet arising from upper rim of atrial aperture. Dorsal languets wide and relatively long, displaced to the left side of branchial sac. About 10-12 longitudinal muscles on thorax. Stigmata in 9 or 10 rows; about 12-14 stigmata per half row, although they cannot be counted precisely. Stomach with 21-

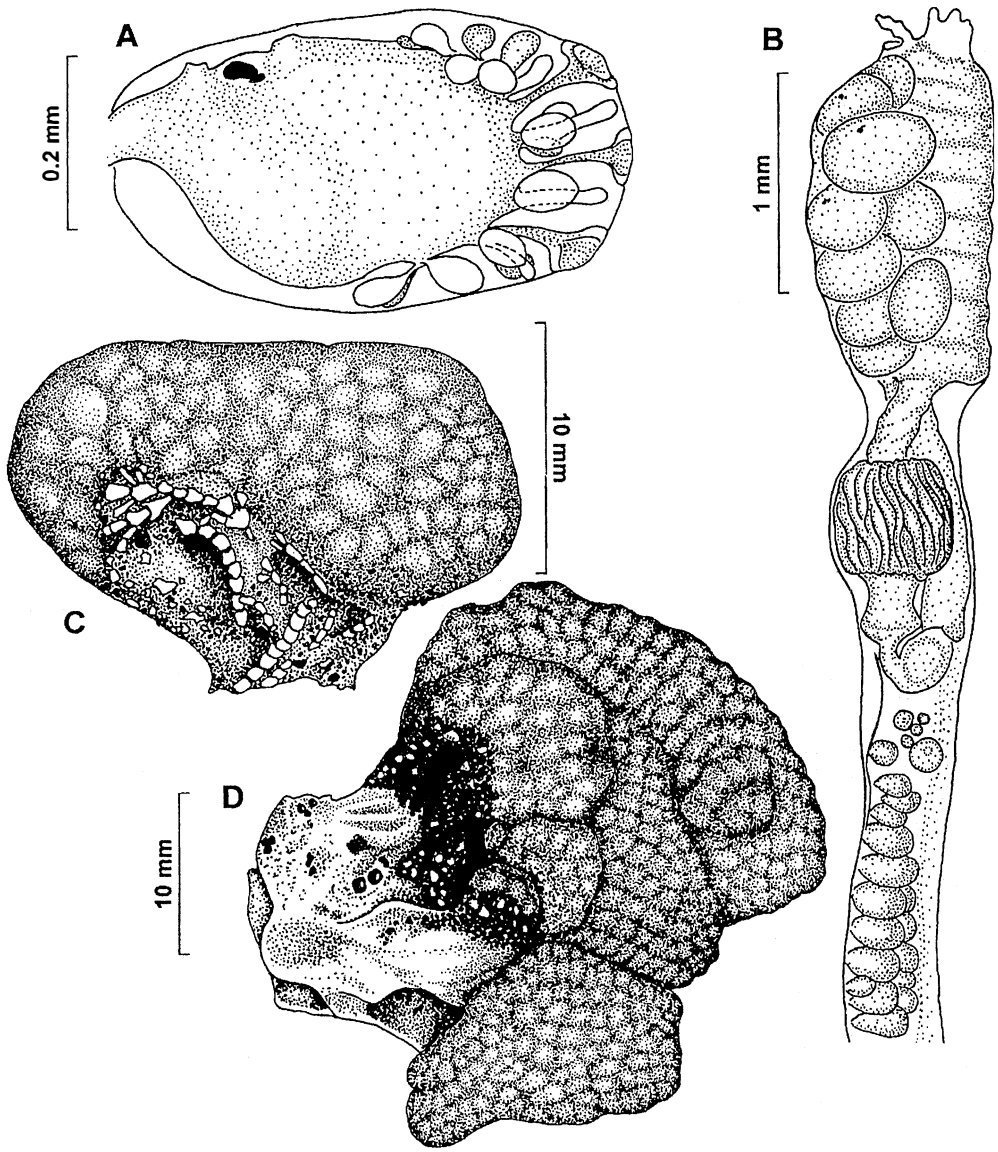

Fig. 1. *Aplidium confusum* sp. n.: **A**, larva; **B**, zooid; **C**, colony (paratype KIE 3/1011); **D**, colony (paratype KIE 4/1012).

25 rather irregular and often somewhat oblique longitudinal folds. Postpyloric subdivision of intestine usual for the genus; rectal caeca present. Anus on the level of fifth row of stigmata. Ovary just below gut loop; crowded testis follicles arranged in several rows in postabdomen.

Numerous embryos and larvae in atrial cavity of many zooids in all examined colonies. Larval trunk 0.6 mm long, with tail wound three-quarters of the way around it. Larva with four long, cylindrical median ampullae alternating with three adhesive organs and 9 to 13 large ectodermal vesicles arranged in regular row around anterior half of larval trunk. These vesicles often connected with larval epidermis by fine or more or less thick strands. Otolith and ocellus present.

Remarks. A. confusum sp. n., *A. pliciferum* (Redikorzev, 1927), *A. tenuicaudum* (Be-

niaminson, 1974) and *A. translucidum* (Ritter, 1901) constitute a group of closely related species, all of which have zooids similar in the number of rows of stigmata and stomach folds. *A. confusum* sp. n. has colonies similar to those of *A. translucidum* and was initially identified with this species. The latter species, however, always has a 3-lobed or trifid atrial languet while in the present species it is simple.

A. tenuicaudum has a 3-lobed atrial languet and its larva has numerous small vesicles arranged in several rows (Sanamyan, 1998, type revision) and differs distinctly from the present species.

A. pliciferum has zooids with a simple atrial languet, but it usually forms massive colonies and the structure of its larva differs distinctly from those of *A. confusum* sp. n. *A. pliciferum* has larvae with many small ectodermal vesicles which are not in a single series, and clumps of them branch off on a single stem from the larval ectoderm (Sanamyan, 1998). The specimens described as *A. pliciferum* by Tokioka (1953) and Nishikawa (1990) are probably conspecific with *A. tenuicaudum* (see Sanamyan, 1998). They have a 3-lobed atrial languet and many small ectodermal vesicles arranged in several rows anterodorsally and ventrally along each side of the larval trunk, and the larva figured by Tokioka (1953, Pl. 6, Fig. 10) looks like those from the holotype of *A. tenuicaudum*, and differs from the larva of the present species. Thus, the main character separating *A. confusum* sp. n. from *A. pliciferum* is the structure of the larvae. On the other hand, it is difficult, if possible, to identify specimens without larvae, and some specimens identified as *A. pliciferum* by Sanamyan (1998) may belong to *A. confusum* sp. n.

Beniaminson (1974) described four species of *Aplidium* from the Kurile Islands. The descriptions are, however, too insufficient to provide detailed comparison with the present species. Among them, *A. tenuicaudum* seems to be a valid species and *A. vinogradovae* is conspecific with *A. glabrum* (see below). *A. kurilense* and *A. oculatum* both lack larvae and therefore their exact affiliation cannot be determined. The former species has a 3-lobed atrial languet and may be conspecific with *A. tenuicaudum* or with *A. translucidum*, while the latter species may be a synonym of *A. pliciferum*, since it has a row of yellow pigment spots on each side of the thorax along the endostyle, a feature observed in some specimens of *A. pliciferum*.

Aplidium glabrum (Verrill, 1871)
(Fig. 2)

Amaroucium glabrum: Van Name, 1945: 31 (with synonymy); Tokioka, 1967: 30.
Amaroucium vinogradovae Beniaminson, 1974: 320, **syn. n.**
Aplidium glabrum: Sanamyan, 1998: 119.

Material examined. Kamchatka: Kronotsky Bay, 30.VIII.1985, 5 m; Starichkov Island, 7.IX.1985, 3.5 m. Southern Kurile Islands, intertidal zone: Shikotan Island, Tserkovnaya Bay, 14.VII.1987; Krabovaya Bay, 1.IX.1997; Yuriy Island, Katernaya Bay and Shirokaya Bay, 7.VIII.1987; Tanfilieva Island, 11.VIII.1987. Several colonies and fragments in each station.

Description. Colonies flattened or cushion-like, usually attached to substratum by whole lower side. Largest colony (from Kronotsky Bay) 7 cm in diameter and 1.5 cm thick; specimens from the Kurile Islands smaller, up to 4 cm in diameter and 0.5-1 cm thick. Test soft and gelatinous, colourless, yellowish or pinkish, translucent or in some specimens almost transparent. Few sand grains are on surface of some colonies, but generally there is no sand and other foreign particles on surface and in inner layers of test. Reddish zooids are seen through the test; they open on upper flattened surface of colony. Circular or oval systems were seen only on colony from Starichkov Island; in other colonies true form of systems difficult to recognize since they are rather damaged.

Contracted zooids small, attaining only 3.5-5 mm in length, with thorax, abdomen and postabdomen of about equal length. Each zooid with 6 pointed, triangular oral lobes and simple, elongated atrial languet arising from the upper rim of atrial aperture. Dorsal languets are rather long and displaced to the left side of branchial sac. Most zooids have 9 or rarely 10 rows of stigmata, with 9-11 stigmata per half-row. About 10 thin longitudinal muscles on each side of thorax.

Cylindrical stomach with 12-14 (most often 14) deep and regular longitudinal folds, a few of which are sometimes broken. Anus on the level of fourth row of stigmata. Ovary situated just below gut loop; crowded testis follicles arranged in several rows in postabdomen.

Numerous embryos and larvae present in atrial cavity of many zooids. Trunk 0.55-0.6 mm long and the tail makes half circle around it. Larva with three adhesive organs on long thin stalks and regular row of 11-16

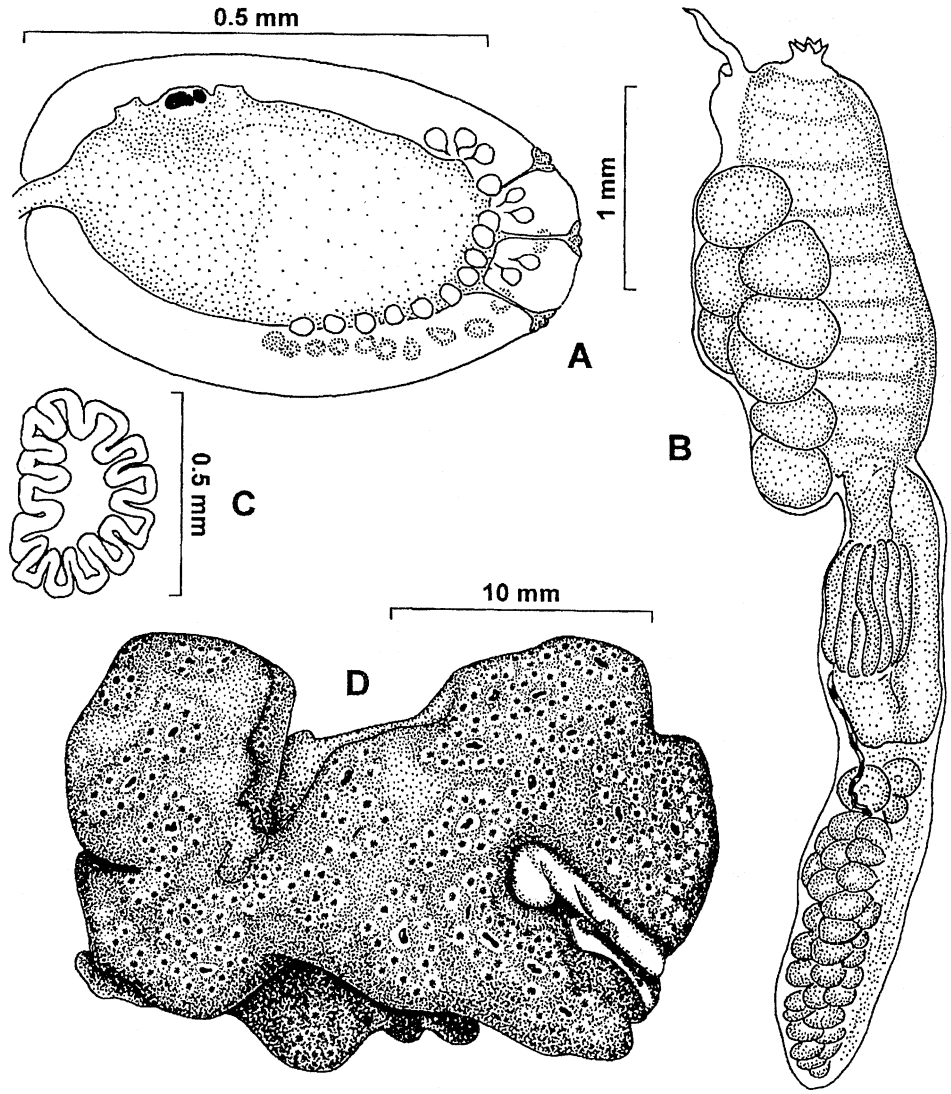

Fig. 2. *Aplidium glabrum*: **A**, larva; **B**, zooid; **C**, cross section of the stomach; **D**, colony (specimen from Starichkov Island).

rounded epidermal vesicles on each side of anterior half of larval trunk. Two median vesicles present in each interspace between adhesive organs. No ampullae. Otolith and ocellus present.

Remarks. The specimens conform to previous descriptions of *A. glabrum*, and larvae are similar to those figured by Tokioka (1967). This species is closely related to *A. californicum* (Ritter & Forsyth, 1917) which is known with certainty only from California where it is abundant in shallow waters. Monniot & Monniot (1996: 136) provided a brief description of *A. californicum* collected from British Columbia, and their description agrees nearly in all features, including structure of the larva, with the present specimens. The single feature separating two species is the arrangement of zooids: in *A. californicum*, according to Monniot & Monniot (1996), zooids are arranged in double rows, while in *A. glabrum* they form circular or oval systems.

Some of the present specimens were collected from Shikotan Island, Krabovaya Bay, the type locality of the incompletely de-

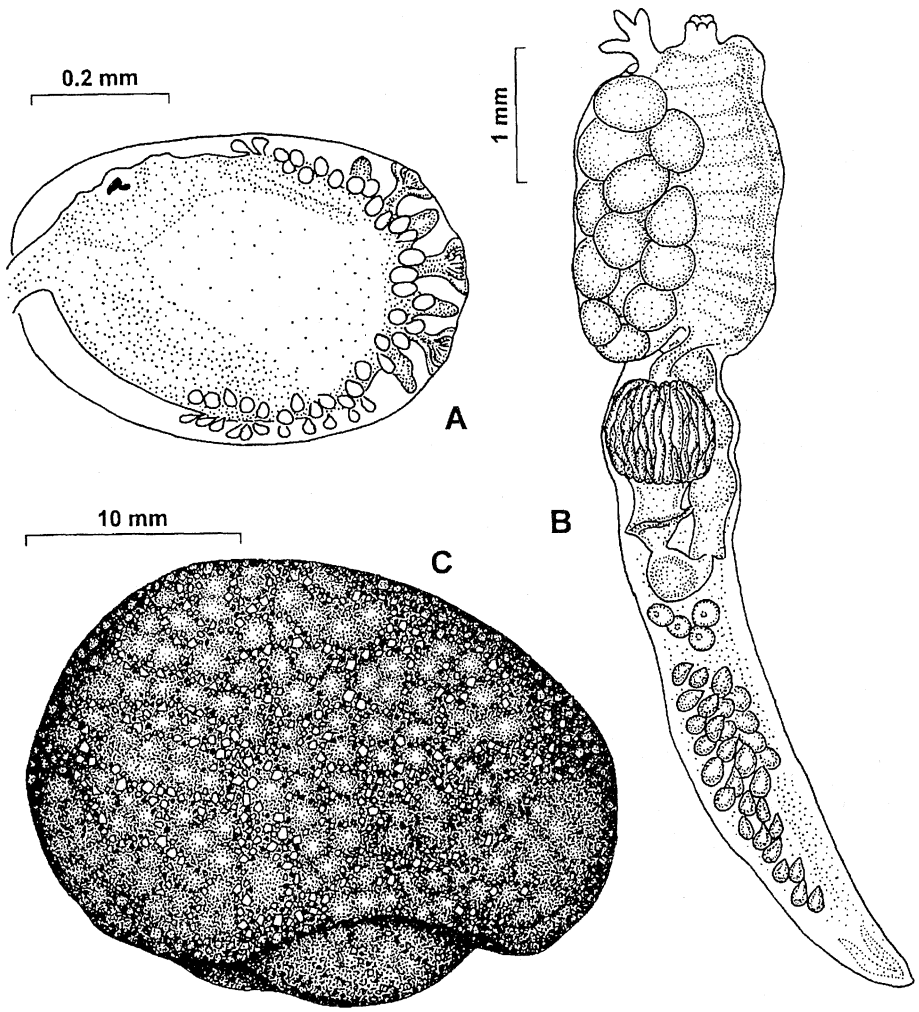

Fig. 3. *Aplidium tenuicaudum*: **A**, larva; **B**, zooid; **C**, colony.

scribed *A. vinogradovae* (Beniaminson, 1974) which was based on a single colony from intertidal zone of this locality. According to the original description (Beniaminson, 1974), it has 8 rows of stigmata with up to 20 stigmata per row (i.e. 10 per half row). The stomach is described as "folded", but according to her figure (Beniaminson, 1974, Figs 2d, 2e) it has about 15 regular folds. Up to 18 larvae and embryos are in the atrial cavity of each zooid; the structure of the larva is not described. *A. vinogradovae* is regarded here as a junior synonym of *A. glabrum*.

A. dubium (Ritter, 1899) somewhat resembles the present species, but differs in the presence of three-lobed atrial languet and its test is densely encrusted with sand.

Aplidium tenuicaudum (Beniaminson, 1974) (Fig. 3)

Amaroucium tenuicaudum Beniaminson, 1974: 324.
Aplidium tenuicaudum: Sanamyan, 1998: 124.

Material examined. Southern Kurile Islands, intertidal zone: Shikotan Island, Tserkovnaya Bay, 12.VII.1987, 2 colonies; Tanfilieva Island, Tanfilieva Bay, 10.VIII.1987, 1 colony; Polonskogo Island, Moryakov Bay, 1 colony.

Description. Colonies cushion-like, attached to substratum by large area on their lower surface. Largest colony 25 × 30 mm in extent and 10 mm high. Surface of test covered with sparse sand grains, especially in spaces between zooids, but there is no embedded sand. Test soft, brownish or reddish;

zooids indistinctly seen through test, crowded, their arrangement in systems is unclear.

Zooids vertical and robust, 6-8 mm long; postabdomen about combined length of thorax and abdomen. Atrial languet three-lobed in all examined zooids. There are about 12 thin longitudinal thoracic muscles, 10 or 11 rows of stigmata with about 13 stigmata per half row. Stomach with 22-25 irregular and broken longitudinal folds.

Numerous larvae in atrial cavity of some zooids. Larval trunk 0.65-0.7 mm long. Larva with three thick, conical median ampullae alternating with three adhesive organs and numerous small ectodermal vesicles arranged in several irregular rows around anterior half of larval trunk (Fig. 3A).

Remarks. The specimens conform with the holotype of *A. tenuicaudum* redescribed by Sanamyan (1998) and have similar larvae. The species differs from *A. pliciferum* in the presence of three-lobed atrial languet and closely resembles *A. translucidum*, from which it somewhat differs in the shape of the colony.

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