



The genus *Anguisia* as a model of a possible origin of erect growth in some Cyclostomatida (Bryozoa)

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A representative of the genus *Anguisia* Jullien, 1882 is recorded for the Southern Ocean for the first time. A detailed description of zooidal and colonial morphology of the new species, *Anguisia jullieni*, is given with special regard to budding. A mode of budding identical to that in most crisiids is found in fertile erect branches. A possible way that erect branches in crisiids may have evolved by modification of peristomial budding is proposed.

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INTRODUCTION

In the course of studies on the Recent Antarctic Stenolaemata (see also Ostrovsky, 1991; Ostrovsky & Taylor, 1996), some specimens of a new stomatoporiform species with erect branches were found in the samples collected during the 34th Soviet (Russian) Antarctic Expedition (SAE). These specimens are so fragile it is surprising that they were not broken in the dredge. In some cases they may have been protected by a thick felt of spicules of glass sponges: most of the colonies found are attached to spicules (see also Ostrovsky, 1997). The specimens belong to the genus *Anguisia*

Jullien, 1882, and are the first record of this genus in the Southern Ocean. A detailed investigation of colony structure and, particularly, budding patterns, has provided new arguments supporting Silén's (1977) hypothesis on the origin of crisiids from a stomatoporiform ancestor. Description of the new species *Anguisia jullieni* and discussion of these evolutionary problems are the main subjects of this paper.

MATERIAL AND METHODS

The specimens of *Anguisia jullieni* were collected by Dr A. F. Pushkin, Research Associate of the Zoological Institute of the Russian Academy of Sciences (ZIRAS), St Petersburg. Some of the colonies were coated with gold for SEM study. Type specimens of the new species are kept in the Marine Research Laboratory (Polychaeta & Bryozoa Section) of the Zoological Institute, St Petersburg.

SYSTEMATIC ACCOUNT

Family Oncousoeciidae Canu, 1918

The family as defined by Hayward & Ryland (1985: 60) includes some genera with "... uniserial or multiserial, alternating arrangement ..." and a small, simple (pyriform or oval) brood chamber. Most of the species are entirely encrusting. Erect colony portions, in all cases connected with gonozooid formation, have only been described for some species (Harmelin, 1979; Moyano, 1991). The presence of a characteristic uniserial budding pattern in entire colonies or in their initial portions has resulted in the descriptive names 'stomatoporiformes' and 'stomatoporiennes' often being used for species from different genera.

Genus *Anguisia* Jullien, 1882

The genus *Anguisia* was created by Jullien (1882: 497) for *Anguisia verrucosa* Jullien from the northeastern Atlantic Ocean and the Mediterranean Sea. Jullien only had poor material of erect branches at his disposal. For about a century the genus was neglected except by Bassler (1953) who included it in the bryozoan part of the Treatise on Invertebrate Paleontology. Harmelin (1977: 1058–1059; 1979: 414) redescribed *A. verrucosa* based on a new material from a locality just north of the Canaries. Importantly, Harmelin found encrusting parts of the colony assigned by him to *A. verrucosa*. The validity of the genus *Anguisia* was reaffirmed by Harmelin & d'Hondt (1982: 7–8), who questioned whether the specimens described by Harmelin (1977, 1979) did indeed belong to Jullien's species. Using more representative material from the Mediterranean, Harmelin & d'Hondt redescribed *A. verrucosa* and supplemented the characters of the genus *Anguisia*. According to their description, oncousoeciids possessing uniserial encrusting initial portions and uniserial or multiserial erect branches with a simple gonozooid having a terminal tubular oocystome belong to *Anguisia*.

The species *Anguisia verrucosa* was also mentioned by David & Pouyet (1986: 163–164) from a locality south of Madagascar.

Anguisia jullieni sp. nov.
(Figs 1–5)

Type series. *Holotype*. ZIRAS 1/48620a, 1 fertile colony. *Type locality*. Princess Martha coastal waters, Cape Norway, 70°52.98" S, 10°17.48" W, 239 m. 34 SAE, r/v 'Akademik Fedorov', voyage 2, St 4, Hyalospongia spicules (25 December 1988). *Paratypes*. ZIRAS 1/48620b, 14 colonies and fragments (3 fertile); all data as above.

Other material. ZIRAS 2/48621, 39 colonies and fragments (2 fertile), all expedition data as above, St 2/52, Princess Martha coastal waters, 70° 51.05" S, 11°04.27" W, 394 m, sand with shingle and gravel (20 December 1988); ZIRAS 3/48622, 1 fertile colony, St 8/53, Sea of Cosmonauts, 66°49.89" S, 46°52.32" E, 332 m, clay with shingle and gravel (10 January 1989); ZIRAS 4/48623, 1 fertile colony, St 10, Davis Sea, Haswell Islands, 66°32.17" S, 92°57.14" E, 46–50 m, rock (22 January 1989).

Etymology. The name '*jullieni*' is given in honour of the French zoologist J. Jullien who created the genus *Anguisia*.

Description. Colonies with exceptionally weak calcification, uniserial for most of their astogeny. Adult colony consisting of proximal encrusting branches and distal erect branches. Encrusting branches short, usually with dichotomous ramifications; supporting zooids sometimes present. Bases of erect branches uniserial; branching extremely rare. Erect uniserial branches sterile, composed of 2–8 autozooids with peristomes oriented in different directions. Erect bi- or multiserial branches with 4–14 zooids, often alternating; peristomes directed distally or disto-laterally. Zooidal apertures oval or circular. Gonozooid pyriform or oval, located at top of erect branch or distally; laterally and dorsally flanked by some autozooids. Ooeciostome terminal, subterminal or, exceptionally, subcentral; tubular and relatively long. Ooeciopore oval. Thin diaphragms sometimes divide cavities of autozooids into two parts.

Measurements (μm). Diameter of basal disk of ancestrula: 156–212; peristome length: 714–1.783; peristome diameter: 156–212 (round), 142–254 \times 177–226 (oval); peristome aperture diameter: 126–198 (round), 135–212 \times 156–170 (oval); gonozooid length \times width: 856–1.884 \times 411–599; ooeciostome length: 411–512; ooeciostome proximal diameter; 170–261 \times 84–91; ooeciostome distal diameter: 91–98 \times 98–105; ooeciopore diameter: 70–84 \times 91–98.

Remarks. The initial 'Stomatopora-like' stage of *Anguisia jullieni* can be easily confused with that of other stomatoporiform cyclostomes or with the initial stages of species of *Entalophorecia*. In all cases examined, the primary autozooid buds from the ancestrula, which in turn buds two daughter zooids usually by dichotomous branching (see Illies, 1973). Each of these two zooids forms a uniserial creeping branch able to form further ramifications. In three colonies, biserial portions were found at the ends of encrusting branches, but these were very short and returned to a uniserial pattern (Fig. 1A, C).

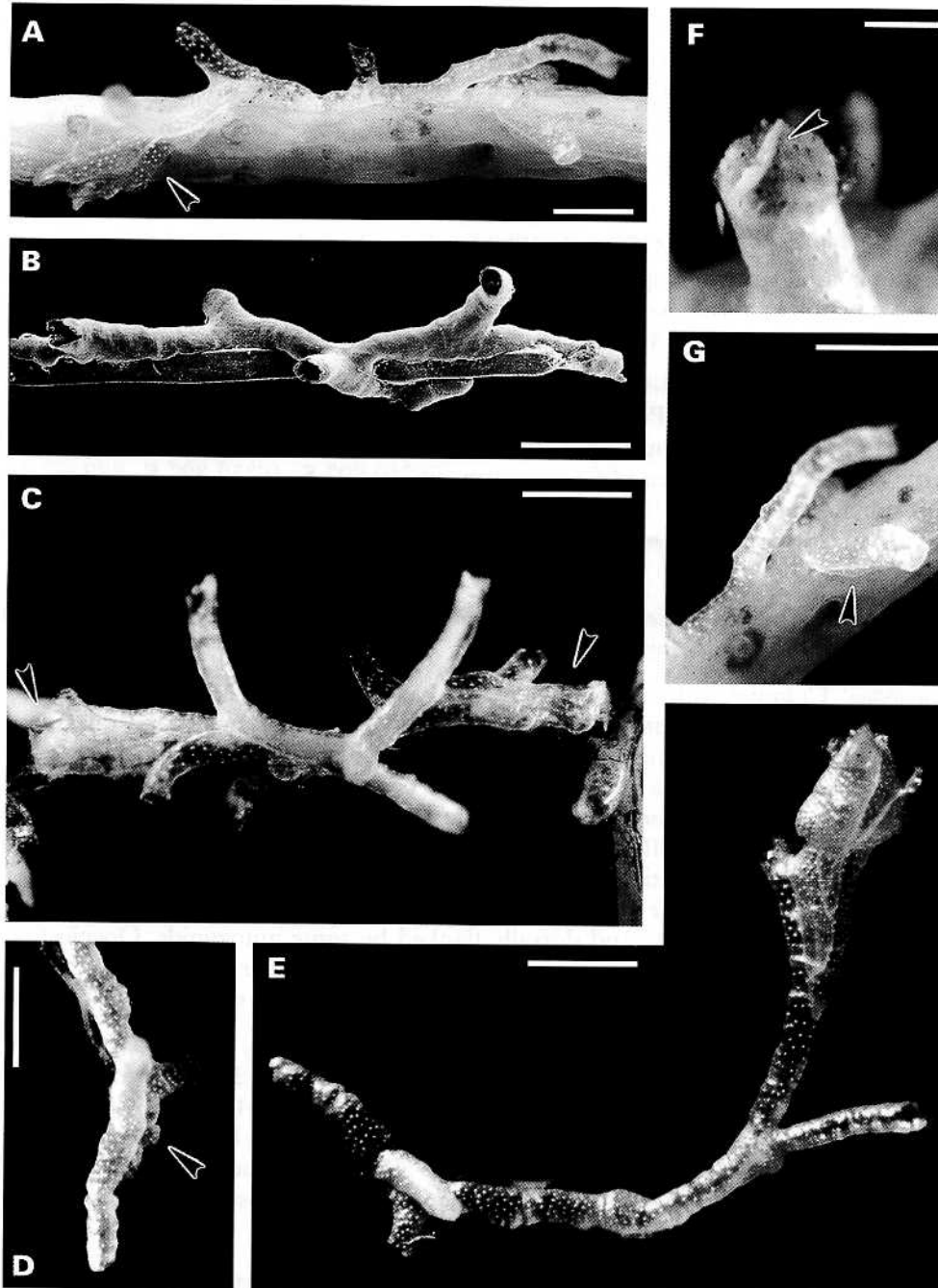


Figure 1. *Anguisia jullieni* sp. nov. A–D, G, initial encrusting colony portions (biserial ends and supporting edges arrowed); E, general view of entire fertile colony; F, peristome with septum (arrowed) of peristomial budding. Scale bars: A–E, G = 500 μ m; F = 100 μ m.

Two kinds of supporting structures are found. First, horizontal portions of autozooids adhering to the substrate form lateral supporting edges (Fig. 1D, G) in a manner similar to that of some other Tubuliporina (Borg, 1926). Second, very

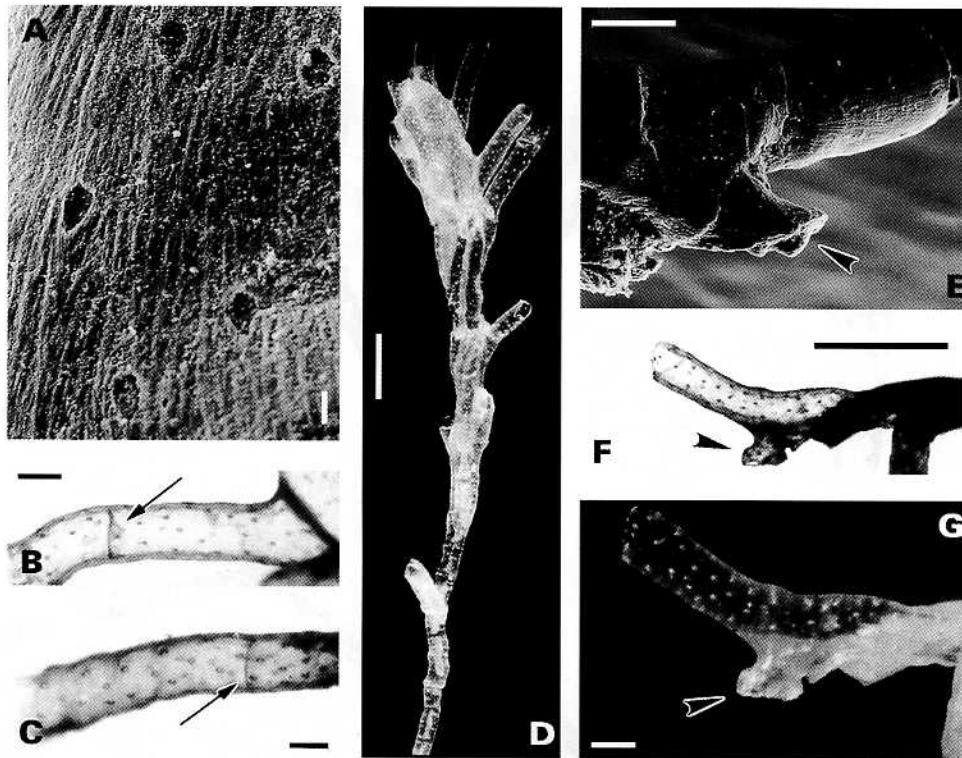


Figure 2. *Anguisia jullieni* sp. nov. A, pseudopores; B–C, peristomes with inner diaphragms (arrowed); D, general view of fertile erect branch (holotype); E–G, short supporting zooids (arrowed). Scale bars: A = 10 μ m; B, C, E, G = 100 μ m; D, G = 500 μ m.

short closed zooids without polypides were found in three colonies. The appearance and location of these true kenozooids (Fig. 2E–G) testify to their supporting function.

Anguisia jullieni is a typical 'runner' whose fragility may be compensated by an enhanced reparative potential (for a discussion of repair in runners see Taylor, 1990) and, possibly, a high rate of growth. In many cases the proximal colony portions were broken or sometimes absent entirely (Fig. 1D, E). Nevertheless some of these colonies evidently survived because the openings caused by breakage were closed by calcareous diaphragms.

If successful, the formation of a stomatoporiform portion terminates in an erect branch the base of which was always represented by one autozoooid. In only one colony was the erect branch formed in the middle of an encrusting branch. Sterile erect branches are usually uniserial, but rarely end with bi- or triserial portions. In only one case the end of the branch consisted of four autozooids (Fig. 3A). All of these multiserial portions of the erect branches were very short, similar to biserial encrusting branches, and returned to uniserial budding unless a gonozooid was formed. Lateral branches (Fig. 3B) are extremely rare.

A simple gonozooid is located at the end of an erect branch or, at least, in a distal location. Its shape varies from oval or pyriform to club-like, and it is surrounded laterally and dorsally by three to eight autozooids. In contrast to those in sterile branches, these autozooids are arranged relatively regularly, showing a tendency

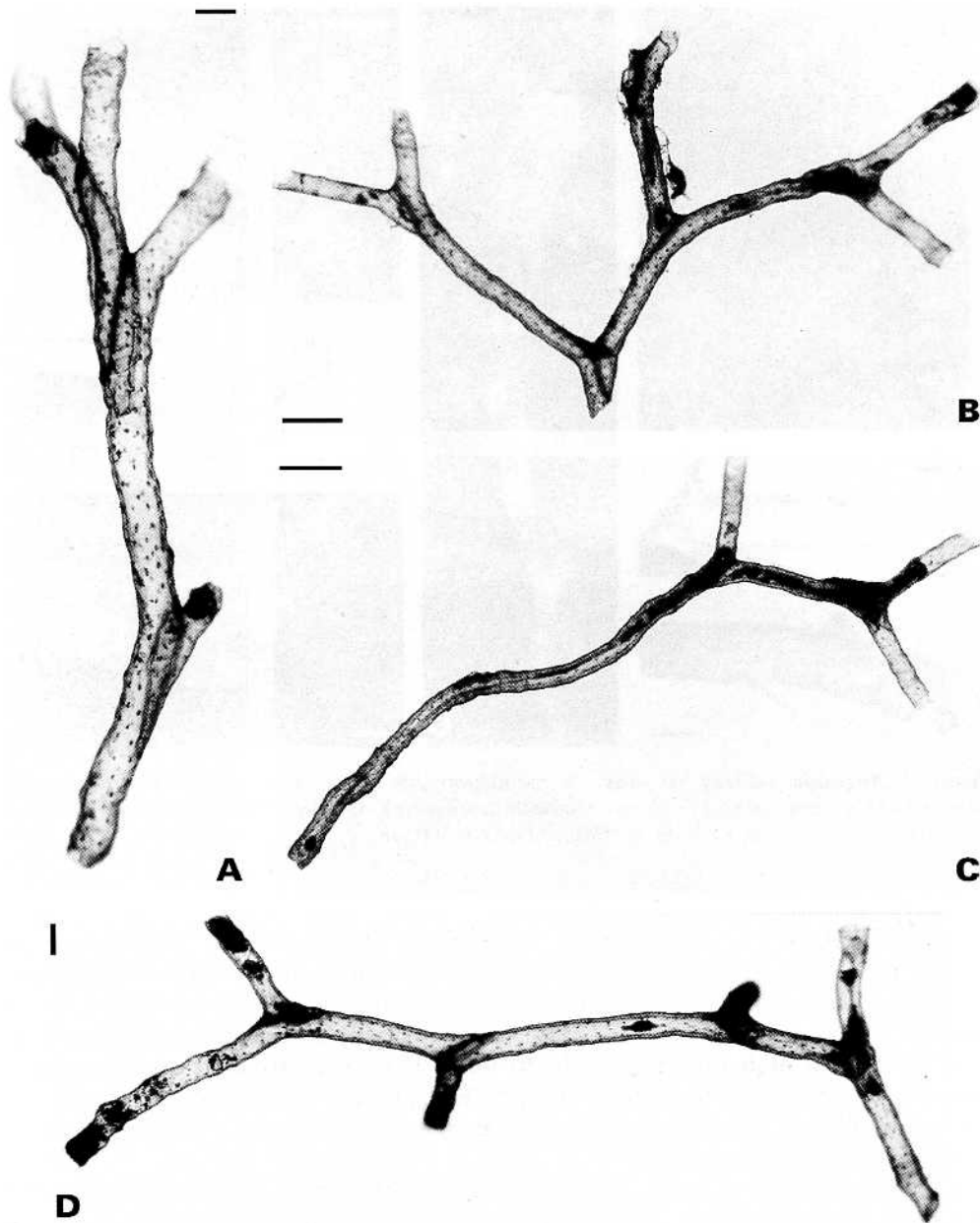


Figure 3. *Anguisia jullieni* sp. nov. A–D, erect sterile branches of different appearances. Scale bars: A, D = 100 μ m; B, C = 500 μ m.

towards alternation (Fig. 4). In one case an autozoid was found to pierce a brood chamber and had its aperture closed by a calcareous diaphragm. The tubular oeciostomes are uniform in morphology, but their location varies from terminal to subcentral (Fig. 4A, B, D).

Thin transverse plates (diaphragms) are found inside the autozooids and can be

