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RESEARCH ARTICLE

Parasmittina macroavicularia, status promotus (Bryozoa: Smittinidae): redescription and promotion to species rank

Parasmittina macroavicularia, status promotus (Bryozoa: Smittinidae): переописание и повышение ранга до видового

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Abstract. The little-known subspecies *Parasmittina trispinosa macroavicularia* (Androsova, 1958) has only been recorded from its type locality near Moneron Island in the Sea of Japan. Based on scanning electron microscope (SEM) images of the holotype, the diagnostic characters of this taxon have been refined, and it is hereby redescribed. This subspecies is promoted to species rank under the name *Parasmittina macroavicularia* (Androsova, 1958), **status promotus**, following a comparison with the nominate subspecies *P. trispinosa trispinosa* (Johnston, 1838) from the North Atlantic, which revealed significant differences in their diagnostic characters.

Резюме. Малоизвестный подвид *Parasmittina trsinosa macroavicularia* (Androsova, 1958) был найден только в типовом местонахождении, расположенном у острова Монерон в Японском море. На основании изображений голотипа, полученных с помощью сканирующего электронного микроскопа, его диагностические признаки были уточнены и таксон был переописан. Этот подвид повышен до ранга вида под названием *Parasmittina macroavicularia* (Андросова, 1958), **status promotus** на основании сравнения его с номинативным подвидом *P. trispinosa trispinosa* (Johnston, 1838) из Северной Атлантики, выявившего существенные различия в их диагностических признаках.

Key words: marine bryozoans, Sea of Japan, northwestern Pacific, taxonomy, subspecies, promoted status, Smittinidae, *Parasmittina*

Ключевые слова: морские мшанки, Японское море, северо-западная Пацифика, таксономия, подвид, повышение ранга, Smittinidae, *Parasmittina*

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Introduction

The highly diverse genus *Parasmittina* Osburn, 1952 exhibits wide distribution across all oceans, with the highest number of species recorded in the Pacific and Indian Oceans (Bock & Gordon, 2015; Bock, 2024a). In earlier publications (e.g., Hincks, 1880; Androsova, 1958; Kluge, 1962) and within the collection of the Zoological Institute of the Russian Academy of Sciences, all historical specimens now classified under this genus were previously attributed to the genus *Smittina* Norman, 1903. Frequently, when catalogue data were analysed during the preparation

of faunistic publications, older species names were automatically replaced with their accepted modern synonyms without a thorough examination of the actual specimens. This was the case with the catalogue records of *Smittina trispinosa* Johnston, 1838 and *Smittina jeffreysi* Norman, 1876 found in the Arctic seas, which were automatically reassigned to the genus *Parasmittina* (Gontar & Denisenko, 1989; Denisenko, 1990, 2008, 2011; Gontar, 2001). A subspecies from the Sea of Japan, described under the name *Smittina trispinosa* var. *macroavicularia* Androsova, 1958, has recently been transferred to the genus *Parasmittina* without any explanation (Grischenko et al., 2007: 1108; Denisenko, 2013: 185).

The original description and illustration of this subspecies are relatively brief and schematic (Androsova, 1958). This style of species description was quite typical until the middle part of the 20th century, primarily due to the limited technical capabilities of light microscopy, which hindered the detailed study of fine structures of autozooids, such as the condyles or lyrula. These challenges were common among many researchers who described new bryozoan species during that period. A thorough examination of the original description and illustration of *P. trispinosa macroavicularia*, along with a detailed investigation of its holotype, highlighted the need for a redescription of this taxon.

The aim of this report is to clarify the taxonomic status of the *Parasmittina* subspecies stored in the bryozoan collection at the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZIN).

Material and methods

The paper is based on the results of study of the holotype of *Parasmittina trispinosa macroavicularia* stored at ZIN. Terminology follows Bock (2024b).

The specimen was coated with platinum for examination using a QUANTA 250 (FEI) scanning electron microscope (SEM). Measurements were taken in millimetres from SEM images using the software IMAGEJ (www.imagej.net). The orifice length was measured as the maximum extent, excluding the lyrula.

Results

Class **Gymnolaemata**

Order **Cheilostomatida**

Family **Smittinidae**

Genus ***Parasmittina*** Osburn, 1952

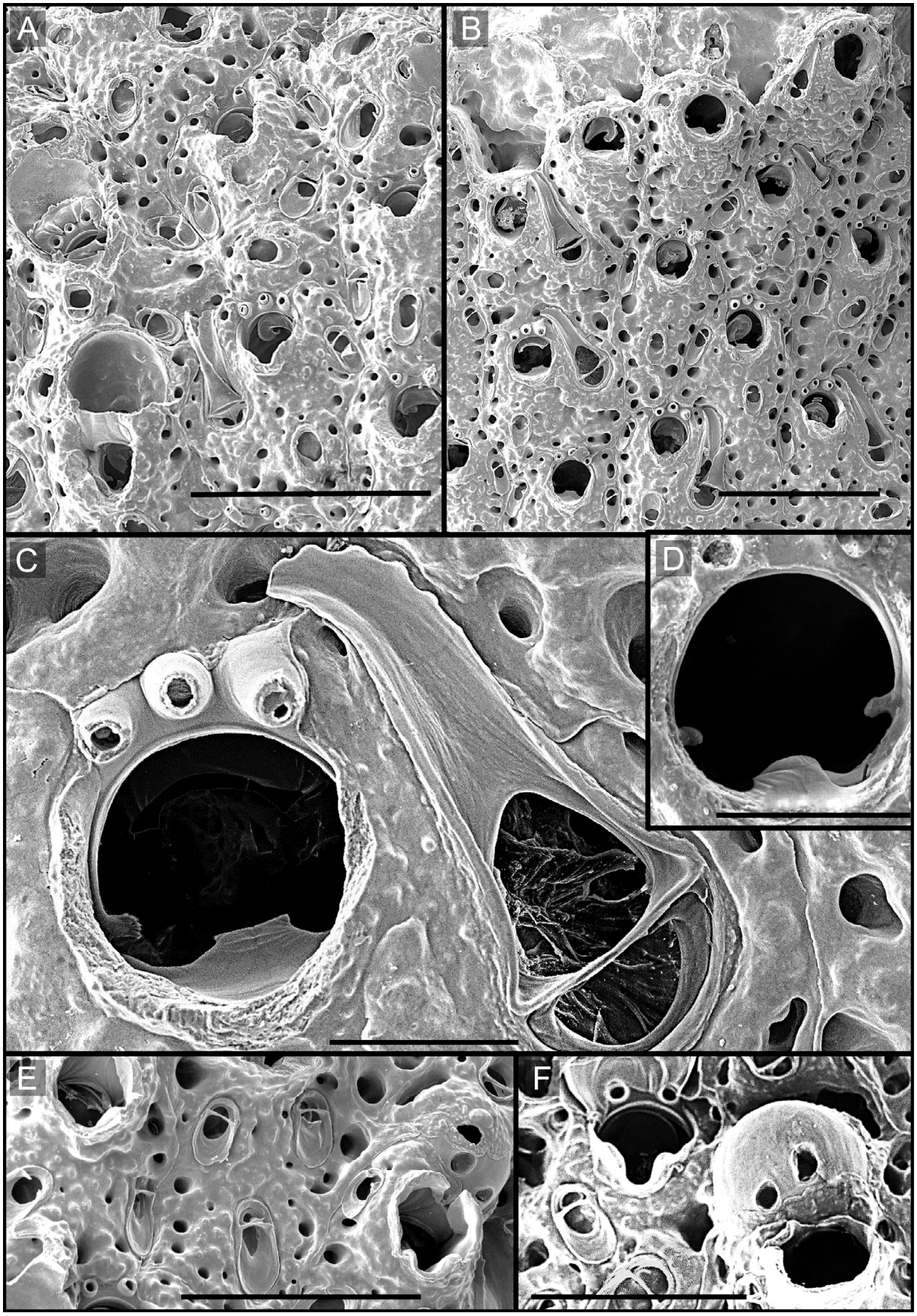
Type species *Smittina jeffreysi* Norman, 1876.

Parasmittina macroavicularia (Androsova, 1958), **status promotus**
(Fig. 1)

Smittina trispinosa var. *macroavicularia* Androsova, 1958: 159, fig. 89.
Parasmittina trispinosa macroavicularia (Androsova, 1958): Denisenko, 2013: 185.

Holotype. 1/3734 ZIRAS, Sea of Japan, Tatarskiy Strait near Moneron I., Kuril-Sakhalin Expedition of ZIN, Station 3 (46.246574°N, 141.255850°E), 14.VIII.1947, depth 60–100 m, pebbles with sand, Sigsbee trawl, coll. S.I. Kobiakova.

Redescription. Colony encrusting other bryozoans, large (30 x 40 mm), white. Autozooids small, varying widely in size from 0.37 to 0.58 mm (Table 1), mostly oval in shape, arranged in alternating rows or located irregularly in old part of colony (Fig. 1A). Boundaries between zooids clearly visible and separated by a suture. Frontal shield of autozooids slightly convex, roughly granulated, with a row of large, immersed marginal pores (Fig. 1B, C). In central part of colony, some pseudopores present near avicularian chambers in all autozooids. Primary orifice slightly longer than wide in mature autozooids. Tapering, anvil-shaped lyrula of variable width (Table 1), flat or rounded distally, sometimes slightly alate (Fig. 1C); in younger zooids, its apical surface varying from straight to oblique (Fig. 1C, D). Condyles long, initially slightly curved downward and smooth (Fig. 1D), but quickly becoming layered and clavate, and burred in mature zooids (Fig. 1C, D). Distal to orifice, two or three tubular spines. Peristome beginning with formation of lateral lappets being fused and forming high semi-collar with U-shaped pseudosinus. Later in ontogeny, peristome becoming thick and pseudosinus almost indistinct. In autozooids with ovicells, proximal ooecium margin raised (Fig. 1F) being continuation of peristome


A
B
C
D
E
F

laterally, forming a ring-shaped suture between this margin and rest of peristome on each side (Fig. 1A–C, F). Two types of avicularia. Large avicularia (Fig. 1A–C; Table 1) with wide palate and acute rostrum being raised and serrated distally (Fig. 1C). These avicularia located lateral to orifice, directed distally, flattened, curved distally, sometimes curved laterally towards orifice. Smaller, oval avicularia (Fig. 1A, B, E; Table 1) with wide palate and spatulate rostrum. At growing edge, they located near lateral margin; in mature zooids, they situated in different parts of frontal shield, oriented at random angles (Fig. 1E). Both types of avicularia with a complete crossbar (Fig. 1A–E). Ovicells wider than long (Table 1), prominent, hyperstomial. They overlapping distal autozooid, with two large roundish openings in central part, partly covered by coarser calcification from distal autozooid (Fig. 1E).

Discussion. Until the mid-20th century, technological limitations hindered the ability to provide a detailed description of the fine structure of autozooids, particularly regarding characters such as the shape and size of condyles, the details of the lyrula, and the shape of the orifice, which were often overlooked in species descriptions. The advent of scanning electron microscopy has enabled a comprehensive investigation of specimens from the Western Pacific and Western Arctic, previously identified as *Parasmittina trispinosa* (Osburn, 1952; Kluge, 1962; Dick & Ross, 1988). This advancement has resulted in the establishment of eight new distinct species within the genus (Soule & Soule, 2002).

Parasmittina trispinosa macroavicularia, described by E.I. Androsova (1958) as a variety of *P. trispinosa*, shares several common characters with this species. These characters include a peristome with a pseudosinus, three spines in the distal part of the orifice, and oval adventitious avicularia. The main distinguishing character of the subspecies, as noted by the author, is the presence of large or giant avicularia with a very long mandible and an acute rostrum, which are located laterally and parallel to the orifice in the distal part of the zooid.

Our study revealed additional distinguishing characters in the examined holotype of *P. trispinosa macroavicularia*. The shape of the primary orifice is more oblate in this taxon than in *P. trispinosa trispinosa* (Soule & Soule, 2002). Both taxa have the peristome originating laterally from lateral lappets, and in both, the peristome has a U-shaped pseudosinus. However, in *P. trispinosa macroavicularia*, the pseudosinus is wider, and the lappets are flared distally. During later ontogeny, the lappets become thicker and encircle the orifice; the increased thickness of the sinus edges also results in a more clearly defined sinus shape. In both taxa, the peristome overlaps the ovicell opening (Hayward & Ryland, 1999; Soule & Soule, 2002). According to Androsova (1958), four tubular spines are present in *P. trispinosa macroavicularia*, but I observed only two or three in the holotype, which corresponds to the number found in *P. trispinosa trispinosa*. The lyrula in *P. trispinosa* is described as either square (Hayward & Ryland, 1999) or anvil-shaped (Soule & Soule, 2002), while in the holotype of *P. trispinosa macroavicularia*, it predominantly exhibits an anvil shape in mature autozooids. The condyles also distinguish *P. trispinosa macroavicularia* from *P. trispinosa trispinosa*, in which the condyles are short, curved downward, and pointed. The condyles in the holotype of *P. trispinosa macroavicularia* are initially also curved downward in young autozooids, but they are longer and broader at their apices; in mature autozooids, the condyles are wider and burred. The differing number of openings on the ovicell surface in *P. trispinosa macroavicularia* compared to the ovicells of *P. trispinosa trispinosa* further highlights the dissimilarity between these taxa. The ovicells of the holotype of *P. trispinosa macroavicularia* have two pores of distinct

Fig. 1. *Parasmittina macroavicularia* (Androsoca, 1958), **status promotus**, holotype 1/3734 ZIRAS. **A**, autozooids in older part of colony; **B**, group of autozooids at growing edge of colony; **C**, primary orifice, lyrula, condyles and large adventitious avicularium in mature autozooid; **D**, shape of primary orifice, lyrula and condyles of autozooids at growing edge of colony; **E**, locations of spatulate avicularia on autozooid frontal shield in older part of colony; **F**, shapes of peristome and ovicell in mature autozooids. Scale bars: 0.5 mm (A, B), 0.1 mm (C, D), 0.4 mm (E), 0.3 mm (F).

Table 1. Measurements (in millimetres) for *Parasmittina macroavicularia* (Androsova, 1958), **status promotus**, holotype. N, number of measurements; SD, standard deviation.

Characters measured	N	Mean ± SD	Range
Autozooid length	15	0.482 ± 0.055	0.371–0.584
Autozooid width	15	0.378 ± 0.047	0.311–0.478
Primary orifice length	8	0.115 ± 0.004	0.110–0.121
Primary orifice width	12	0.109 ± 0.008	0.096–0.119
Large avicularium length	4	0.312 ± 0.051	0.272–0.386
Large avicularium width	6	0.112 ± 0.021	0.092–0.150
Oval avicularium length	13	0.107 ± 0.015	0.074–0.125
Oval avicularium width	13	0.060 ± 0.007	0.051–0.073
Ovicell length	11	0.216 ± 0.026	0.183–0.242
Ovicell width	7	0.228 ± 0.016	0.204–0.255
Lyrula width	9	0.029 ± 0.007	0.017–0.039

shapes, predominantly similar in size. In contrast, *P. trispinosa trispinosa* possesses pores of three to four different shapes and sizes. Furthermore, the autozooids of *P. trispinosa macroavicularia* are approximately one-half to one-third the size of those in *P. trispinosa trispinosa* and have a thicker frontal shield. Finally, the presence of giant avicularia in *P. trispinosa macroavicularia* distinguishes this taxon not only from *P. trispinosa* but also from other congeneric species (Soule & Soule, 1973, 2002; Gontar, 1982). These characters can be considered sufficient criteria for elevating the subspecies to species rank as *P. macroavicularia* (Androsova, 1958), **status promotus**.

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