

## Some Antarctic and sub-Antarctic species of Smittinidae (Bryozoa: Cheilostomata)

P. J. HAYWARD

*Marine, Environmental and Evolutionary Research Group, School of Biological Sciences,  
University College, Singleton Park, Swansea SA2 8PP, UK*

AND J. P. THORPE

*Department of Marine Biology, University of Liverpool, Port Erin, Isle of Man, UK*

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(With 12 plates in the text)

Twenty-six species of Bryozoa, in the ascophoran cheilostome family Smittinidae Levinsen, 1909, are described from Antarctic and sub-Antarctic localities. Fourteen species are considered to be new to science. *Aspericeta* gen. nov. is introduced for *Smittina crassatina* Waters, 1904, and *Platychelyna* gen. nov. for *Cellarinella plumdata* Hayward, 1980.

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### Introduction

The ascophoran Cheilostomata are the least well known of the Antarctic marine Bryozoa. In her account of endemic Antarctic Bryozoa, Rogick (1965) listed 69 species of ascophora, out of a total of 178. This proportion seems substantially lower than in any other fully marine bryozoan fauna, including that of the Arctic Seas. That this figure is unrealistically low is suggested by certain recent studies in which many new species of ascophorans have been reported from Antarctic regions (e.g. Moyano, 1985; Hayward & Thorpe, 1988*a, b*, 1989). Rogick (1956) herself had described six new species in the previously poorly known genus *Cellarinella*, as well as 10 new species of Smittinidae.

Such published sources as are available, including the two important studies of Waters (1904) and Calvet (1909), for the most part, deal mainly with ascophoran species with large and conspicuous colony forms. Encrusting species with generally small autozooids and small colony size seem to be under-represented in the systematic literature. This may simply reflect a bias in collecting, or may suggest that the bryozoan fauna of benthic environments in Antarctic coastal waters is dominated by relatively few species of large erect Cheilostomata. Certainly, populations of some of these seem to be both dense and widespread (Winston, 1983). However, there exists also

a fauna of smaller, encrusting ascophoran cheilostomes which has been scarcely studied at all. While the Bryozoa of the sub-Antarctic regions, particularly those of the southern Patagonian Shelf and the Magellanic region, have received slightly more attention in recent years, they remain still poorly known. Many of the species described by such authors as Jullien (1888) and Calvet (1904) have not been reported upon again. Some have been wrongly synonymized with species described from elsewhere, while others were so inadequately described in the first place that it has been difficult to recognize them again.

The immense collections of Antarctic and sub-Antarctic Bryozoa held by the Institute of Oceanographic Sciences, Deacon Laboratory (Wormley, UK), include material from the National Antarctic Expedition (1901–1904), the British Antarctic Expedition (1910–1913), Discovery Investigations (1925–1939), Operation Tabarin (1943–1945) and the Falkland Islands Dependencies Surveys (1946–1960). While researching these collections, the present authors have also benefited from extensive samples recently collected by SCUBA at Signy Island, by members of the British Antarctic Survey. Together, these materials provide the most comprehensive collections of Bryozoa from the cold southern hemisphere which have ever been assembled, and have offered unrivalled opportunities for systematic revision. Many species of anascan and ascophoran Cheilostomata, otherwise known only by the type series from which they were originally described, are present in abundance in these collections, together with numerous undescribed species. This present account treats 26 species within the ascophoran family Smittinidae Levinsen, almost all of which are encrusting forms with generally small colony sizes. Fourteen of the species are considered to be new to science. Through the courtesy of Dr J.-L. d'Hondt (Museum National d'Histoire Naturelle, Paris) and Dr W. Decraemer (Institut Royal des Sciences Naturelles de Belgique, Bruxelles), it has been possible to re-examine type material of species described by Jullien (1888), Calvet (1904) and Waters (1904), and to compare original specimens with series from the I.O.S. collections. Dr Alan H. Cheetham (Smithsonian Institution, Washington) kindly loaned type specimens from the collection of M. D. Rogick.

All I.O.S. material listed has been deposited in the Bryozoa Section, Department of Zoology, British Museum (Natural History); registration numbers are denoted by the prefixes BMNH, MNP (Museum National, Paris), IRB (Institut Royal, Bruxelles), or USNM (Smithsonian Institution, Washington). Details of collecting stations are given in Appendix I.

### Systematic accounts

#### *Smittina alticollarita* Rogick

(Plate Ia–c)

*Smittina alticollarita* Rogick, 1956: 287, pl. 24.

*Smittina canui* Rogick, 1956: 289, pl. 25; Hayward & Taylor, 1984: 72, fig. 6A.

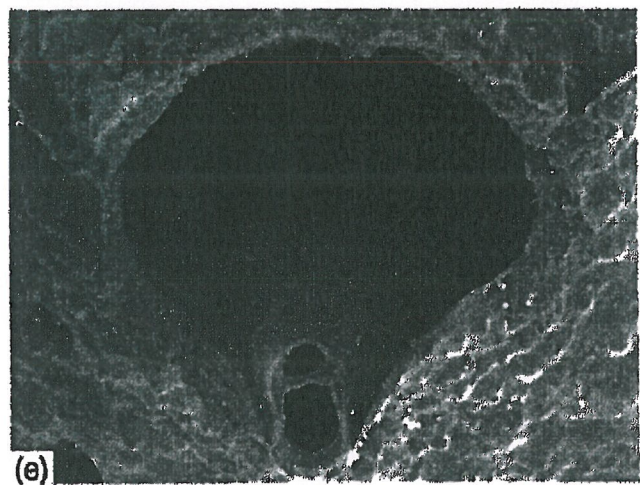
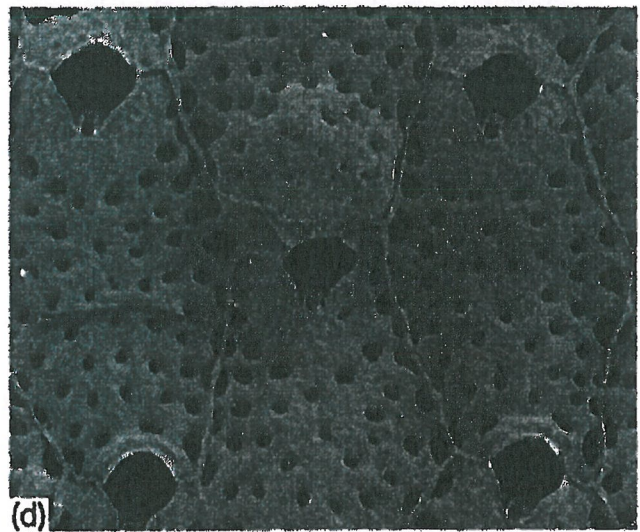
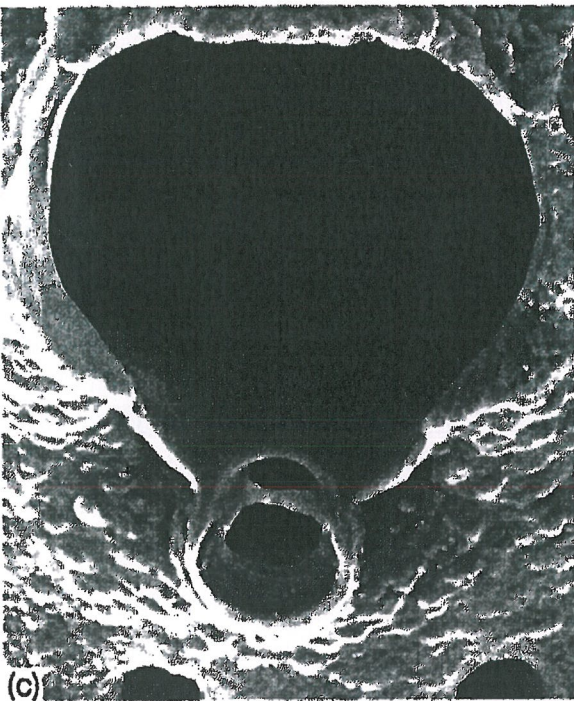
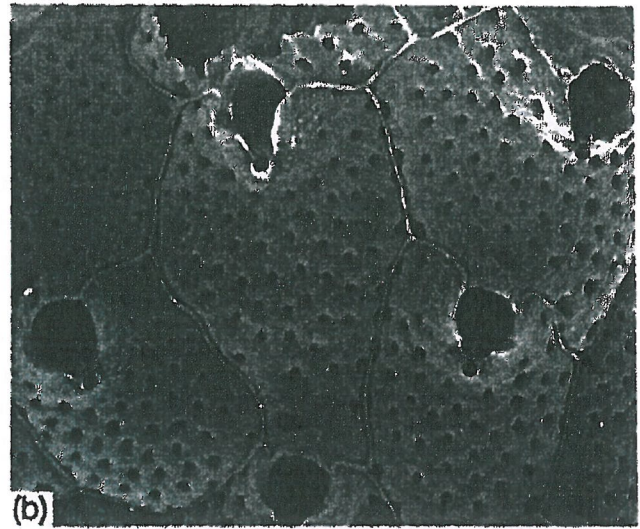
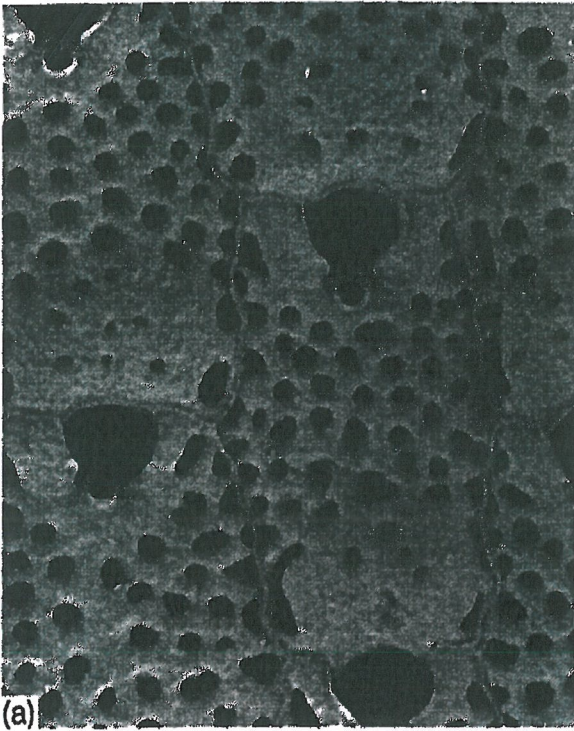
#### Material

HOLOTYPE: USNM 11306, 65°25'S, 101°13'E.

Other material: USNM 11304 (HOLOTYPE of *Smittina canui* Rogick), 65°25'S, 101°13'E.

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PLATE I. (a–c) *Smittina alticollarita*: (a) ovicelled autozooids,  $\times 50$ ; (b) group of autozooids at the growing edge,  $\times 45$ ; (c) the primary orifice,  $\times 315$ . (d, e) *Smittina anecdota*, holotype: (d) group of autozooids, including an ovicell,  $\times 50$ ; (e) the primary orifice,  $\times 210$ .



National Antarctic Expedition: 3.6.1903, Winter Quarters, 130 fms. British Antarctic Expedition: Terra Nova Stns 316, 349, Discovery Stns 170, 1948, 2605.

### *Description*

Colony initially encrusting, developing erect, folded, unilaminar sheets. Autozooids oval to hexagonal, or rectangular, flat, separated by thin, raised ridges. Primary orifice about as wide as long, proximal edge with thick, anvil-shaped lyrula occupying about half total width, with irregular edge and sharply cusped corners; condyles characteristic, in the form of thickened, rounded, frontally projecting knobs, curving over the proximal rim of the orifice. No oral spines. Peristome developing as a finely granular collar, the distal third originating from the distally succeeding autozoid, deeply embayed proximally; primary orifice becoming deeply immersed as peristome thickens. Suboral avicularium small, oval, situated within proximal notch of peristome and projecting on to frontal surface; crossbar slender, without a columella. Frontal wall fairly granular, evenly and densely perforated by large round pores; marginal pores initially larger than others, less obviously so as calcification thickens. Ovicell slightly wider than long, recumbent on distally succeeding autozoid, and at first quite prominent, but becoming partially immersed; calcification uniform with frontal wall, perforated by up to a dozen small, frontal pores.

*Measurements* (means and standard deviations of 20 values), mm:

Specimen: Terra Nova Stn 316

Autozoid length  $1.29 \pm 0.13$

Autozoid width  $0.66 \pm 0.07$

Avicularium length  $0.09 \pm 0.007$

### *Remarks*

The holotypes of *S. alticollarita* Rogick and *S. canui* Rogick represent the same species, as the author (Rogick, 1956) would certainly have realized had she had access to better material. Both are small, encrusting colonies, in a poor state of preservation. The material available to the present authors was extensive, including both encrusting colonies, and large, unilaminar, erect colonies. In all cases, the species is recognized by its moderately narrow lyrula, by its small avicularium, the crossbar of which lacks a columella, positioned precisely in the proximal notch of the peristome, and by its characteristic, forwardly projecting condyles. It differs from *Smittina rogickae* Hayward and Taylor, and *Smittina incernicula* sp. nov. in these respects, and also in its larger autozooids, and the morphology of its ovicell. *Smittina alticollarita* appears first in Rogick's (1956) text, and is accordingly adopted as the senior synonym.

*Smittina alticollarita* is an endemic Antarctic species.

*Smittina anecdota* sp. nov.

(Plate 1d, e)

### *Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.1, Terra Nova Stn 194.

PARATYPE: British Antarctic Survey: Halley Bay, Coats Land, Jan. 1960. Other material: National Antarctic Expedition: 22.4.1903, Winter Quarters, 130 fms.

### Description

Colony with encrusting base, developing erect, unilaminar sheets. Autozooids large, broad, oval to hexagonal, gently convex, separated by distinct ridges. Primary orifice wider than long, proximal border with short, broad, quadrate lyrula occupying more than half its total width; condyles prominent, rounded quadrangular; no oral spines. Frontal wall evenly perforated by large, round pores. Peristome low, finely granular, shallowly concave proximally, enclosing a small, narrowly oval, suboral avicularium, with slender crossbar and no columella. Ovicell hyperstomial, recumbent on distally succeeding autozoid, wider than long; finely granular, with 10-20 small, irregular pores frontally.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length	$0.99 \pm 0.12$
Autozoid width	$0.65 \pm 0.09$
Avicularium length	$0.06 \pm 0.006$

### Remarks

The tiny suboral avicularium of this species is similar to those seen in both *S. alticollarita* Rogick and *S. ctenocondyla* sp. nov. Of these three species, *S. alticollarita* has the largest autozooids, and is particularly distinguished from *S. anecdota* by its narrow lyrula, and frontally directed condyles. *Smittina ctenocondyla* has much smaller autozooids than *S. anecdota*, and is further characterized by its narrow lyrula, more densely perforated frontal wall, and less perforated ovicell. The material of *S. anecdota* collected so far suggests that it is endemic, and restricted, to Antarctic waters.

*Smittina ctenocondyla* sp. nov.  
(Plate IIa-c)

### Material

HOLOTYPE: BMNH reg. no. 1989.4.18.2, Halley Bay, Coats Land, Jan. 1960.  
PARATYPES: Halley Bay, Coats Land, Jan. 1960; two further colonies.

### Description

Colony encrusting, forming small, irregular patches. Autozooids small, oval to hexagonal, convex, separated by deep grooves; flatter in later ontogeny, with less distinct outlines. Primary orifice wider than long; proximal edge with a short, quadrangular lyrula occupying about half its width; condyles distinct, rounded, with a delicately toothed edge revealed by SEM. No oral spines. Frontal wall thickly calcified, granular, evenly perforated by closely spaced round pores; peristome developing early in ontogeny, thickened, conical, with a slender, deep notch medio-proximally. A small suboral avicularium enclosed within peristome, disto-proximally orientated; rostrum rounded, crossbar slender, without a columella. Ovicell spherical, prominent, with a few minute perforations, and typically a single, elongate, frontal fenestra; obscured by granular ooeccial cover and becoming immersed, but with the fenestra persisting as a central pore.

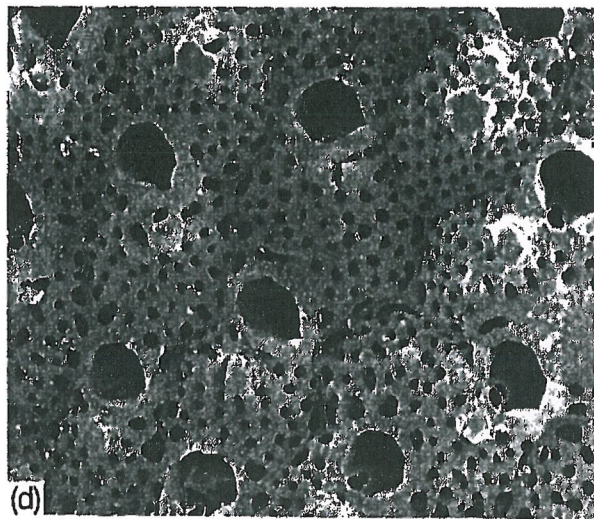
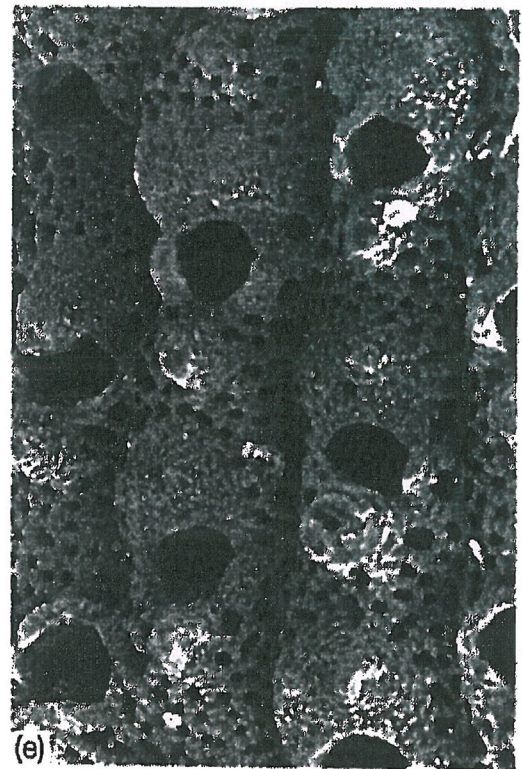
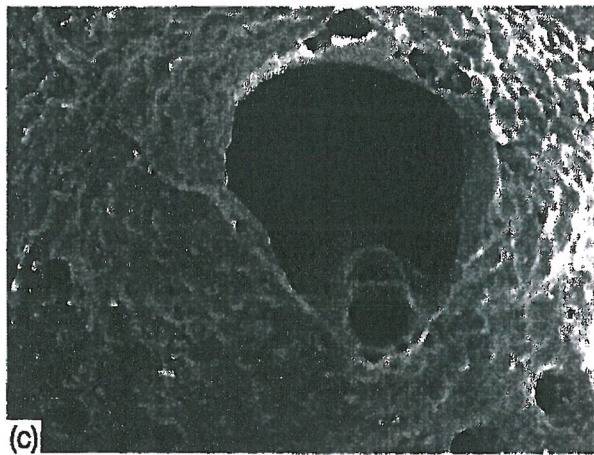
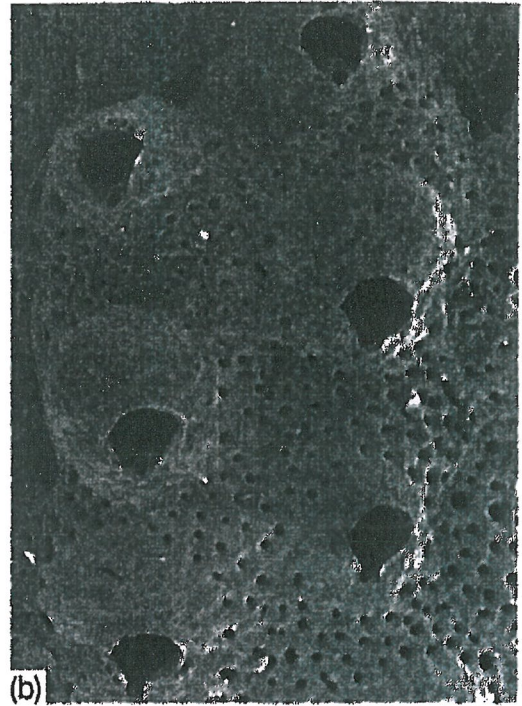
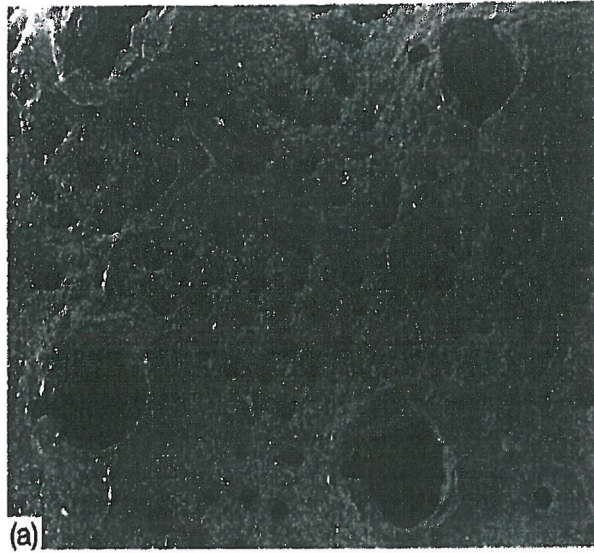


PLATE II. (a-c) *Smittina ctenocondyla*, holotype: (a) old autozooids with thickened frontal walls,  $\times 90$ ; (b) autozooids at the growing edge, two with ovicells,  $\times 60$ ; (c) the primary orifice and avicularium,  $\times 235$ . (d, e) *Smittina globula*, holotype: (d) autozooids close to the growing edge,  $\times 50$ ; (e) ovicelled autozooids,  $\times 60$ .

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.62 \pm 0.07$   
Autozoid width  $0.44 \pm 0.05$

*Remarks*

Three small colonies were found in a sample of material from Halley Bay, encrusting *Celleriaeforma aurorae* (Livingstone) and other erect bryozoans. *Smittina ctenocondyla* is particularly characterized by its tiny avicularium, narrow lyrula, finely perforated frontal wall, and by its ovicell.

*Smittina glebula* sp.nov.  
(Plate IId, e)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.3, Discovery Stn 456.

PARATYPE: National Antarctic Expedition, 9.1.1902, Cape Adare, 18 fms.

*Description*

Colony encrusting, forming small, round, thick patches. Autozooids hexagonal to rectangular, steeply convex, separated by deep grooves. Primary orifice about as wide as long, proximal border with a short, quadrate lyrula occupying about half its total width; condyles prominent, rounded; no oral spines. Frontal wall thick, nodular, densely perforated by large irregular pores, developing a stout, conical, suboral umbo. Peristome developing in early ontogeny, deep, completely encircling and partly hiding the primary orifice; shallowly concave proximally, more deeply notched to one or other side of the umbo. Suboral avicularium enclosed within peristome, short, oval, with the rostrum slightly broadened proximally, crossbar slender, without a columella. Ovicell recumbent on distally succeeding autozoid, partly immersed, about as wide as long, with one or more small frontal pores; becoming immersed in nodular calcification, and developing a stout frontal umbo.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.63 \pm 0.06$   
Autozoid width  $0.34 \pm 0.04$

*Remarks*

Colonies of this species develop thick crusts on pebbles. It is distinguished by its coarsely thickened calcification, which is raised into conspicuous umbones on the frontal wall, and on the frontal surface of the ovicell.

*Smittina incernicula* sp.nov.  
(Plate IIIa-c)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.4, Discovery Stn 1948.

PARATYPE: British Antarctic Expedition, Terra Nova Stn 194.

Other material: Terra Nova Stns 316, 335. Discovery Stn 170.

*Description*

Colony encrusting, forming small patches, or larger, loosely attached, folded, unilaminar sheets. Autozooids oval to hexagonal, convex, separated by distinct sutures. Primary orifice wider than long, proximal border with a short, straight-edged lyrula occupying about one-third its total width; condyles distinct, quadrangular with rounded edge; no oral spines. Frontal wall densely and regularly perforated by small pores, marginal pores larger, elongate or slit-like. Peristome developing in early ontogeny, finely granular, forming a complete collar, the distal third derived from the distally succeeding autozoid; slightly embayed proximally to accommodate a conspicuous avicularium, the cystid enclosed within the peristome but the rostrum raised above it. Avicularium with slightly spatulate rostrum, crossbar complete, with a short, thick columella. Ovicell hyperstomial, recumbent on distally succeeding autozoid and slightly immersed; wider than long, flattened frontally, with a central group of two to six irregular pores, developing a sutured oocelial cover, originating from distal autozoid, but central porous area remaining exposed.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length	$0.82 \pm 0.06$
Autozoid width	$0.56 \pm 0.06$
Avicularium length	$0.10 \pm 0.006$

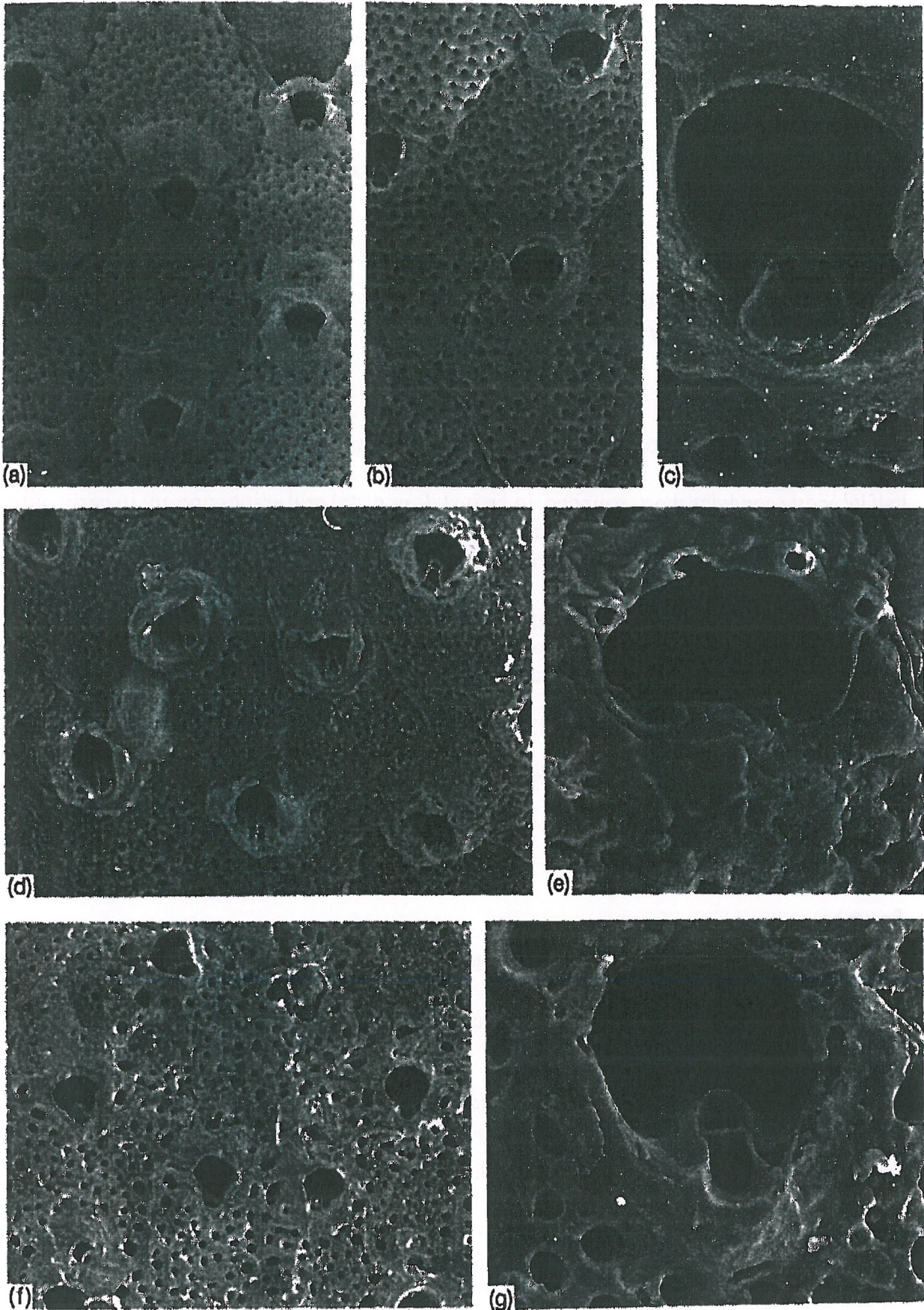
*Remarks*

This species is similar to both *S. alticollarita* Rogick and *S. rogickae* Hayward and Taylor. The former is distinguished by the larger size of its autozooids, its more coarsely perforated frontal wall, and its distinctly anvil-shaped lyrula. Also, the suboral avicularium of *S. alticollarita* is proportionately smaller than that of *S. incernicula*, and lacks a columella, and its ovicell is regularly perforated. *Smittina rogickae* is a smaller species than *S. incernicula*, with autozooids only two-thirds the size of this species. It has a regularly perforated frontal wall, without enlarged marginal pores, and the ovicell is globular and prominent, with a few scattered pores. The suboral

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PLATE III. (a-c) *Smittina incernicula*, holotype: (a) autozooids at the growing edge, with ovicells,  $\times 40$ ; (b) later autozooids with thickened frontal walls,  $\times 45$ ; (c) the primary orifice and avicularium,  $\times 235$ . (d, e) *Smittina usulata*, holotype: (d) group of autozooids, some with ovicells,  $\times 80$ ; (e) the primary orifice in a newly developed autozoid,  $\times 345$ . (f, g) *Smittina jullieni*: (f) group of old autozooids, with immersed ovicells,  $\times 60$ ; (g) the primary orifice and avicularium,  $\times 290$ .





avicularium of *S. rogickae* is similar to that of *S. incernicula*, but is completely enclosed within the peristome. Specimens of *S. incernicula* were collected from off Oates Land, from the Ross Sea, and from the South Shetlands; it is evidently widely distributed in Antarctic waters, and may be assumed to be an endemic species.

*Smittina insulata* sp. nov.

(Plate III d, e)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.5, Discovery Stn 399.

PARATYPE: Discovery Stn 1909.

*Description*

Colony encrusting. Autozooids small, oval to hexagonal, convex, separated by deep grooves. Primary orifice wider than long, proximal border with a short, quadrate lyrula occupying about half its width; condyles short, rounded, indistinct; four distal oral spines present in early ontogeny, later obliterated by development of peristome. Frontal wall thickly calcified, nodular, perforated by numerous, closely spaced, small pores. Peristome low, thick and nodular, completely enclosing suboral avicularium and extending on to frontal surface of ovicell. Avicularium acute to frontal plane; rostrum slender, oval, slightly spatulate; crossbar slender, without a columella. From the proximal end of the avicularium a low ridge extends on to the lyrula. Ovicell hyperstomial, recumbent, spherical, with a closely spaced group of about 10 pores frontally; becoming enclosed by a thick oocial cover, with just the porous frontal area remaining distinct.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.44 \pm 0.03$

Autozoid width  $0.28 \pm 0.03$

*Remarks*

This small species is particularly characterized by its peristome and avicularium, and the morphology of the primary orifice. The two specimens collected, both of which encrusted small stones, were from Burdwood Bank and Bouvet Island. It has not been found in samples from Antarctic localities.

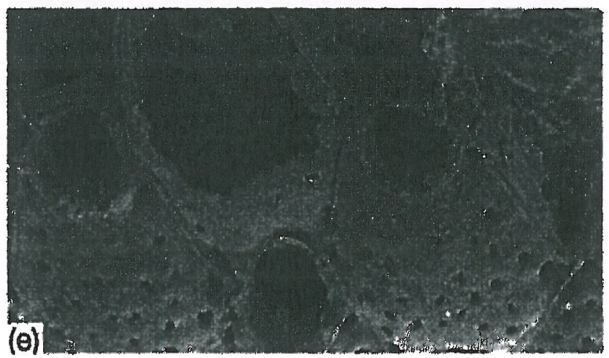
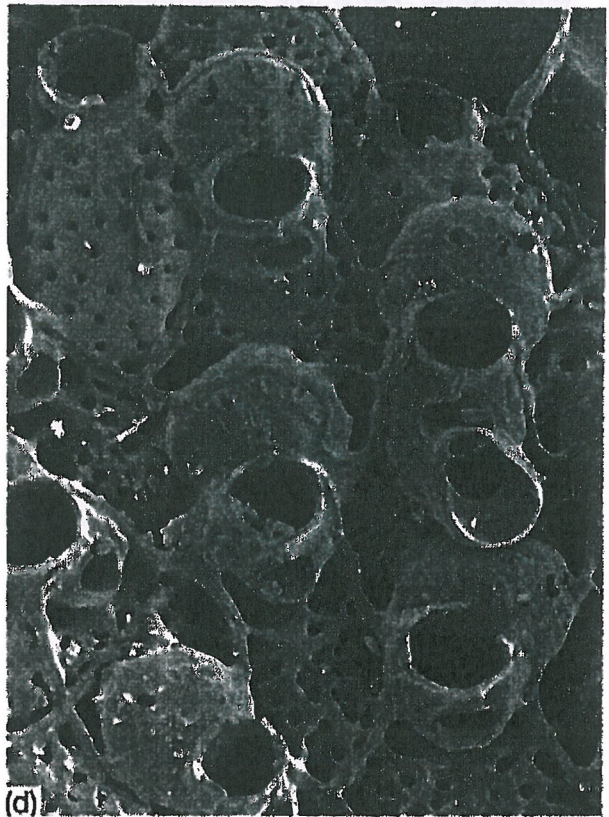
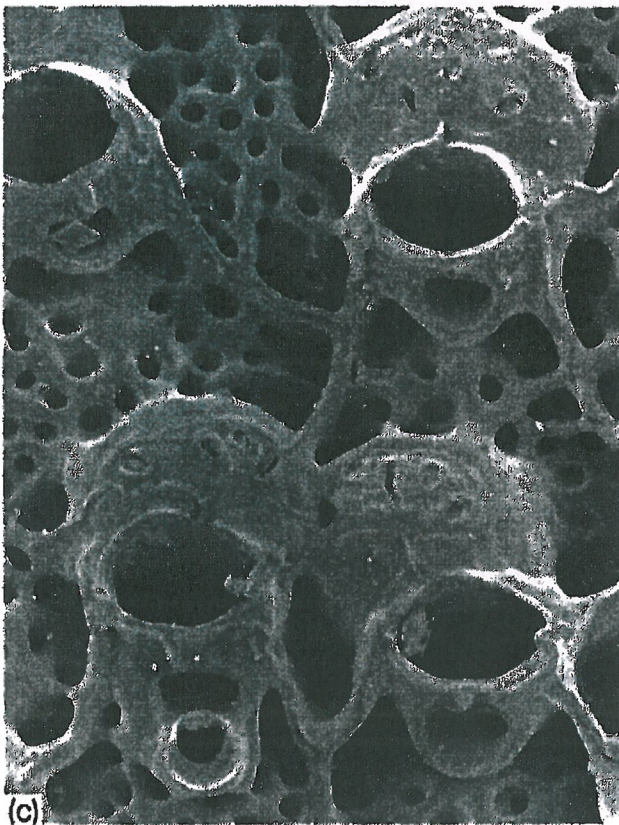
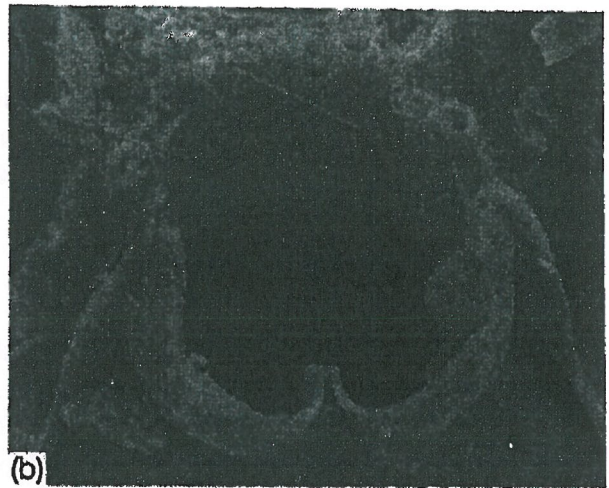
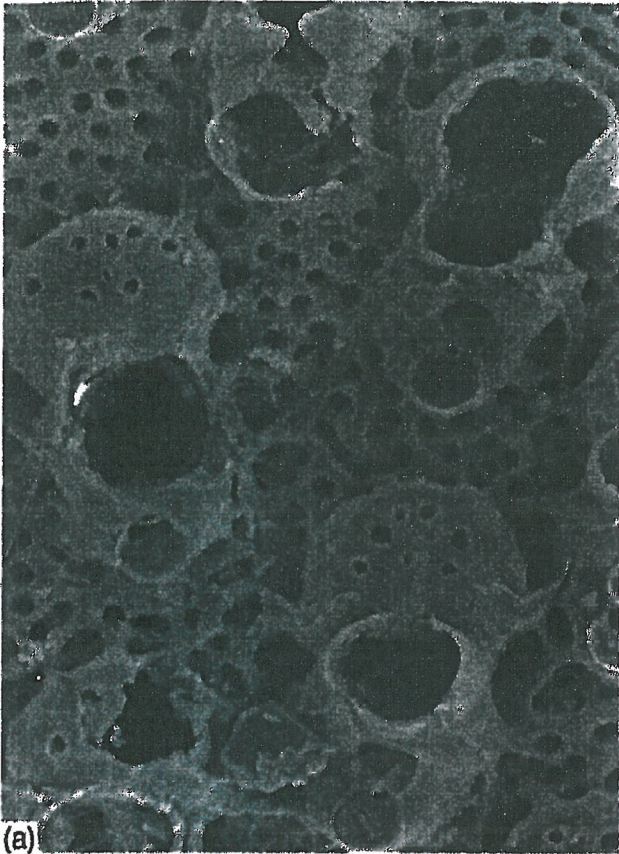
*Smittina jacobensis* (Busk)

(Plate IV a, b)

*Smittia jacobensis* Busk, 1884: 153, pl.19, fig. 7.

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PLATE IV. (a, b) *Smittina jacobensis*: (a) group of autozooids, with ovicells,  $\times 110$ ; (b) the primary orifice,  $\times 200$  (c, d) *Smittina leptodentata*, holotype: (c) ovicelled autozooids, one with a suboral avicularium,  $\times 120$ ; (d) ovicelled autozooids, one with an enlarged avicularium,  $\times 80$ ; (e) autozooids at the growing edge, showing the primary orifice,  $\times 90$



*Material*

COTYPES: BMNH reg. no. 1887.12.9.606, Porto Praya, St. Iago, Cape Verde Islands (figd Busk, 1884: pl.19, fig. 7); 1887.12.9.607, Marion Island.

Other material: Discovery Stns 51, 53, 724, 1187, 1562, 1563, 1564, WS85, WS776.

*Description*

Colony encrusting, generally developing small, rounded patches. Autozooids oval to hexagonal, gently convex, separated by thin sutures. Primary orifice as wide as long; proximal edge with slender, peg-like lyrula, condyles indistinct; four oral spines present in earliest ontogeny, lost with development of peristome. Frontal wall finely granular, densely punctured by numerous small, round pores. Peristome developing early in ontogeny, forming an erect tubular structure, with the edge variously produced into small, spinous processes; with a large, circular, proximo-medial foramen. Suboral avicularium situated immediately proximal to peristomial foramen: oval and pyriform, with a slender crossbar, lacking a columella, and a crescentic palatal foramen. Frequently, the avicularium is greatly enlarged, and more distinctly pyriform in shape, and may be deflected proximo-laterally. Ovicell recumbent on distally-succeeding autozooid, broader than long, smooth surfaced, with 4–10 variably shaped frontal pores. Peristome extends on to frontal surface of ovicell, developing as a complete tube.

*Measurements* (means and standard deviations of 20 values), mm:

Specimen: Stn 1564	
Autozooid length	0.56 ± 0.05
Autozooid width	0.36 ± 0.06
Orifice length	0.12 ± 0.004
Orifice width	0.12 ± 0.005

*Remarks*

This distinctive little species was founded on Challenger Expedition material from the Cape Verde Islands and from Marion Island; re-examination of Busk's (1884) Cotype specimens confirms that he had indeed just a single species, and *S. jacobensis* evidently has an unusually wide distribution within the Atlantic. Waters (1904) erroneously placed *S. jacobensis* in the synonymy of *Smittia landsborovii* form *personata* Hincks (together with *S. monacha* (Jullien)), and its identity was lost in the taxonomic maze surrounding *Smittina purpurea* (Hincks). Brown (1952) redescribed this last species, selecting a neotype from Australian specimens in the Hincks collection. Atlantic records of *S. purpurea* (as '*S. landsborovii* form *personata*') are here considered to represent either *S. jacobensis* or *S. monacha*.

Discovery material of *S. jacobensis* includes abundant specimens from Marion Island, and others from Tristan da Cunha, the Falkland Islands, the southern Patagonian Shelf, and the Magellan Strait. The distinction between *S. jacobensis* and *S. leptodentata* sp. nov. is discussed under the latter.

*Smittina jullieni* Moyano  
(Plate III f, g)

*Smittina jullieni* Moyano, 1983: 11.

*Smittia purpurea* Jullien, 1888: 54, pl. 2, fig. 4.

non *Smittia landsborovii* var. *purpurea* Hincks, 1881: 123.

*Material*

MNP reg. no. BRY273, BRY1697 (Cotypes), Baie Orange, Ile Hoste, Terre de Feu, colln J. Jullien. Discovery Stns WS88, WS249, 1902.

*Description*

Colony encrusting, developing broad unilaminar sheets. Autozooids oval to hexagonal, convex; separated by distinct sutures in early ontogeny, flatter, with indistinct boundaries later. Primary orifice wider than long; proximal edge with lyrula occupying half total width, straight-edged, with sharply concave sides and pointed corners; no oral spines. Frontal wall finely granular, densely perforated by numerous small, round pores, less regular in late ontogeny as frontal calcification thickens. Peristome low and thick, with a deep proximal embayment; suboral avicularium completely enclosed within peristome, the distal edge of the rostrum just protruding; rostrum oval, slightly broadened distally, with slender crossbar, lacking a columella. Ovicell spherical, prominent, with a group of two or three large frontal foramina; becoming covered and partially obscured by a thickened oocelial cover, but with the frontal foramina remaining visible.

*Measurements* (means and standard deviations of 20 values), mm:

	WS249	MNP BRY273
Autozooid length	0.52 ± 0.05	0.56 ± 0.06
Autozooid width	0.31 ± 0.04	0.31 ± 0.04
Lyrula width	0.07 ± 0.005	0.06 ± 0.006
Avicularium length	0.07 ± 0.008	0.07 ± 0.006

*Remarks*

*Smittina jullieni* was introduced by Moyano (1983) for *Smittia purpurea* Jullien, the identity of which had been confused with the Australian species *Smittina purpurea* (Hincks). *Smittina monacha* (Jullien) and *S. jacobensis* (Busk) are two further, perfectly valid, species which had also been lost in the synonymy of *S. purpurea* (see Brown, 1952: 323).

Jullien's specimens of this species are juvenile colonies, about 6 mm<sup>2</sup>, encrusting pieces of *Chlamys* shell. The specimen figured here, from Discovery Stn WS249, is a large, aged colony, with thickened frontal walls, which covered about 1 cm<sup>2</sup> of a mussel shell. All specimens had the purplish tinge described by Jullien (1888) and Moyano (1983). In later ontogeny, some autozooids of *S. jullieni* may develop one or two additional suboral avicularia, lateral to the original one but usually more frontal in position. This tendency has also been noted in *S. smittiana* (Busk).

*Smittina leptodentata* sp. nov.

(Plate IVc-e)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.6, Discovery Stn WS781.

PARATYPE: Discovery Stn 51.

Other material: Discovery Stns 1321, WS84.

*Description*

Colony encrusting, developing small round patches. Autozooids oval to hexagonal, convex, separated by distinct sutures. Primary orifice about as wide as long, proximal border with a very short, peg-like, median lyrula, condyles bluntly pointed, inconspicuous. Two small distal oral spines present in early ontogeny, obscured by development of peristome. Frontal wall hyaline, glistening; with regular perforations, accentuated by thickening calcification in later ontogeny. Peristome forming a complete, thin-walled tube, extending on to ovicell in fertile autozooids; with a large proximal foramen, with slightly flared rim, through which the primary orifice is visible. Suboral avicularium, when present, situated on the outer lip of the peristomial foramen, broadly pear-shaped, with a slender crossbar, lacking a foramen; in some autozooids replaced by a larger, spatulate avicularium, proximo-laterally directed; in many autozooids no avicularium is developed. Ovicell spherical, with a short labellum extending over its aperture; smooth surfaced, with about six irregular frontal pores; developing a smooth oocial cover, and with the peristomial tube rising steeply from its frontal area.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length	$0.57 \pm 0.05$
Autozoid width	$0.33 \pm 0.04$
Orifice length	$0.10 \pm 0.006$
Orifice width	$0.10 \pm 0.005$

*Remarks*

Avicularia seem to be of generally low occurrence. They were completely lacking in some of the colonies examined, and were rarely present on more than 5% of the autozooids in most others. This species is confusingly similar to *Smittina monacha* (Jullien); in particular, the ovicell and peristome, and both types of avicularia, are almost identical in the two species. However, the peg-like lyrula, and tiny condyles are constant characters in *S. leptodentata*, which, moreover, never has more than two oral spines. *Smittina monacha* has a large, anvil-shaped lyrula, thick condyles, and always four oral spines. *Smittina leptodentata* is also very similar to *S. jacobensis* (Busk), formerly known only from Marion Island, and from a single station off Cape Verde. Like the present species, *S. jacobensis* has a narrow peg-like lyrula; it differs from *S. leptodentata* in having a larger primary orifice and four oral spines, and in that every autozoid is provided with an avicularium. The three species discussed here are undoubtedly phylogenetically very close;

although *S. monacha* may be certainly regarded as a distinct species, a wider range of material may show the taxonomic distinction between *S. jacobensis* and *S. leptodentata* to be less sure.

The present material of *S. leptodentata* comprises three samples from stations in the vicinity of the Falkland Isles, and a further one from the Strait of Magellan.

*Smittina monacha* (Jullien)  
(Plate Va, b)

*Smittia monacha* Jullien, 1888: 52, p. 2, figs 1-3.

*Smittia monacha*: Calvet, 1904: 28.

*Smittia landsborowi* form *personata*: Waters, 1904: 63.

*Material*

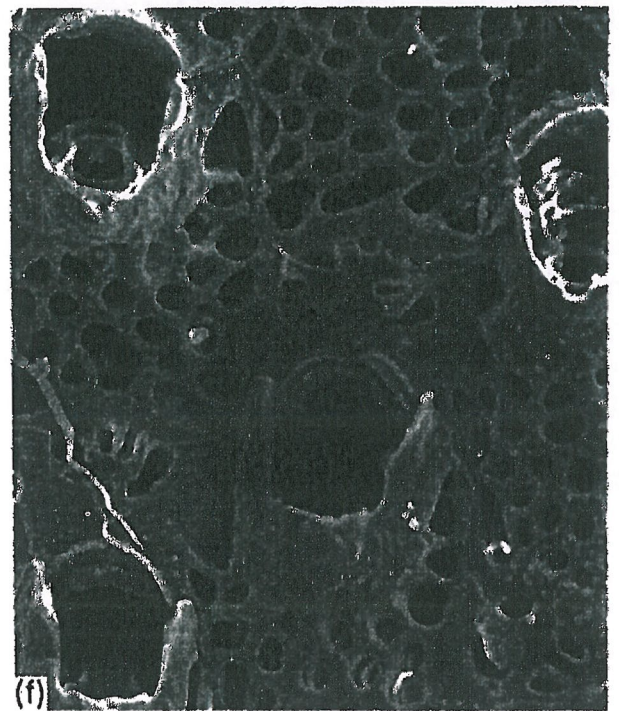
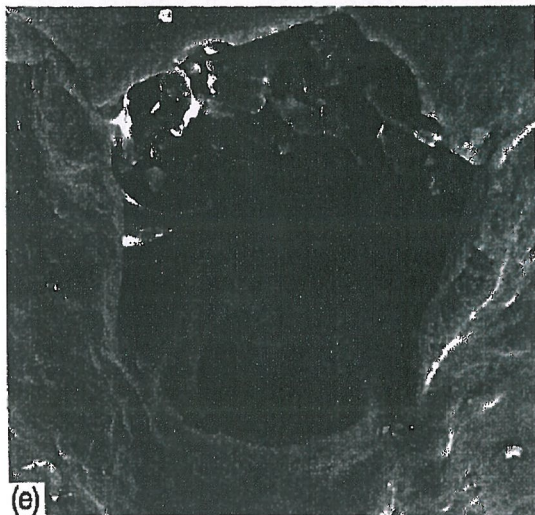
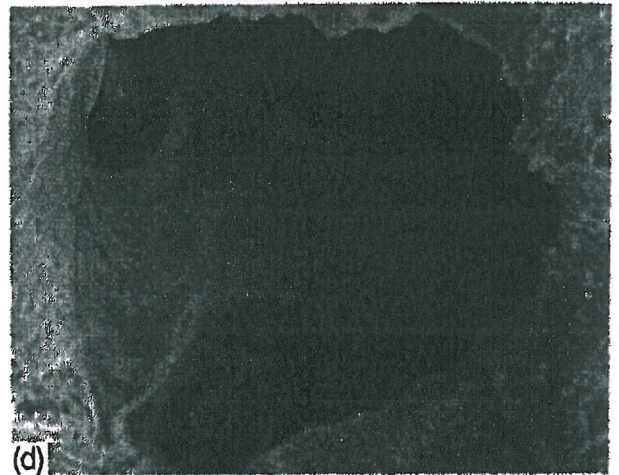
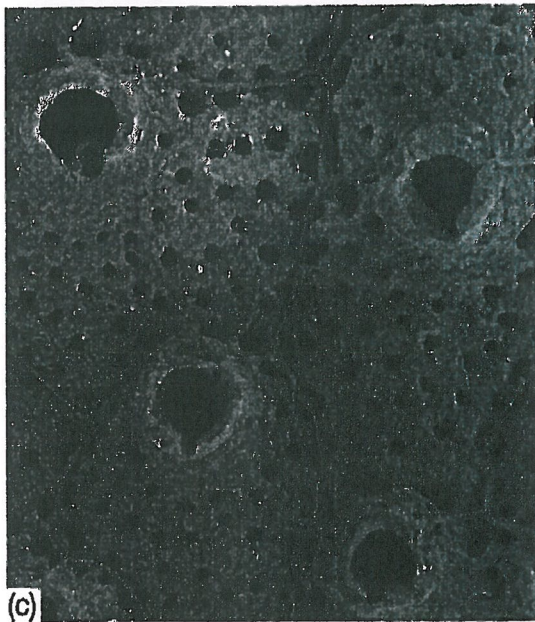
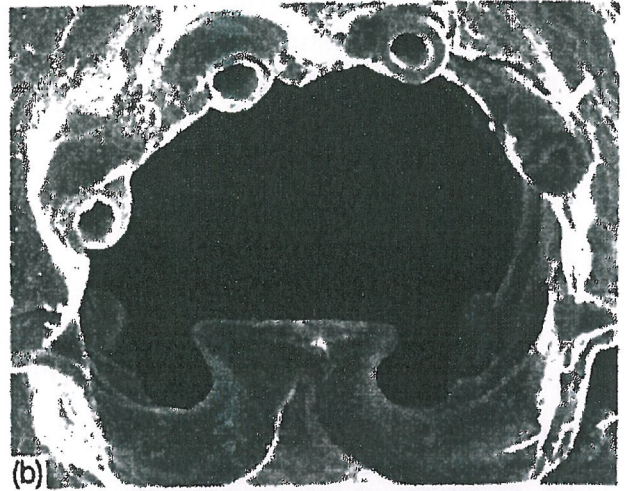
NMP reg. no. BRY274, BRY275: Baie Orange, Ile Hoste, Terre de Feu; Exped. de la Romanche, 1883; colln J. Jullien, SYNTYPES, Figd. Jullien, 1888. Discovery Stns 1321, WS85, WS838.

*Description*

Colony encrusting, forming small round patches. Autozooids oval to hexagonal, convex, separated by distinct sutures. Primary orifice slightly wider than long, proximal border with an anvil-shaped lyrula occupying about half total width; condyles angular, conspicuous; four distal oral spines present in newly budded autozooids, later obscured by development of peristome or ovicell. Frontal wall hyaline, smooth and glistening, regularly perforated by small, round pores. A single, proximally directed avicularium immediately proximal to primary orifice; rostrum rounded, slightly broader distally than proximally, palate with a distinctive crescentic foramen, crossbar slender, without a columella. Frequently, the suboral avicularium is enlarged, with a rounded, scaphoid rostrum extending to midpoint of autozoid frontal wall, with the characteristic crescentic foramen. Peristome developing initially as paired proximo-lateral flaps, growing vertically and medially, fusing above the avicularium, above a large round foramen. Lateral and distal elements of the peristome are contributed by adjoining autozooids, obliterating the spines and forming a complete tube. Ovicell spherical, prominent, recumbent on distally succeeding autozoid; with about 10 irregular frontal pores; developing a smooth ooecial cover; in later ontogeny the peristome extends on to the frontal surface of the ovicell, growing vertically as a straight tube.

*Measurements* (means and standard deviations of 20 values), mm:

Specimen:	WS85
Autozoid length	0.43 ± 0.04
Autozoid width	0.29 ± 0.02
Avicularium length	0.06 ± 0.006





*Remarks*

This distinctive species is immediately recognized by its suboral avicularium, peristome and lyrula. The material described here originates from the Magellan Strait, the Falkland Isles and the southern Patagonian Shelf and the species is perhaps quite common in the Magellanic and Patagonian regions. Its small, subcircular colonies are found on a wide range of biogenic carbonate substrata, including other bryozoans. Unfortunately *S. monacha* (Jullien) was synonymized with *S. landsborovii* form *personata* (Hincks) by Waters (1904), and its identity subsequently lost. The latter, described from Victoria, Australia, was considered to be a junior synonym of *Smittina purpurea* (Hincks), another Australian species, by Brown (1952), who echoed Waters in stating that *S. monacha* (Jullien) was probably synonymous with *S. purpurea* (Hincks). However, Brown (1952: 323) did note that the four spines figured by Jullien (1888) were not a feature of the latter species, all examples of which lack spines altogether. Jullien's species is here considered to be perfectly valid, and distinct from *S. purpurea* (Hincks), which should be deleted from faunal lists for the south-west Atlantic region.

*Smittina pliofistulata* sp. nov.  
(Plate Vc, d)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.7, Discovery Stn WS250.

*Description*

Colony encrusting. Autozooids quadrangular or irregular, convex, separated by distinct sutures. Primary orifice wider than long, proximal border entirely occupied by a broad, flat lyrula, with slightly convex edge, and concave sides; condyles short, quadrangular, indistinct in frontal view; no oral spines. Frontal wall coarsely granular, perforated by numerous, regularly spaced pores, larger and more conspicuous around the margins. Peristome developed in early ontogeny, forming a slender, erect tube, completely enclosing and partly obscuring the primary orifice; highest distally, with a narrow notch proximally. Suboral avicularium enclosed and hidden by peristome; rostrum oval, slightly expanded distally, with a complete crossbar bearing a broad, flat columella; palate with a slender, crescentic foramen. Ovicell hyperstomial, recumbent on distally succeeding autozoooid; broader than long, flattened frontally, coarsely granular, with scattered pores identical to those of frontal wall.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoooid length	0.78 ± 0.11
Autozoooid width	0.55 ± 0.06
Avicularium length	0.08 ± 0.005

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PLATE V (a, b) *Smittina monacha*: (a) group of autozooids, with ovicells and different types of avicularia, × 90; (b) the primary orifice, × 450. (c, d) *Smittina pliofistulata*, holotype: (c) group of autozooids, including an ovicell, × 50; (d) the primary orifice and avicularium, × 290. (e, f) *Smittina pocilla*, holotype: (e) the primary orifice and avicularium, × 310; (f) group of autozooids, two with ovicells, × 105.

*Remarks*

A single large specimen of this species encrusted a shell, collected off the Falkland Islands. It is a distinctive species, especially characterized by its broad lyrula, by the inconspicuous suboral avicularium, the pivotal bar of which bears a very substantial columella, and by its tall, narrow, proximally notched peristome.

*Smittina pocilla* sp. nov.  
(Plate Ve, f)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.8, Discovery Stn 1873.

*Description*

Colony encrusting. Autozooids oval to hexagonal, convex, separated by distinct grooves. Primary orifice wider than long, proximal edge with short lyrula, with slightly concave edge and distinctly cusped corners, occupying about half total width. No oral spines. Peristome developing in early ontogeny, comprising prominent, paired lateral flaps, with a deeply cupped proximal portion enclosing a conspicuously large suboral avicularium. Frontal wall coarsely granular, perforated by large, closely spaced, angular pores, giving a reticulate effect to entire frontal surface. Suboral avicularium with spatulate rostrum, complete crossbar, and stout, often bifid, columella. Ovicell small, spherical, recumbent on distally succeeding autozooid, smooth surfaced, with about six large, irregular pores; immersed and partly obscured by oocelial cover developed from adjoining autozooids, but with the central perforate area remaining distinct.

*Measurements* (means and standard deviations of 20 values), mm:

Autozooid length  $0.76 \pm 0.08$   
Autozooid width  $0.38 \pm 0.05$

*Remarks*

A single specimen of this species was collected from the South Shetland Islands. It is particularly characterized by its deeply cupped peristome, and the very large, enclosed, suboral avicularium. These features, together with its densely punctured, almost cribrate, frontal wall, distinguish it immediately from other Antarctic and sub-Antarctic species of *Smittina*.

*Smittina portiuscula* sp. nov.  
(Plate VIa, b)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.9, Discovery Stn 1902.

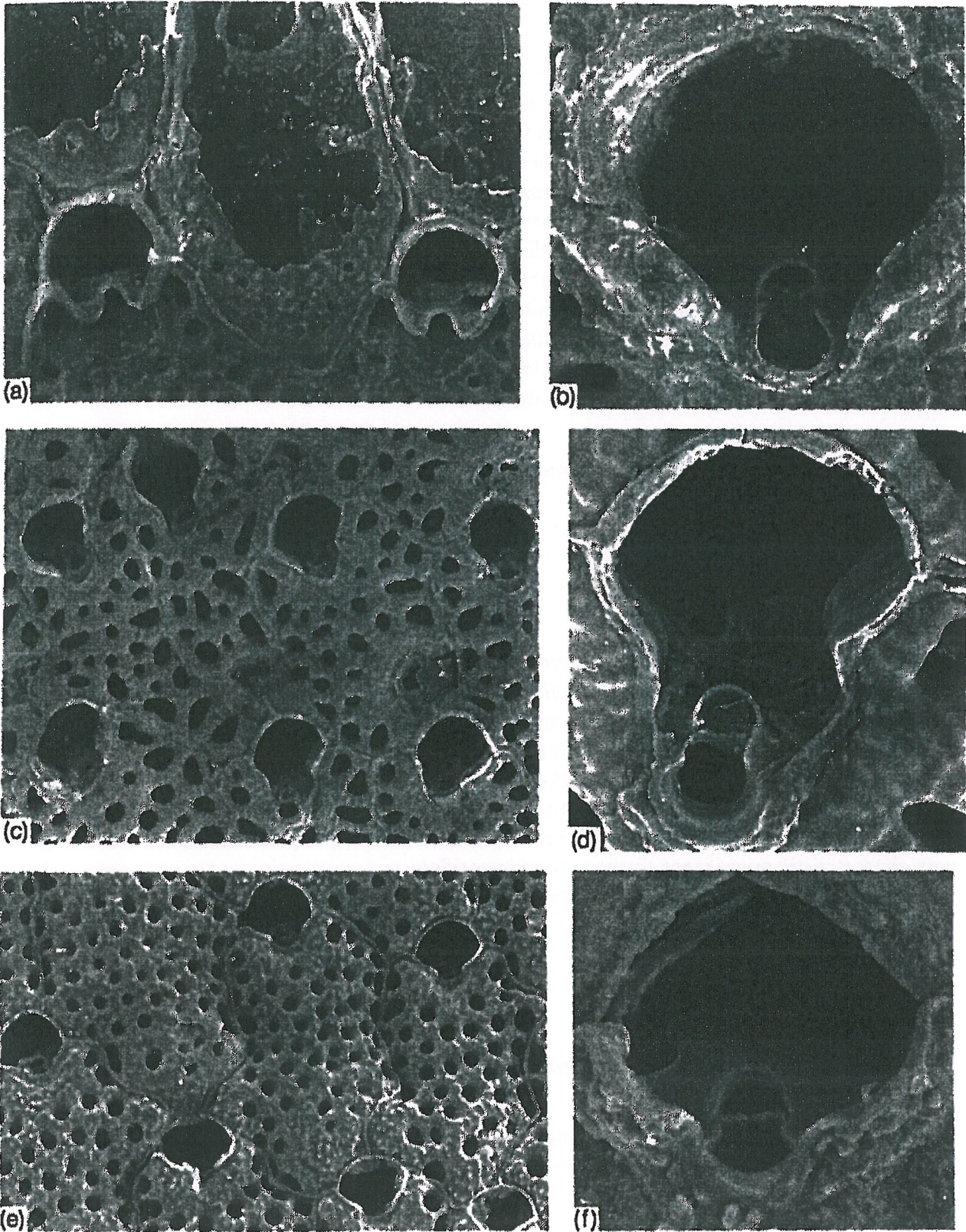


PLATE VI (a, b) *Smittina portiuscula*, holotype. (a) autozooids at the growing edge,  $\times 120$ ; (b) the primary orifice, and a rare avicularium,  $\times 360$ . (c, f) *Smittina stigmatophora*. (c) the holotype, old autozooids with immersed ovicells,  $\times 70$ ; (d) detail of an orifice from the holotype, with twinned avicularia,  $\times 330$ ; (e) autozooids and ovicells, Stn 1902,  $\times 80$ ; (f) the primary orifice and avicularium, Stn 1902,  $\times 320$ .

*Description*

Colony encrusting, developing small, irregular patches. Autozooids oval to hexagonal, flat or slightly convex, separated by distinct raised ridges. Primary orifice wider than long, proximal border entirely occupied by a broad, anvil-shaped lyrula, with straight edge, concave sides, and distinctly cusped corners; condyles prominent, rather angular; no oral spines. Frontal wall finely granular, densely and evenly perforated by small, round pores; becoming thicker and flatter in late ontogeny, but the pores remaining small and rounded. Peristome distinctive, developing in early ontogeny as paired lateral flanges, encircling primary orifice; raised distally, deeply embayed proximally, with the lateral flanges produced and tapered. Suboral avicularium, when present, lodged within peristome and rather indistinct, narrowly oval, with slender crossbar, lacking a columella. Many autozooids lack an avicularium, having instead a short, but pronounced ridge extending from the notch in the peristome to the base of the lyrula. Ovicell broadly oval, smooth surfaced, with about eight large pores frontally.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.56 \pm 0.05$

Autozoid width  $0.33 \pm 0.03$

*Remarks*

This species is very similar to *S. stigmatophora* (Busk), and both have been found on single pieces of substratum. *Smittina portiuscula* is distinguished from the latter by its more finely punctured frontal wall, by its ovicell, and most particularly by reference to its orifice. The avicularium of this species is smaller, and more clearly oval than that of *S. stigmatophora*, and is less constant in occurrence. Some colonies completely lack avicularia, their normal situation being occupied by a short peg, which can be seen to be the frontal section of a low ridge extending to the lyrula base. Together with the tapered, erect, proximo-lateral peristome flanges, these impart a very characteristic appearance to the secondary orifice.

Specimens of *S. portiuscula* were collected from a single station on the southern Patagonian Shelf.

*Smittina smittiana* (Busk)

(Plate VII)

*Smittia smittiana* Busk, 1884: 151, pl. 17, fig. 3.

*Smittina ehrlichi* Lopez Gappa, 1979: 31, pls 1, 2.

*Material*

COTYPES: BMNH reg. no. 1887.12.9.598-600, Chall. Stn 320

Other Material: Discovery Stns 51, 55, 388, 562, 1321, 1902; WS80, WS82, WS84, WS85, WS88, WS97, WS243, WS246, WS247, WS250, WS781, WS847, WS874.

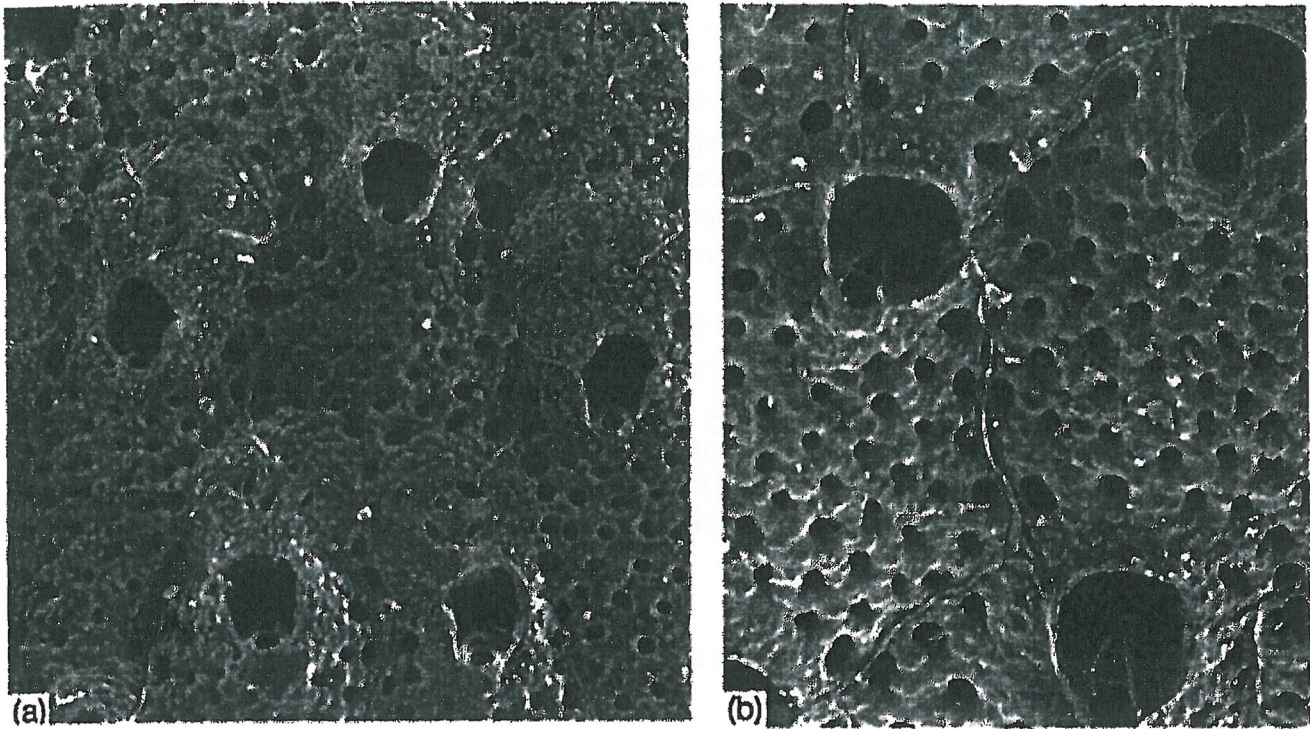


PLATE VII *Smittina smittiana* (a) ovicelled autozooids, Stn 167,  $\times 60$ ; (b) younger autozooids, showing the primary orifice and avicularium, Stn 338,  $\times 80$ .

#### Remarks

All of the morphological variations illustrated by Lopez Gappa (1979) as characteristic of *Smittina ehrlichi* may be seen in Busk's type specimens of *S. smittiana*, which is here regarded as the senior synonym of *S. ehrlichi*. This species is widely distributed, and common, across the whole of the Southern Patagonian shelf. The Discovery samples include encrusting colonies, and foliose, bilaminate, erect colonies up to 10 cm high. *Smittina smittiana* (Busk) does not occur in Antarctic waters.

#### *Smittina stigmatophora* (Busk) (Plate VIc-f)

*Smittina stigmatophora* Busk, 1884: 154, pl. 22, fig. 6.

#### Material

HOLOTYPE: BMNH reg. no. 1887.12.9.610, Challenger Stn 315, 51°40'S, 57°50'W, 12 fms.  
Other material: Discovery Stns 1902, WS847.

#### Description

Colony encrusting, forming small, rounded patches and larger, irregular sheets. Autozooids oval to hexagonal, or rather irregular, gently convex, separated by narrow sutures. Primary orifice

distinctly hammer-shaped, with straight edge, deeply concave sides, and rounded distal corners, occupying entire proximal border of orifice; condyles stout, blunt; no oral spines. Frontal wall finely granular, densely punctured by large round pores. Peristome entirely surrounding orifice, but level with frontal wall, not projecting, deeply notched proximally, the folds on each side of the notch thickened. Suboral avicularium enclosed within peristome, rostrum slightly spatulate, just showing at edge of peristomial notch; crossbar slender, without a columella. Ovicell broader than long, rather flattened, with four or five large frontal pores; becoming immersed and indistinct, with just the frontal pores clearly visible.

As noted by Busk (1884), this species shows a tendency to rapid thickening of frontal calcification. The primary orifice becomes deeply immersed, and occasionally a second suboral avicularium develops within the peristome, frontal to the first one. The peristome rim also thickens, particularly on each side of its proximal notch, but is not raised above the colony surface. The ovicell becomes almost totally hidden in thick calcification: its presence marked only by a rim enclosing two or three of the original frontal pores; this is the 'crescentic or reniform stigma' referred to by Busk (1884).

*Measurements* (means and standard deviation of 20 values), mm:

Specimen: 1902

Autozoid length  $0.53 \pm 0.04$

Autozoid width  $0.30 \pm 0.05$

#### *Remarks*

This species has not been recognized since Busk's (1884) original description. The type material consists of a few fragments from an old, much thickened colony; the source of Busk's stylized figure can be discerned in this specimen, but it is practically impossible to identify the species from the figure alone. The Discovery material described here comprises colonies displaying every ontogenetic stage, from the growing edge to the late ontogenetic phase figured by Busk. *Smittina stigmatophora* is presently known only from a limited area of the southern Patagonian shelf.

#### *Parasmittina dubitata* Hayward

*Parasmittina dubitata* Hayward, 1980: 701, figs 2A, B.

*Smittia marsupialis* Busk, 1884: 151 (in part).

*Smittia trispinosa* var. *munita*: Calvet, 1904: 28.

#### *Material*

BMNH reg.no. 1899.7.1.4949, 5076, 5077, Chall. Stn 313 (as *S. marsupialis* (Busk)). MNP reg. no. 3969, 44°32'S, 61°25'W, colln L. Calvet (as *S. trispinosa* var. *munita* Hincks). Discovery Stns 388, 1902, 1909, WS71, WS88, WS90, WS243, WS836, WS847, WS848.

#### *Remarks*

Busk (1884) founded his *Smittia marsupialis* on Challenger specimens from the eastern end of the Magellan Strait (Stn 313) and from Hawaii. Soule & Soule (1973) noted that the south-west

Atlantic specimen represented a different species to that from Hawaii, and rather resembled the *S. trispinosa* var. *munita* recorded from the same region by Calvet (1904). The holotype of *S. marsupialis* (BMNH 1887.12.9.601—now *Parasmittina marsupialis*) is from Hawaii. It is characterized by a distally directed, triangular, lateral oral avicularium, while that of the specimen from Challenger Stn 313 has a proximally, or proximo-laterally directed avicularium. Comparison of Busk's material from Stn 313 with that of Calvet (1904) shows that they are indeed the same species, namely *Parasmittina dubitata* Hayward.

*Parasmittina dubitata* develops substantial multilaminar, nodular colonies, encrusting every kind of hard substratum. It seems to be widely distributed throughout the Magellanic-Patagonian regions, but does not extend into Antarctic waters.

The status of *S. trispinosa* var. *munita* requires re-evaluation. The Australian type specimen (BMNH 1956.10.26.1) shows a striking resemblance to specimens of *P. dubitata*, but differs in its more finely perforated ovicell, deeply notched peristome, and generally smaller dimensions.

*Smittoidea bulbosa* sp. nov.  
(Plate VIIa, b)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.11, Discovery Stn 388.

*Description*

Colony encrusting, forming thick, flat sheets, tending to multilamellar growth. Autozooids irregularly hexagonal, convex, separated by thick, raised ridges with conspicuous median sutures. Primary orifice wider than long, proximal edge entirely occupied by a broad, deep lyrula with straight edge and cusped corners, condyles lacking; obscured in early ontogeny by the development of a deep peristome. No oral spines. Frontal calcification thick, nodular, developing a prominent conical knob medially; with large marginal pores in a single series, deepening and widening as calcification thickens. Peristome forming a thick, low, circular rim, with a short notch proximo-medially. Suboral avicularium completely enclosed within peristome, and inconspicuous, disto-proximally orientated; rostrum slightly broadened distally, with a serrated edge, crossbar complete, with a short columella. Ovicell hyperstomial, recumbent on distally succeeding autozoid; indistinct, developing a nodular ooecial cover in early ontogeny with a thickened frontal umbo identical to that on frontal wall.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length     $0.54 \pm 0.05$   
Autozoid width     $0.41 \pm 0.06$

*Remarks*

Two colonies of this species were collected from Cape Horn, encrusting a small piece of carbonate substratum; both were beginning multilamellar growth through frontal budding.

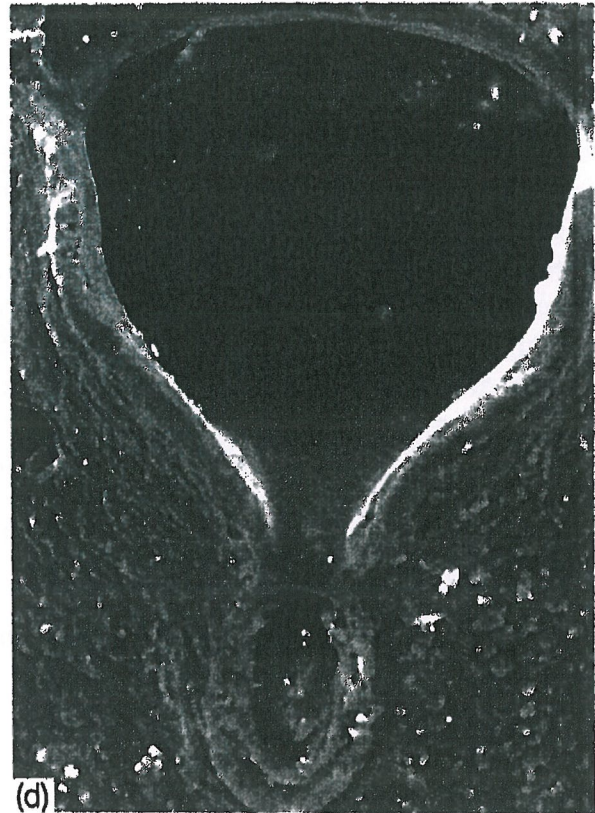
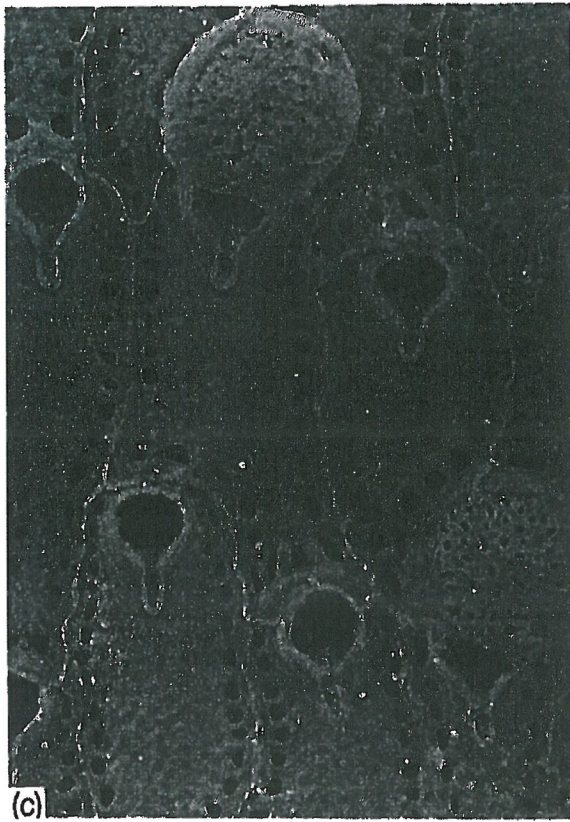
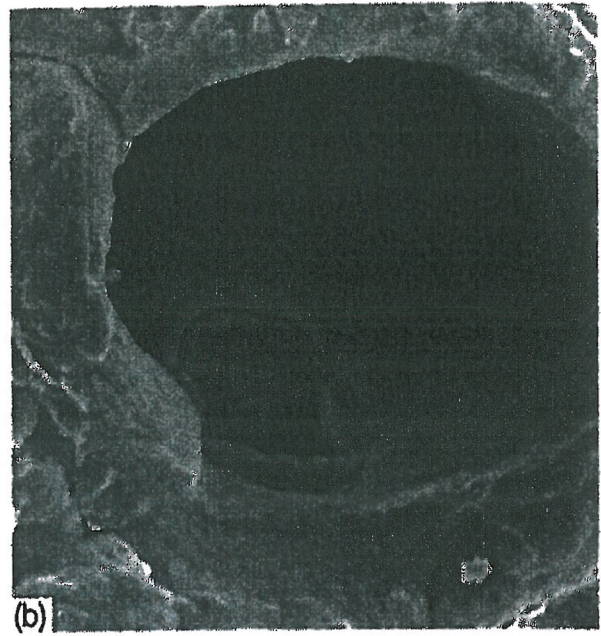
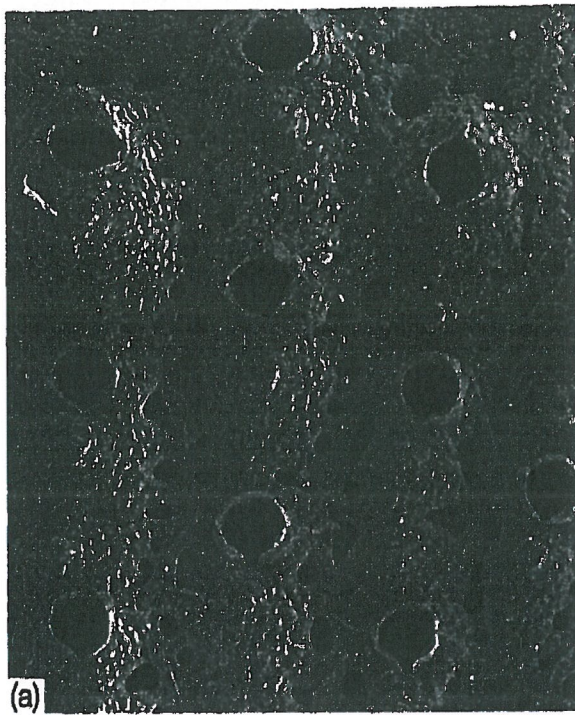


PLATE VIII. (a, b) *Smittoidea hulbosa*, holotype: (a) group of autozooids,  $\times 50$ ; (b) the primary orifice and avicularium,  $\times 400$ . (c, d) *Smittoidea cribrooecia*, holotype: (c) group of autozooids, two with ovicells,  $\times 50$ ; (d) the primary orifice and avicularium,  $\times 300$ .



*Smittoidea cribrooecia* sp. nov.  
(Plate VIIIc, d)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.12, Discovery Stn WS225.

*Description*

Colony encrusting. Autozooids elongate, rectangular, rather flat, separated by slender ridges. Primary orifice wider than long; proximal edge entirely occupied by a broad, deep lyrula, tapered distally, its free edge smoothly rounded between two blunt cusps; condyles large, oval, downcurved, with finely serrated edges revealed by SEM. No oral spines. Peristome developed as a thin, erect collar completely encircling orifice, with a narrow medio-proximal notch. Frontal wall finely granular, with a single series of distinct marginal pores, rather angular, with thickened ridges between. A single, suboral avicularium present immediately proximal to peristomial notch; relatively small, oval, with an extensive palate, and a complete crossbar with a short columella. Ovicell distinctive, very prominent, longer than wide, frontal surface densely perforated by numerous small, irregular pores, to give a sieve-like effect; with a smooth ooecial cover derived from adjoining autozooids surrounding it distally and laterally.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.93 \pm 0.10$   
Autozoid width  $0.42 \pm 0.05$

*Remarks*

The broad, tapered lyrula of this species, its unusually small suboral avicularium, and its very distinctive ovicell, distinguish it from other species of *Smittoidea*. A single specimen only was collected from Discovery Stn WS225, on the southern Patagonian Shelf.

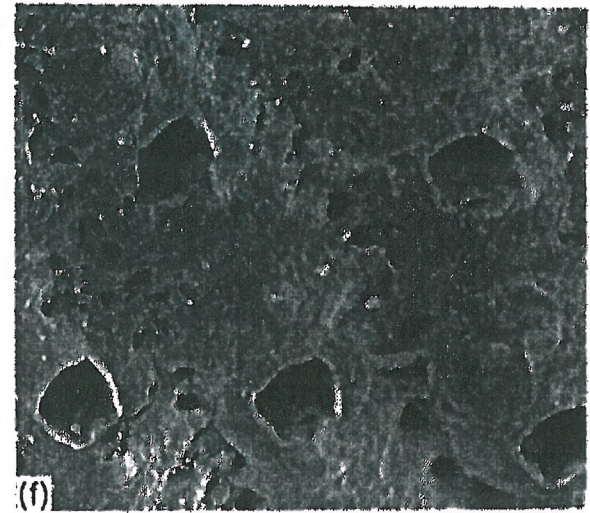
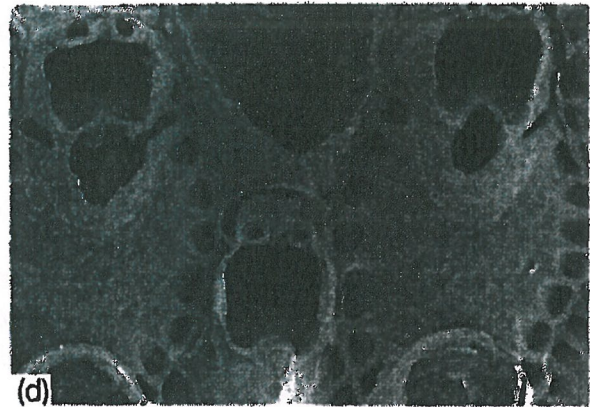
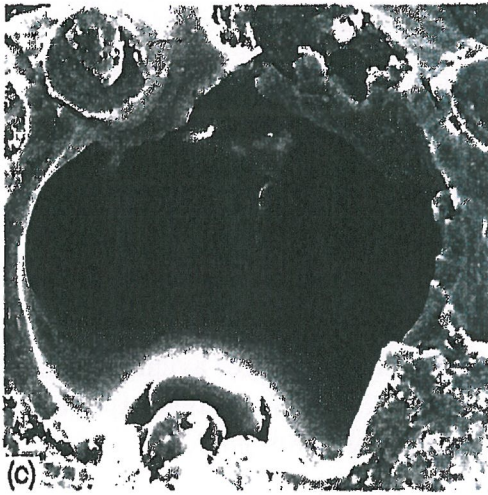
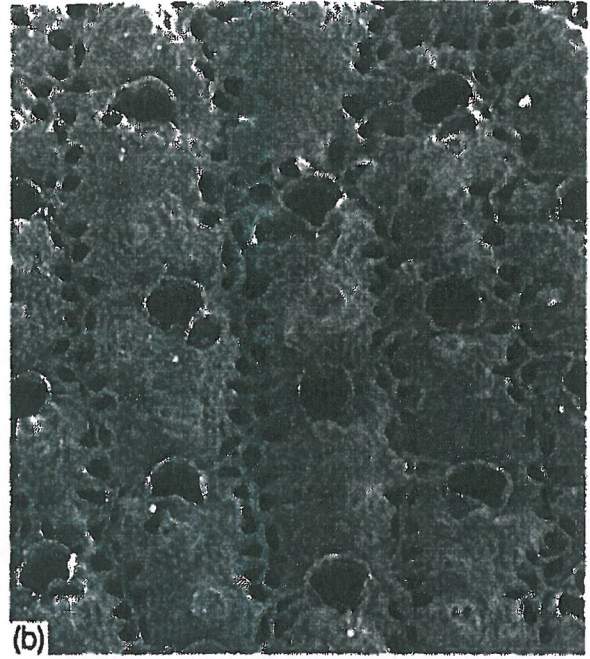
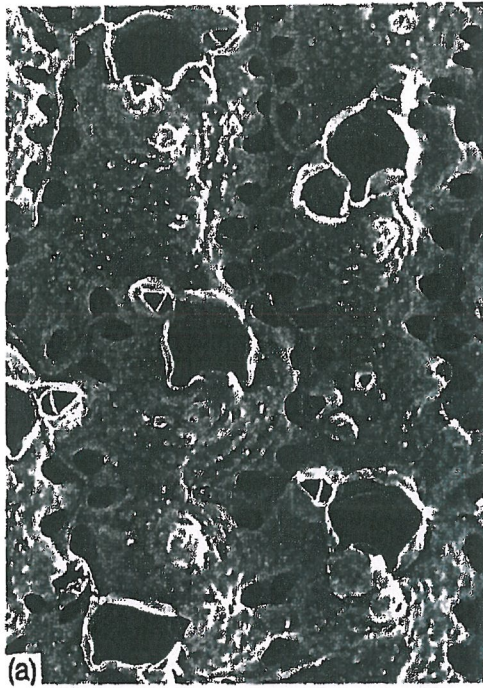
*Smittoidea pachydermata* sp. nov.  
(Plate IXa, c)

*Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.13, Discovery Stn 1909.  
PARATYPE: Discovery Stn 388.  
Other material: Discovery Stns 652, 1909, WS83, WS86, WS225.

*Description*

Colony encrusting, forming thick, rounded patches. Autozooids rectangular or irregular, steeply convex, separated by deep grooves. Primary orifice wider than long, proximal border entirely occupied by a deep lyrula with straight edge and sharply pointed corners; condyles not



apparent; three or four distal oral spines present in early ontogeny, obliterated by development of peristome. Frontal wall coarsely granular, typically with a stout, nodular umbo proximo-lateral to orifice; marginal pores large and conspicuous, with thickened ridges between. Peristome low and thick, completely hiding primary orifice; rim rounded distally, uneven proximally, with one or more small notches medially or laterally. Suboral avicularium enclosed by peristome, its triangular, hooked rostrum just protruding; additional, similar avicularia develop at various positions around the rim of the peristome, directed away from the aperture, and also along lateral and proximal margins of the autozoid. Ovicell recumbent on distally succeeding autozoid, wider than long, with one or more small frontal pores; becoming immersed, and obscured, by thick nodular calcification, surmounted by a second umbo.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.47 \pm 0.05$   
Autozoid width  $0.33 \pm 0.04$

#### *Remarks*

The notched peristome, elongate suboral avicularium, and a tendency to bud additional suboral avicularia, together distinguish *S. pachydermata* from other species of *Smittoidea*. Its thickly calcified colonies occurred on rock, especially small pebbles, at each of the six stations from which it was collected, from Cape Horn to Burdwood Bank.

*Smittoidea rhynchota* sp. nov.  
(Plate IXd-f)

#### *Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.14, Discovery Stn 366.  
PARATYPE: Discovery Stn 1909.

#### *Description*

Colony encrusting, developing small, rounded patches. Autozooids broad, oval to hexagonal, convex, separated by distinct sutures. Primary orifice slightly wider than long, proximal edge with short, broad lyrula, with straight edge, occupying more than half total width; lateral and distal edges smooth, lacking condyles. Two short, distal oral spines present in early ontogeny. Frontal wall smoothly calcified, with large, conspicuous marginal pores, separated by stout ridges. Peristome developed as paired lateral flaps, produced and slightly flared; suboral avicularium occupying proximal gap in peristome, cystid swollen, with an apical umbo, rostrum elongate triangular, hooked distally, acute to frontal plane. One to three additional avicularia may develop

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PLATE IX. (a-c) *Smittoidea pachydermata*, holotype: (a) group of autozooids showing additional avicularia,  $\times 80$ ; (b) older autozooids, several with ovicells,  $\times 50$ ; (c) the primary orifice and avicularium,  $\times 350$ . (d-f) *Smittoidea rhynchota*, holotype: (d) autozooids at the growing edge,  $\times 65$ ; (e) ovicelled autozooids,  $\times 80$ ; (f) older autozooids, two with additional avicularia,  $\times 70$ .

on the proximo-lateral edges of the peristome in later ontogeny. Ovicell slightly wider than long, prominent, globular, recumbent on frontal wall of distally succeeding autozoid; with six to eight small, round frontal pores; developing a finely granular ooecial cover in later ontogeny, with the distal rim of the peristome extending on to its frontal surface.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $0.63 \pm 0.07$

Autozoid width  $0.43 \pm 0.04$

#### *Remarks*

Specimens of this distinctive species were collected from Burdwood Bank, and also from the South Sandwich Islands. It remains to be seen, therefore, whether its distribution is primarily Antarctic or sub-Antarctic.

#### *Smittoidea sigillata* (Jullien)

(Plate Xa, b)

*Smittia sigillata* Jullien, 1888: 54, pl. 2, figs. 5, 6.

*Smittia sigillata*: Calvet, 1904: 29.

#### *Material*

MNP reg. no. BRY1686, Iles Malouines à détroit de Magellan, colln J. Jullien. Discovery Stns 562, 1321, 1909, WS88, WS221, WS225, WS226, WS228, WS243, WS783, WS836, WS848, WS871.

#### *Description*

Colony encrusting, multilaminar, forming thick, nodular, mamillate mounds through continuous frontal budding; large colonies exceed 5 cm<sup>2</sup> and may be up to 2 cm thick. Autozooids hexagonal to rectangular in young colonies; irregular, with random orientation, in multilaminar colonies, rather flat, separated by thick sutures. Primary orifice wider than long; proximal edge entirely occupied by a massive, deep lyrula, with straight edge and sharply cusped corners, condyles small and indistinct; no oral spines. Frontal wall thick, coarsely granular, with large and obvious marginal pores, separated by thickened ridges; two or three frontal pores proximal to peristome. Primary orifice becoming deeply immersed, encircled by a low, thick peristome, with a conspicuous median notch proximally; suboral avicularium enclosed within peristome, relatively large, the rostrum broadened distally, crossbar stout, with a knob-like columella. Ovicell recumbent on distally succeeding autozoid, broader than long, slightly flattened frontally, with up to 20 small, scattered pores; calcification coarsely granular and scarcely distinguishable from adjacent autozooids.

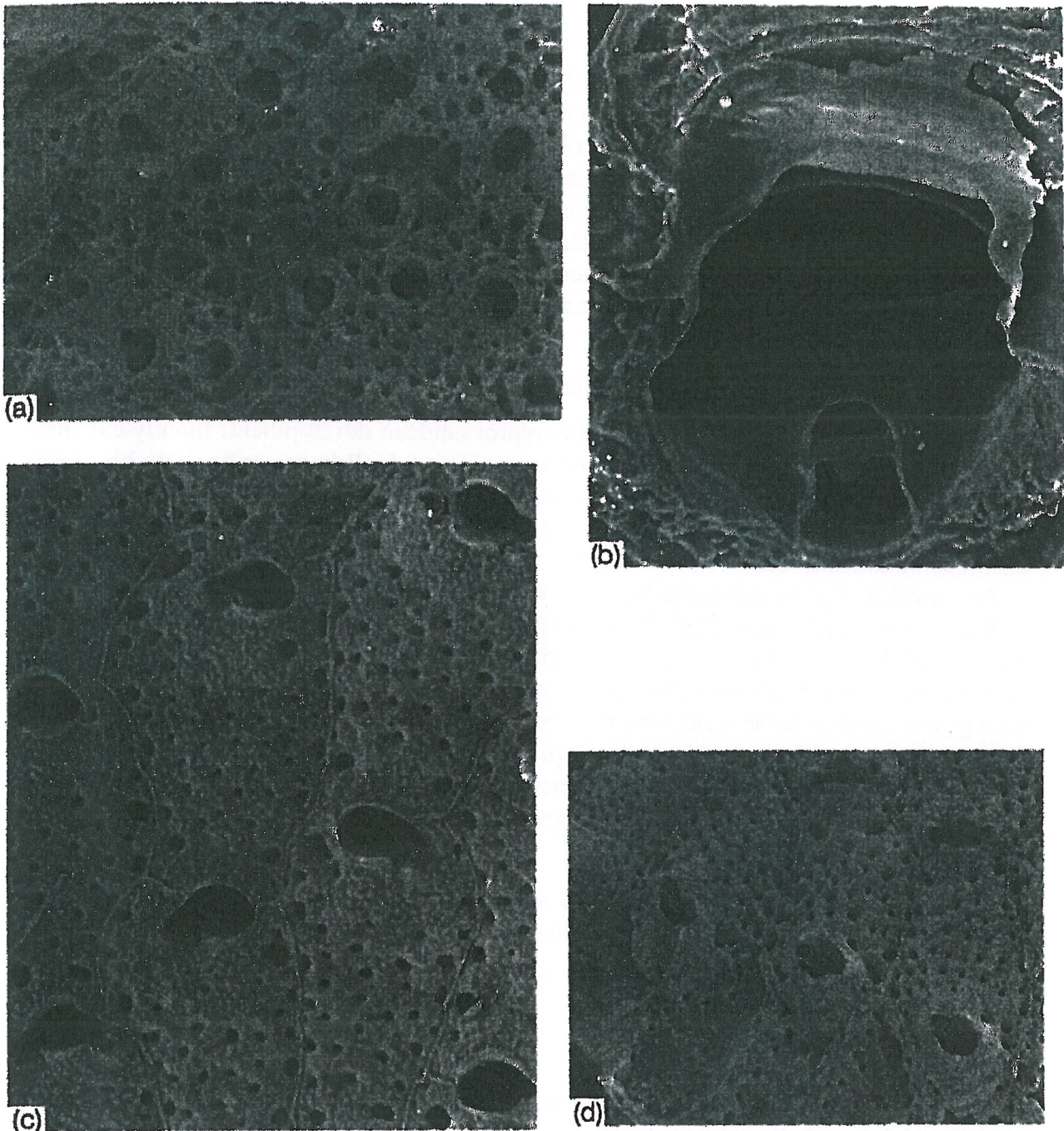


PLATE X. (a, b) *Smittidea sigillata*, Stn WS836: (a) frontally budded autozooids in a large colony,  $\times 30$ ; (b) the primary orifice and avicularium,  $\times 230$ . (c, d) *Platyhelyna planulata*, Stn WS840: (c) group of autozooids,  $\times 40$ ; (d) autozooids at the growing edge,  $\times 25$ .

*Measurements* (means and standard deviations of 25 values), mm:

Autozoid length	$0.68 \pm 0.08$
Autozoid width	$0.47 \pm 0.09$
Avicularium length	$0.09 \pm 0.009$

*Remarks*

*Smittoidea sigillata* develops massive nodular colonies which, in the largest examples, appear to envelop the original substratum completely and lie freely among coarse bottom deposits. Despite the fact that it has been reported on only two previous occasions, it appears to be widely distributed, and common, throughout the Magellanic region. The present material originates mostly from the Southern Patagonian Shelf, but includes a specimen from the west end of Magellan Strait, and others from the Falkland Isles and Burdwood Bank. *Smittina ectoproctolitea* Moyano, from Magellan Strait and southern Chile, seems very similar to this species. *Smittoidea sigillata* does not seem to range into Antarctic waters.

*Aspericreta gen. nov.*

Frontal wall of autozooids with inferred cryptocystidean development; thickly calcified, with numerous irregular pores; vertical walls with recessed septula. Primary orifice with blunt proximal tooth, lacking condyles. No oral spines; no avicularia. Ovicell hyperstomial, partly immersed; with a frontal tabula (entoecium?) perforated by few irregular pores, obscured in later ontogeny by encroaching calcification.

Type species: *Smittia crassatina* Waters, 1904

*Smittia crassatina* is immediately distinguished from other Antarctic and sub-Antarctic species here assigned to *Smittina* by its primary orifice, with variably developed proximal tooth, and smooth rim, lacking condyles. Although the morphology of the ovicell remains unclear (especially with regard to which layer is perforated), it seems to be of a different type to that of *Smittina* s.s. These features, together with the lack of spines and avicularia, suggest that a distinct genus is appropriate for *S. crassatina* Waters. A new species from South Georgia has some striking similarities to *S. crassatina* and is also assigned to *Aspericreta* gen. nov.

*Aspericreta crassatina* (Waters)  
(Plate XIa-c)

*Smittia crassatina* Waters, 1904: 70, pl. 4, fig. 9; pl. 3, fig. 7.

*Material*

IRB no.288 (COTYPE), 71°19'S, 89°15'W, I.G. 10.131, 'Belgica', 1897-1899.

National Antarctic Expedition, locality unknown, numerous colonies on large cobbles.

*Description*

Colony encrusting, forming thick, flat sheets; basically unilaminar, but with separate lobes of colony occasionally overlapping. Autozooids large, visible to unaided eye, with irregular outlines; not markedly convex, separated by well-marked grooves. Primary orifice wider than long, proximal border with stout, knob-like median tooth, of variable shape; lacking condyles and oral spines; encircled by a thickened peristome, with a deep embayment proximally, giving on to a smooth area of calcification between it and the lryula. Frontal wall thickly calcified, densely perforated by large pores, variable in size, often much larger at the proximal end of the autozooid

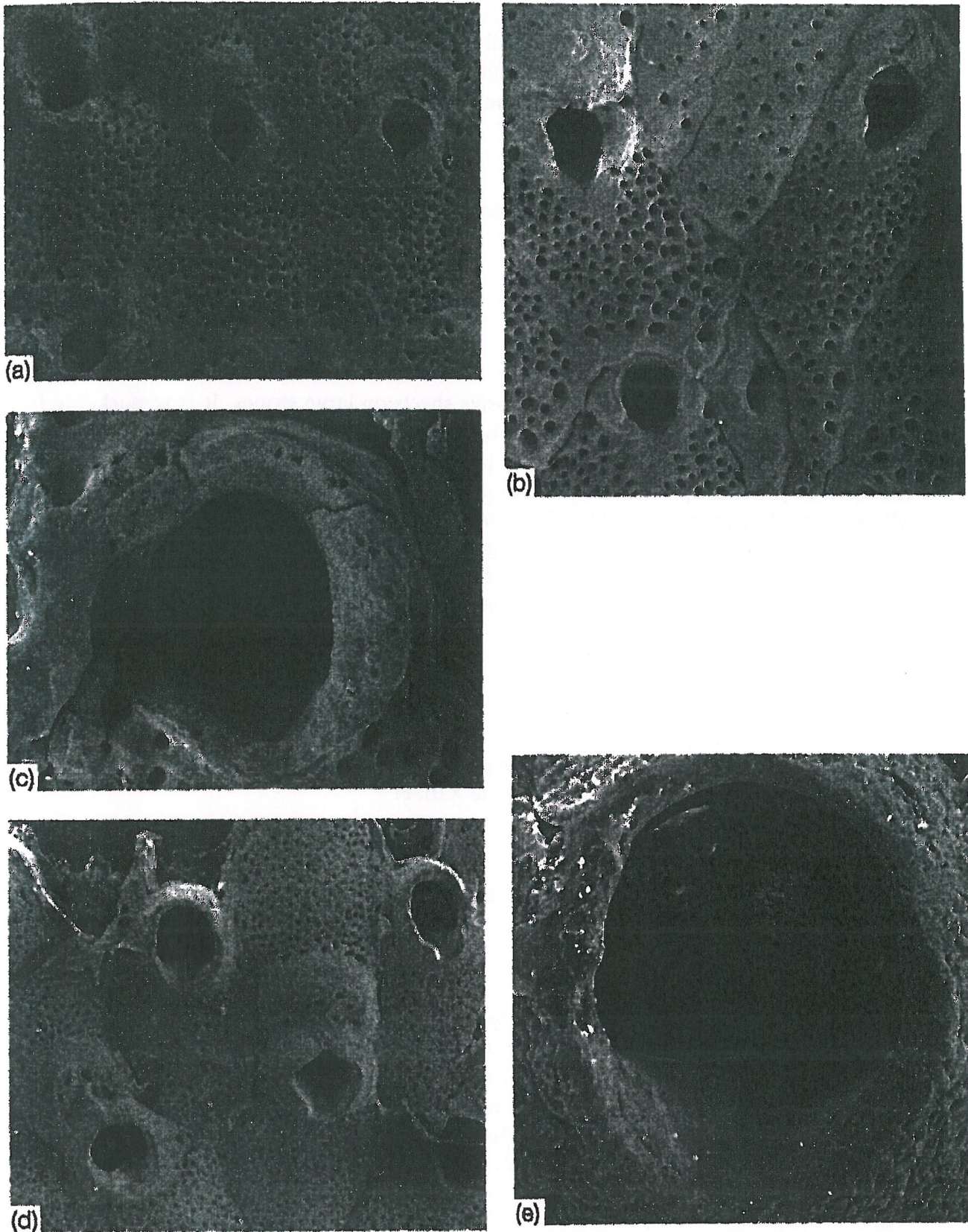


PLATE XI. (a-c) *Aspericreta cruxatina*: (a) autozooids with ovicells,  $\times 26$ ; (b) older autozooids, with interzooidal thickening,  $\times 28$ ; (c) the primary orifice,  $\times 90$ . (d, e) *Aspericreta georgensis*, holotype: (d) autozooids at the growing edge, two with ovicells,  $\times 30$ ; (e) the primary orifice,  $\times 160$ .

than at the distal end. Irregular ridges of thick secondary calcification develop in later ontogeny, occupying areas between autozooids. Ovicell about as wide as long, partly immersed; coarsely calcified distally, with a depressed frontal tabula, perhaps representing the entooecium, perforated by a small number of irregular pores, becoming covered by thick calcification which appears to represent the ectooecium.

*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length	$1.75 \pm 0.21$
Autozoid width	$1.03 \pm 0.16$

### *Remarks*

*Aspericreta crassatina* develops flat, extensive sheets on large stones. It is remarkable for the very large size of its autozooids, which may be clearly seen by the unaided eye, and for the thick ridges of calcification, perhaps extrazoidal in origin, which develop between the autozooids in later ontogeny. This species was described by Waters (1904) from four stations in the Bellingshausen Sea, from 435 to 500 m. The NAE material here described is abundant, comprising spreading colonies, exceeding 5 cm<sup>2</sup>, on large cobbles, from an unrecorded Antarctic locality. Unfortunately, such substratum is not conducive to good preservation; most of the colonies have been damaged by collection, and complete astogenetic and ontogenetic sequences have not been preserved.

*Aspericreta georgensis* sp. nov.  
(Plate XI d, e)

### *Material*

HOLOTYPE: BMNH reg. no. 1989.4.18.15. Discovery Stn 152.

### *Description*

Colony encrusting. Autozooids irregularly oval, convex, separated by deep grooves. Primary orifice longer than wide, proximal border with a short, peg-like lyrula, variably developed. Peristome developing in early ontogeny, forming a thick, granular rim completely enclosing the primary orifice, with a broad, shallow, medio-proximal notch; a broad area of smooth calcification extends proximally from the lyrula to the peristomial notch. Frontal wall finely granular, densely perforated by numerous minute pores, with some of those at the margin slightly enlarged. Ovicell hyperstomial, recumbent on distally succeeding autozoid, about as wide as long; coarsely granular, except for a crescentic frontal tabula, perhaps representing entooecium, with about six conspicuous pores. The peristome extends on to the ovicell, proximal to the tabula, forming a complete tube. In later ontogeny sutures between autozooids become conspicuously thickened by additional calcification.



*Measurements* (means and standard deviations of 20 values), mm:

Autozoid length  $1.40 \pm 0.17$

Autozoid width  $0.79 \pm 0.13$

*Remarks*

The large, thickly calcified autozooids of this species are immediately reminiscent of those of *A. crassatina*, and the structure of its ovicell, the primary orifice and peristome, and the tendency to thick interzooidal calcification in later ontogeny demonstrate that it belongs in the same genus. Its principal differences from the type species are its more elongate orifice, displaying only a minimal development of the median tooth, and a proportionately large ovicell. It is presently known only from a single station off South Georgia; the holotype comprised a well grown colony encrusting a stone.

*Platychelyna gen. nov.*

Colony erect, attached by an encrusting base, developing flat, bilaminar branches. Frontal wall of autozooids with inferred cryptocystidean development, with irregular perforations over entire surface; vertical walls with small, recessed septula. Primary orifice with lyrula, but lacking condyles; no oral spines. Peristome developed as prominent, flattened, distal and proximal flaps, projecting from frontal plane, giving an impression of a pair of lips. Avicularium adventitious, lateral oral, present on either or both of the corners between the peristomial flaps. Ovicell partially immersed, indistinct, with scattered frontal pores.

Type species: *Cellarinella planulata* Hayward, 1980.

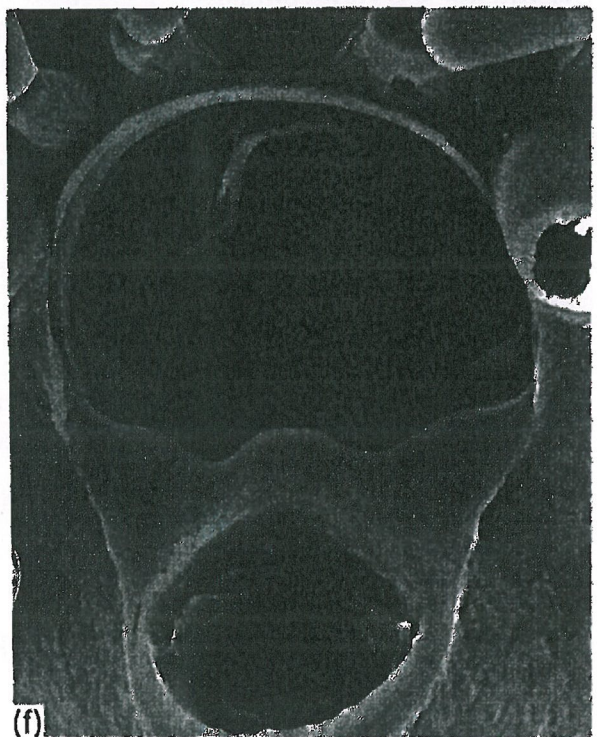
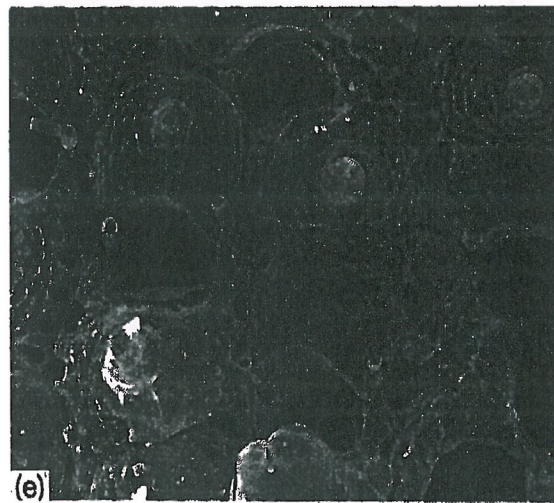
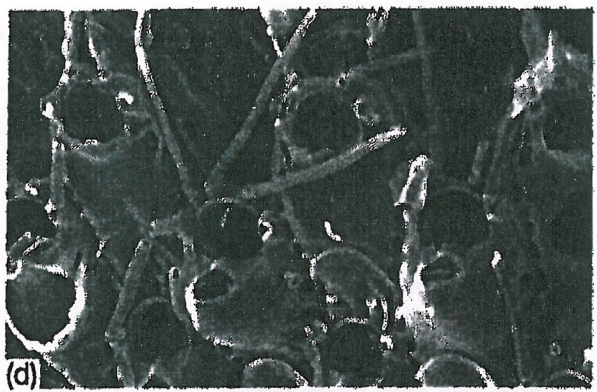
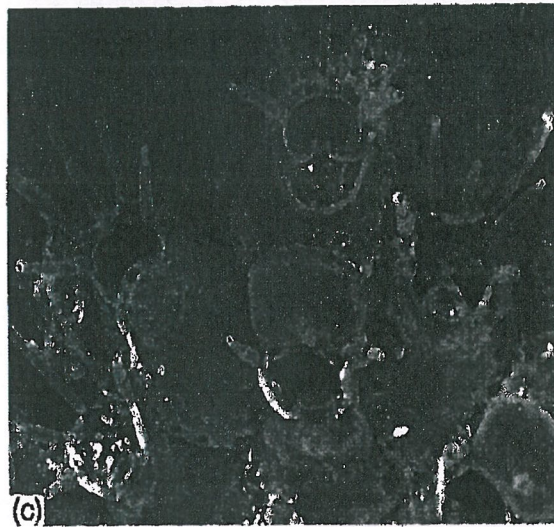
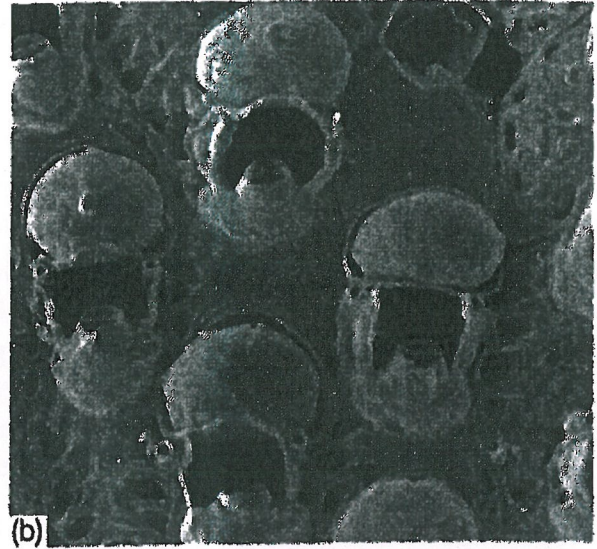
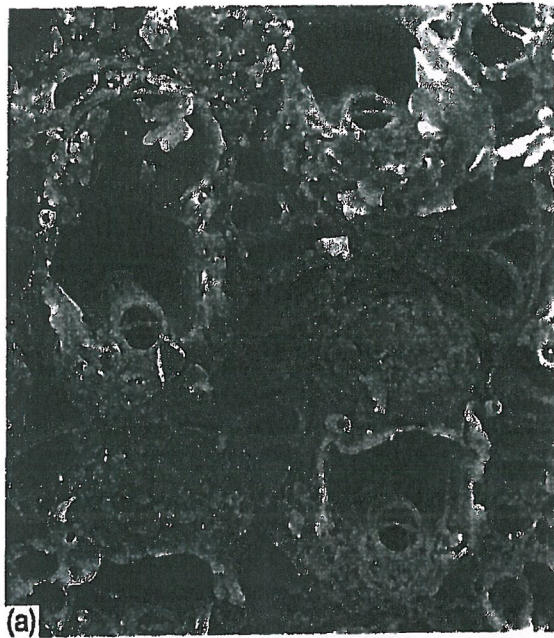
The curious development of the peristome of *Cellarinella planulata*, which incorporates a small avicularium in one or both of its proximal corners, is reminiscent of other species of that genus, as is its tendency to erect, bilaminate growth. However, SEM micrographs (Plate Xc, d) demonstrate quite unequivocally that the species is more akin to the Smittinidae. The above features also militate against its inclusion in any presently known smittinid genus, and the new genus *Platychelyna* is here introduced for *Cellarinella planulata* Hayward. The type specimen was collected from Burdwood Bank, and the Discovery Investigations produced two further samples from the same region, off the south-west Patagonian Shelf. *Platychelyna planulata* does not seem to range into Antarctic waters.

*Aimulosia australis* Jullien  
(Plate XIId-f)

*Aimulosia australis* Jullien, 1888: 59, pl. 1, fig. 5; pl. 9, figs 3-4; Calvet, 1904: 29.

*Material*

MNP reg. no. BRY24, Baie Orange, Ile Hoste, Terre de Feu, sur *Fissurella*, Exped. de la Romanche (1883), colln J. Jullien; BRY752, Smyth Channel, Puerto Bueno, colln L. Calvet. Discovery Stns 42, 123, 124, 366, MS74, WS25, WS33. Operation Tabarin, Port Lockroy, Palmer Archipelago.



*Description*

Colony encrusting, forming broad, unilaminar sheets. Autozooids small, hexagonal to rectangular, steeply convex, separated by deep grooves. Primary orifice broader than long; disto-lateral border smoothly arched, terminating proximally in conspicuous, rounded condyles; proximal border curving upwards, in a plane almost perpendicular to that of the disto-lateral border, its edge sinuous, and developed as a projecting, angular denticle medially. Four or five long, slender, distal oral spines, two persisting in ovicelled autozooids. Suboral avicularium prominent, acute to frontal plane, directed proximally; rostrum semielliptical, with a finely denticulate edge; crossbar complete, lacking a columella; cystid developing a blunt, spike-like umbo. Frontal calcification at first smooth, becoming coarsely nodular in later ontogeny; marginal pores distinct at all ontogenetic stages. Ovicell broader than long, recumbent on distally succeeding autozooid; initially smooth surfaced, with a small peak frontally, becoming coarsely nodular, with the peak developed as a projecting, spinous umbo. Not closed by zooidal operculum. Large basal pore chambers present.

*Measurements* (means and standard deviations of 20 values), mm:

	MNP24	Stn 124
Autozooid length	0.46 ± 0.04	0.42 ± 0.03
Autozooid width	0.27 ± 0.03	0.26 ± 0.04
Orifice length	0.09 ± 0.006	0.08 ± 0.002
Orifice width	0.12 ± 0.008	0.11 ± 0.006

*Remarks*

*Aimulosia australis* has been reported on two previous occasions, both times from Tierra del Fuego. The present material, all of which compares closely with Jullien's and Calvet's specimens, originates from stations in the vicinity of South Georgia, the South Sandwich Isles, and the Palmer Archipelago. It has not, however, occurred in any of the 'Discovery' samples from other regions of Antarctica which suggests that its geographical distribution is limited to the western sub-Antarctic and parts of western Antarctica.

*Aimulosia antarctica* (Powell)  
(Plate XIIa-c)

*Smittia marsupium*: Waters, 1904: 61, pl. 4, fig. 4; Calvet, 1909: 30.

*Smittina marsupium*: Livingstone, 1928: 65.

*Porella marsupium*: Rogick, 1959: 238, figs 8-13, 16-19.

*Porella antarctica* Powell, 1967: 334, pl. 11, fig. C.

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PLATE XII. (a-c) *Aimulosia antarctica*: (a) old, heavily calcified autozooids, Stn 456, × 112; (b) group of ovicelled autozooids, showing progressive thickening of frontal walls, Stn 366, × 90; (c) autozooids at the growing edge, Signy Island, × 80. (d-f) *Aimulosia australis*: (d) autozooids at the growing edge, × 70; (e) older autozooids, with thickened calcification, × 110; (f) the primary orifice and avicularium, × 400.

*Material*

Discovery Stns 27, 164, 366, 456, WS25, Operation Tabarin, Palmer Archipelago, Signy Island.

*Description*

Colony encrusting, developing small, rounded, unilaminar patches. Autozooids small, oval to hexagonal, steeply convex, separated by deep grooves. Primary orifice wider than long; disto-lateral border smoothly rounded, terminating proximally with short, wide, rounded condyles; proximal border sinuous, with a short, peg-like lyrula medially. Four to seven oral spines (most frequently five), long, slender, jointed (antenniform) and often curved; two spines persist for a while in ovicelled autozooids, but are eventually obscured by development of the peristome. Suboral avicularium with semielliptical rostrum, acute to frontal plane; crossbar complete, without columella; cystid tumid, developing a spinous apical umbo in later ontogeny. Peristome developed as paired, prominent, lateral flaps. Frontal wall smooth, or faintly nodular, with large marginal pores separated by distinct areolar ridges which become especially marked in later ontogeny. Ovicell recumbent on distally succeeding autozooid, wider than long, prominent, finely granular and developing a spike-like frontal umbo. Large basal pore chambers present.

*Measurements* (means and standard deviations of 20 values), mm:

Autozooid length	$0.38 \pm 0.04$
Autozooid width	$0.24 \pm 0.03$

*Remarks*

Powell (1967) redescribed the Australian species *Porella marsupium* (MacGillivray), and introduced *Porella antarctica* sp. nov. for Antarctic records of that species, selecting a holotype from among the specimens described by Livingstone (1928). As Powell demonstrated, *P. antarctica* is a distinctive species with small autozooids, characterized particularly by its prominent, lateral peristomial flaps and its large, umbonate, suboral avicularium. In the latter feature, and also in its large basal pore chambers, long oral spines, and prominent, umbonate ovicell, *P. antarctica* seems very similar to *Aimulosia australis*. The type species of *Porella* is the northern hemisphere, cold temperate, species *P. compressa* (J. Sowerby), which develops robust, branching colonies. *Porella compressa* lacks oral spines, has indistinct pore chambers, and an ovicell which is typically immersed in thick secondary calcification. The morphology of *Porella compressa* requires investigation preparatory to a thorough review of the genus. In contrast *Aimulosia*, and its type species *A. australis*, are well characterized and it seems most appropriate to refer *P. antarctica* Powell to it.

*Aimulosia antarctica* seems to have a wide distribution in Antarctic waters. It was described from Adelie Land by Livingstone (1928, as *Smittia marsupium*) and from the Ross Sea by Rogick (1959, as *Porella marsupium*). The 'Discovery' specimens were collected from the South Orkneys, South Georgia, and from Bouvet Island. At Signy Island it is common at 8-15 m, on rock substrata.

### Conclusion

Nine of the species described in this paper were collected from Antarctic localities only, and may be regarded as endemic, and restricted, to Antarctic coastal waters. Of the rest, *Smittoidea rhynchota* sp. nov. was collected from the South Sandwich Islands and from Burdwood Bank, while *Aimulosia australis* seems to be essentially a sub-Antarctic species which occurs also at South Georgia and extends south along the Scotia Arc to the Palmer Archipelago. None of the remaining 15 species was found at any Antarctic collecting station. *Smittina smittiana*, *Parasmittina dubitata* and *Smittoidea sigillata* are evidently common in the Magellanic region, and on the southern Patagonian Shelf, and perhaps may be viewed as endemic to those regions, but for the rest of the previously described species reliable records are so few that their geographical distributions can only be regarded as incompletely known. However, only one species, *Smittina jacobensis* (Busk), was present in Discovery samples from outside the western sub-Antarctic, namely Marion Island, and none of the other species occurred in the quite extensive series of samples from Marion Island, Prince Edward Island, Bouvet Island and South Georgia. While the nine Antarctic species included a high proportion (six) of undescribed species, seven of the 15 sub-Antarctic species were also new to science, and it is thus obvious that the cheilostome fauna of the Patagonian and Magellanic regions is still incompletely known. In general, the distributional data presented here endorse Moyano's (1982) contention of a sharp boundary between Antarctic and sub-Antarctic faunas at the northern end of the Scotia Arc. However, the bryozoan faunas of these regions is immensely rich, and until they are adequately described any conclusions regarding their evolutionary biogeography can only be regarded as provisional.

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## Appendix I: Details of collecting stations

### A. Discovery investigations

Station	Date	Location and Depth
27	15.03.1926	West Cumberland Bay, South Georgia. 110 m
42	01.04.1926	Off Cumberland Bay, South Georgia. 120-204 m
51	04.05.1926	Off Eddystone Rock, East Falkland. 105-115 m
53	12.05.1926	Port Stanley, East Falkland, hulk of 'Great Britain'. 0-2 m
55	16.05.1926	Entrance to Port Stanley, East Falkland. 10-16 m
123	15.12.1926	Off Cumberland Bay, South Georgia. 230-250 m
124	18.12.1926	53°45.5'S, 36°32.5'W. 210 m
152	17.01.1927	Off South Georgia, 53°51.5'S, 36°18.5'W. 245 m
164	18.02.1927	East end of Normanna Strait, South Orkneys. 24-36 m
170	23.02.1927	Off Cape Bowles, 61°25.5'S, 53°46'W. 342 m
366	06.03.1930	Off Cook I., South Sandwich Islands. 77-152 m
388	16.04.1930	Off Cape Horn, 56°19.5'S, 67°9.75'W. 121 m
399	18.05.1930	Gough Island, off south-west point. 141-102 m
456	18.10.1930	East of Bouvet Island. 40-45 m
562	31.12.1930	67°15.5'S, 75°27'W. 100-113 m
652	14.03.1931	Burdwood Bank, 54°04'S, 61°40'W. 171-169 m
724	16.11.1931	Fortescue Bay, Magellan Strait. 0-5 m
1187	18.11.1933	Inaccessible I., Tristan da Cunha. 117-104 m
1321	16.03.1934	West end of Magellan Strait. 66 m
1562	07.04.1935	Marion Island. 90-97 m
1563	07.04.1935	Marion Island. 101-106 m
1564	07.04.1935	Prince Edward Island. 110-113 m
1873	13.11.1936	61°20.8'S, 54°04.2'W. 210-180 m
1902	28.11.1936	Patagonian Shelf. 49°48'S, 67°39.5'W. 50-80 m
1909	30.11.1936	Burdwood Bank, 53°53.2'S, 60°29.9'W. 132 m
1948	04.01.1937	Off Clarence & Elephant I., 60°49.4'S, 52°40'W. 490-610 m
2605	05.03.1939	70°3.2'S, 4°12.9'W. 214 m
MS74	17.03.1926	E. Cumberland Bay, South Georgia. 22-40 m
WS25	17.12.1926	Undine Harbour, South Georgia. 188-27 m
WS33	21.12.1926	Off South Georgia, 54°59'S, 35°24'W. 130 m

WS71	23.02.1927	51 38'S, 57 32.5'W, 82-80 m
WS80	14.03.1927	Patagonian Shelf, 50 57'S, 63 37.5'W, 152-156 m
WS82	21.03.1927	Burdwood Bank, 54 06'S, 57 46'W, 140-144 m
WS83	24.03.1927	Off George I., East Falkland, 137-129 m
WS84	24.03.1927	Off Sealion I., East Falkland, 75-74 m
WS85	25.03.1927	Off Lively I., East Falkland, 79 m
WS86	03.04.1927	Burdwood Bank, 53 53.5'S, 60 34.5'W, 151-147 m
WS88	06.04.1927	Patagonian Shelf, 54 S, 64 57.5'W, 118 m
WS90	07.04.1927	52 18'S, 68 0'W to 52 19.5'S, 67 57'W, 82 m
WS97	18.04.1927	49 0.5'S, 61 58'W, 146-145 m
WS221	04.06.1928	Patagonian Shelf, 48 23'S, 65 10'W, 76-91 m
WS225	09.06.1928	Patagonian Shelf, 50 20'S, 62 30'W, 162-161 m
WS226	10.06.1928	Patagonian Shelf, 49 20'S, 62 30'W, 140 m
WS228	30.06.1928	Off Patagonian Shelf, 50 50'S, 56 58'W, 229-236 m
WS243	17.07.1928	Patagonian Shelf, 51 06'S, 64 30'W, 144-141 m
WS246	19.07.1928	Off Patagonian Shelf, 52 25'S, 61 W, 267-208 m
WS247	19.07.1928	Off Falkland Islands, 52 40'S, 60 05'W, 172 m
WS249	20.07.1928	Off Falkland Islands, 52 10'S, 57 30'W, 166 m
WS250	20.07.1928	51 45'S, 57 0'W, 305 m
WS776	03.11.1931	Patagonian Shelf, 46 18.25'S, 65 02.25'W, 107-99 m
WS781	06.11.1931	Off Falkland Islands, 50 30'S, 58 58'W, 148 m
WS783	05.12.1931	Off Falkland Islands, 50 08'S, 59 50'W, 155 m
WS836	03.02.1932	Patagonian Shelf, 53 05.5'S, 67 38'W, 64 m
WS838	05.02.1932	Patagonian Shelf, 53 11.75'S, 65 W, 148-159 m
WS847	09.02.1932	Patagonian Shelf, 50 15.75'S, 67 57'W, 51-56 m
WS848	10.02.1932	50 37'S, 66 26'W to 50 38'S, 66 22'W, 110-117 m
WS871	01.04.1932	Off Patagonian Shelf, 53 16'S, 64 12'W, 336-341 m
WS874	03.04.1932	52 35'S, 65 17'W to 52 36'S, 65 11'W, 73-135 m

*B. British Antarctic ('Terra Nova') Expedition*

Station

194	22.02.1911	Off Oates Land, 69 43'S, 163 24'E, 329-366 m
316	09.02.1911	Off Glacier Tongue, McMurdo Sound, 348-457 m
335	20.01.1912	Granite Harbour, McMurdo Sound, 0-300 m
349	15.02.1912	Butter Point, McMurdo Sound, 146 m

