SOUTHERN PACIFIC BRYOZOA: A GENERAL VIEW WITH EMPHASIS ON CHILEAN SPECIES*

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RESUMEN.

Este es un estudio sobre la taxonomía, zoogeografía, polimorfismo y diversidad zoarial de las Faunas Pacíficas de Bryozoa con énfasis en las formas australes orientales. El número total de Bryozoa marinos chilenos alcanza a 267 especies, que se distribuyen en 19 del orden Ctenostomata, 46 del orden Cyclostomata y 202 del orden Cheilostomata. Entre éstas se hallan las 24 especies y un nombre nuevos que se describen aquí. Zoogeográficamente la fauna briozoológica chilena puede distribuirse en las cuatro provincias siguientes: Magallánica (42°S – 56°30'S), Chilena (18°S – 42°S), Juan Fernández (33°38'S; 75°52'W) Isla de Pascua (27°07'S; 109°22'W).

Taxonómicamente, en el Pacífico suroriental se encuentran proporcionalmente poco representadas las familias Reteporidae, Vittaticellidae, Adeonidae y Scrupocellariidae, y completamente ausentes Eurystomellidae, Euthyrisellidae, Conescharellinidae, Euthyroididae, y Parmulariidae.

En todo el océano Pacífico más la Antártica y la cuenca del Artico, el polimorfismo y la diversidad zoarial de los Cheilostomata alcanzan los mayores valores en el lado occidental desde la Antártica a las Filipinas. Y los valores más bajos aparecen en el lado oriental desde la región magallánica al Artico. Lo mismo aparece cuando se comparan estos parámetros calculados para las faunas terciarias de Bryozoa de Argentina, Nueva Zelandia y Sudaustralia.

Sobre la base de que la alta diversidad zoarial de toda la briozoofauna y el alto polimorfismo de los Cheilostomata indican especies de selección K, los valores proporcionalmente mayores de éstos parámetros de las faunas de Bryozoa de las plataformas continentales del Pacífico occidental desde la Antártica a las Filipinas, estarían reflejando una historia de ambientes más predecibles. El Pacífico oriental, por el contrario, con valores más bajos reflejaría, al menos para la costa chilena sudamericana, una gran variabilidad de las condiciones ambientales en el largo plazo, las que realmente se hicieron presente durante una gran parte del Terciario.

ABSTRACT

This is a study on the taxonomy, zoogeography, polymorphism and zoarial diversity of the Pacific Bryozoan Faunas with emphasis on the austral eastern forms. The total number of the Chilean marine Bryozoa now reaches to 267 species comprehending 19 Ctenostomata, 46 Cyclostomata and 202 Cheilostomata. These include twenty four new species and a new name being described here. Zoogeographically the Chilean Bryozoan Fauna can be devided into four provinces, namely: Magellanic (42°S-56°30'S); Chilean (18°S-42°S); Juan Fernández (33°38'S; 75°52'W) and Easter Island (27°07'S; 109°22'W).

Taxonomically, in the Eastern South Pacific the families Reteporidae, Vittaticellidae, Adeonidae and Scrupocellariidae are proportionally poorly represented, whereas the Eurystomellidae, Euthyrisellidae, Conescharellinidae, Euthyroididae and Parmulariidae are altogether absent.

In the whole Pacific Ocean plus the Antarctic and the Artic basin, the Cheilostomata polymorphism and the zoarial diversity attain the highest values in the western side from the Antarctic to the Philippines and the lowest ones in the eastern side from the Magellanic region to the Artic, the same reveals when comparing these parameters calculated for the Tertiary Bryozoan Faunas from Argentine, New Zealand and South Australia.

On the basis that high zoarial diversity and high Cheilostomata polymorphism values indicate more K-selected bryozoan species, then the proportionally higher values of these parameters in the Western Pacific shelves bryozoan faunas from the Antarctic to the Philippines, would reflect a history of more predictable environments. The Eastern Pacific, on the contrary, with lower values would reflect at least for the South-american Chilean coast, a great variability of the environmental conditions, which were really present during a large part of the Tertiary.

Key Words: Bryozoa, Taxonomy, Zoogeography, Zoarial Diversity, Pacific Basin.

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INTRODUCTION

Obtaining general views in a global scale, both in time and space, has been the aim of several contributions during the last decades in the evolutive, paleontological, zoogeographical, botanical and ecological fields (Durham, 1979; Fleming, 1979; Grant-Mackie, 1979; Heck and McCoi, 1979, Knox, 1979 and Kubanin, 1980). Whithin the bryozoan field, Schopf (1973) considers the bryozoan colony as the unit in which the natural selection operates producing the polymorphs such as the avicularia and vibracularia. Schopf applied this view to compare polar and tropical faunas, showing that the polymorphism of the Cheilostomata significatively varies between them. In his discussion, he puts together the evolutive environmental forces governing the evolution of bryozoan species and the possibility to characterize bryozoan assemblages from diferent areas of the world. Extending this view, Moyano (1975) compares Antarctic, Arctic and Indo-Pacific bryozoan faunas and characterizes them according to their global polymorphism values. More recently, Moyano (1978, 1982) further extendes this perspective to the bryozoan zoarial types, measuring zoarial diversity of polar, temperate and tropical bryozoan faunas. In addition, the combined analysis of the polymorphism plus the zoarial diversity of both recent and fossil bryozoan faunas would reflect present and past environmental conditions modeling them. This latter approach was pioneerly developed and applied to fossil bryozoan faunas of the Australia region (Stach, 1936, 1938).

Global fossil (Ross, 1978) or recent (Schopf, Fisher & Smith, 1978; Schopf, 1979) zoogeographical schemes, using the Bryozoa as the unique or principal group have been recently developed. A more local scheme has defined the Magellanic Bryozoan Region (Moyano, 1982). Schopf et al. predicted 32 faunal provinces of the world's continental shelves using Bryozoa, Pelecypoda, Foraminiferida and Coral faunas. In this scheme, the South Pacific —from the Equator to the Ross Sea— embraces part of the Malayan, Antarctic, Falkland and Mexican provinces, and the whole extension of the East-Australian, Tasmanian, New Zealand, and Chilean provinces.

The bryozoan faunistic knowledge of the Southern Ocean started at the very beginning of the Nineteenth Century. Species collected in the Magellanic region were first published by Quoy & Gaimard (1824) and d'Orbigny (1841-1847); many others gathered in the Australian seas, South Atlantic, South Pacific and Indian Oceans appeared in Busk's Catalogues of the marine Polyzoa in the collections of the British Museum (1852, 1854). The collections made by the *Challenger* (Busk, 1881, 1884, 1886; Waters, 1888) and by the vessels of several other European Expeditions to the Southern Seas (Ridley, 1881; Calvet, 1904, 1909; Jullien, 1888; Waters, 1904, 1905; Kluge, 1914; Thornely, 1924; Livingstone, 1928; Borg, 1926; Hastings, 1943; Borg, 1944) greatly enriched the knowledge of the Magellanic, Subantarctic and Antarctic Bryozoa.

In the Australian area, the contributions by MacGillivray (1887, 1895); Waters (1881-1906); Maplestone (1899-1909) Hamilton (1898) and more recently Harmer (1915-1957); Marcus (1922); Livingstone (1927-1929); Stach (1936-1938); Hastings (1932); Brown (1952-1956); Silén (1954) and Powell (1967), give a rather sound knowledge of this area.

The South Pacific Tertiary Bryozoa are well known in the Australian area (MacGillivray, 1895; Waters, 1881, 1882; Brown, 1952), but comparatively poorly known in the South-American area where the Tertiary Patagonian Bryozoa studied by Canu (1904, 1908, 1911) need to be reevaluated in the light of modern taxonomy. On the other hand, the Antarctic Tertiary Bryozoa are practically unknown although being necessary for correlations and comparisons of both recent and fossil South-Pacific Bryozoan Faunas.

General compiling and comparative work have been done in the last decades (Hastings, 1943; Brown, 1952; Rogick, 1965; Powell, 1967; Androsova, 1968, 1972; Viviani, 1969; Moyano, 1975, 1978, 1982) generating a partial perspective of the South-Pacific bryozoans, principally focused not only on the

Antartic and Subantarctic regions, but also on the New Zealand area. Thus, the complete perspective of the whole South-Pacific region including the many archipelagos in its vastness is far from being reached.

A contribution to that perspective —making emphasis on the Chilean Bryozoan Fauna— using the polymorphism and the zoarial and zoogeographical parameters outlined above, is the aim of this work.

MATERIALS AND METHODS

The information used in this work has been obtained from: a. old and recent works of the Australian area sent to the author by Dr. Robin Wass of the Universty of Sydney; b. data derived from Viviani's 1969 and 1977 publications, and from Moyano 1982; c. additional material collected along the Chilean coasts.

A. The Samples

The studied samples have the features indicated hereinafter and were collected at:

1. *Easter Island* (27°07'S; 109°22'W): 1934, coral blades bearing zoaria in their dorsal side; collected by Dr. Ottmar Wilhelm G. at 76 m depth; 1972, intertidal material on algae and small stones collected by the author.

2. *Juan Fernández Archipelago* (33°38'S; 78°58'W): 1964, top of a guyot off Más a Tierra island at 220-280 m depth; collectors H.I. Moyano and E. Alarcón; 1966, intertidal collection made at Más a Tierra island by A. Angulo; 1967, a diving collection at 2-5 m depth in Cumberland Bay, Más a Tierra island, made by G. Sanhueza.

3. *Caldera* (27°03'S; 70°30'W): 1982, scallop shells bearing species unrecorded at that area; presented to the author by Mariana Rodríguez.

4. *Coquimbo* (29°53'S; 71°19'W): 1964, shells and stones collected in the intertidal zone by the author.

5. *Los Molles* (32°12'S; 71°27'W): 1980, stones with several cheilostomatous Bryozoa, obtained by diving at 8-10 m depth under a *Lessonia* sp. "forest"; collector Eduardo Villouta.

6. *Algarrobo* (33°21'S; 71°41'W): 1982, stones collected at 8-12 m depth by diving; presented to the author by C. Villalba.

7. *Off Punta Nugurúe* (35°40'S; 72°50'W): 1980, large stones collected by trawl at 350 m depth by A. Rivera and A. Wendt; presented to the author by the collectors.

8. *Coliumo* (36°32'S; 72°56'W): 1981; a large stone collected at 8 m depth by diving; presented to the author by Jacqueline Fernández.

9. *Reque Cove* (36°45'S; 73°11'W): 1982, rock pieces collected between 10-25 m depth by diving; presented to the author by C. Villalba and J. Fernández.

10. *Off Lebu* (37°37'S; 73°59'W): 1979, several zoaria collected at 600 m depth by members of the Department of Oceanology, University of Concepción, Chile.

11. *Melinka* (43°54'S; 73°45'W): 1980, subtidal stones covered by crustose stony algae and Bryozoa, collected and presented by E. Bay-Schmith and C. Werlinger.

12. *IFOP 01 Expedition*: 1964, oceanographical and biological expedition undertaken from Coquimbo (29°35'S; 71°19'W) to Chiloé island and Juan Fernández Archipelago. The studied samples came from Valparaíso to Concepción, and from 37 m to more than 200 m depth. The samples collected by trawl and Petersen 0.1 m^2 grab sampler consist of small stones covered by Bryozoa, solitary corals, ascidiae and foraminifera. This expedition was sponsored by the Instituto de Fomento Pesquero and the Chilean Navy; and the samples collected by the author, T. Antezana and E. Alarcón.

B. Systematics

The systematic account includes all the presently known species from Arica (18°29'S; 70°19'W) to Diego Ramírez islands (56°30'S; 68°45'W) the ones from Juan Fernández islands and those from Easter island. For each new species only a short diagnosis will be given which includes the type numbers. The type material will be deposited in the Museo Zoológico of the Universidad de Concepción, Chile (MZUC).

In Table I, species indicated by a generic name followed by "sp. n. Viviani" correspond to those appeared in a Doctor Rerum Naturae Thesis. As they are recognized as good taxonomical entities, and useful for zoogeographical purposes, they will be cited as such to avoid *nomina nuda* problems.

C. Polymorphism and Zoarial Diversity

The polymorphism of Cheilostomata was evaluated following Schopf (1973) and Moyano (1975, 1978). This procedure has been also utilized regarding the polymorphism of the Tertiary Bryozoan Faunas from Argentina, South Australia and New Zealand. When speaking of polymorphism in general percentages for a given area, no distinctions have been made among vibracularia and avicularia.

The calculations of the zoarial diversity were made following Moyano, 1978. When a species shows more than one zoarial form, the most frequent one is computed. The same criterion has been used in evaluating the Tertiary Bryozoan Faunas from Australia, New Zealand and South America. The zoarial diversity values of the Australian recent Victorian Bryozoa are only approximated owing to the dubious or incomplete descriptions of the zoarial form in many species of that area.

D. Zoogeography

The zoogeographical affinity of the Bryozoa along the Chilean coast was evaluated using the Kulczinsky-2 index, following Sibouet (1979), Monniot (1979) and Moyano (1982). The Chilean South-American shelf was arbitrarily divided into segments of four latitudinal degrees each, except CH10 from 46°S to 52°S. Juan Fernández archipelago and Easter island were considered as one unit each. Two sources of species were evaluated by the Kulczinsky-2 index: 1. Viviani's Chilean littoral Ectoprocta which includes 52 species, mostly collected in the intertidal zone from Arica (18°59'S) to Quellón in the southernmost part of Chiloé island (43°08'S), and 2. Table I which contains 267 species inhabiting the continental shelf from Arica to Diego Ramírez islands plus those of Juan Fernández and Easter islands.

In Table I, species marked* come from beyond 200 m depth. The number of "Magellanic" species appearing in Table I is smaller than that included in a previous work, (Moyano, 1982) because were only considered those collected inside Chilean waters and not those present in the Patagonian shelf between Tierra del Fuego and the Falkland islands.

RESULTS

A. The New Taxa

Antropora paucicryptocysta sp. n.
Fig. 18

Diagnosis: Zoarium encrusting, unilaminar to plurilaminar. Zooids thin-walled, with gymnocyst and cryptocyst slightly developed. Opesia covering almost the whole frontal surface. No spines. Cryptocyst finely granulated. A pair of small triangular avicularia at the proximal side of each autozooid, but each zooid being encircled by six avicularia, two of its own and four of the neighbouring autozooids. Avicularian mandibule very small and semicircular. Ovicell not observed.

Species being different from the others described by Osburn (1950) for the Pacific coast of America due to the slight development of the cryptocyst.

Holotype: MZUC 10953. One colony encrusting a stone, off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October 1964. Collectors: H. Moyano and E. Alarcón.

Paratypes: MZUC 10954, one colony; holotype collecting data.

Arachnopusia areolata sp. n.
Fig. 4

Diagnosis: Zoarium encrusting, unilaminar, white. Zooids with a complete frontal pericyst having round, oval or reniform holes; one or two weak small oral spines rarely present; lateral and proximal borders of the pericyst with a row of small areoles. One to three small pointed or rounded avicularia on the distal apertural border of the pericyst. Ovicell hyperstomial with a more calcified distal belt which has small pores on its proximal rim.

Species differing from *A. monoceros* (Busk) and *A. admiranda* Moyano, for its smaller avicularia, weak —if present— oral spines and for the row of marginal areoles.

Holotype: MZUC 10956, one colony encrusting a large stone collected off Punta Nugurúe (35°40'S; 72°50'W); 350 m, 1980; Collectors: A. Rivera & A. Wendt.

Paratypes: MZUC 10957, several colonies encrusting small stones; off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October 1964; collectors: H.I. Moyano & E. Alarcón.

Aplousina gymnocystica sp. n.
Fig. 22

Diagnosis: Zoarium encrusting, unilaminar. Zooids somewhat irregular, widely or narrowly ovate or pyriform, separated by deep furrows. Distal and lateral gymnocystal borders elevated. Proximal gymnocyst reaching one fifth of the zoecial length; descending cryptocyst laterally narrow, but proximally enlarged reaching to one fourth of the zoecial length. With marginal, minute, decidueous spines encircling the opesia. Endozoecial ovicell widely open, formed by two calcareous superposed sheets. No avicularia; no dietellae. With a large uniporous distal septula and two or three more in each lateral wall.

Species clearly different from other members of the genus *Aplousina* by the development of the cryptocyst and gymnocyst.

Holotype: MZUC 9790, a colony encrusting a valve of *Chama* sp. Cumberland Bay, Más a Tierra island; April 1967. Collector: G. Sanhueza.

Paratypes: MZUC 9796, two zoaria encrusting an *Arca* sp. valve; Cumberland Bay, Más a Tierra island; August 1965; Collector: A. Angulo.

***Cellaria humilis* sp. n.**
Figs. 15, 16, 17

Diagnosis: Zoarium irregulary branching, articulated; joints tubular; branches appearing everywhere as lateral offshoots through the autozooidal oral apertures; this way of branching causes the zoarium to be irregularly cereiform. Zooids long, roughly hexagonal; four making a whorl around the internodal axis. Oral aperture at the beginning of the distal zooidal third; two lateral parenthesis-like cryptocystal thin elevations encircling it, but without fusing themselves proximally or distally. Oral aperture semicircular, the proximal border gently arcuated, without proximal or distal internal denticles. Operculum reinforced by a complete marginal sclerite. Avicularia scarce, small, triangular, one fourth of the frontal zoecial length; with a semicircular mandibule wider than long. Ovicell apertures not seen.

Species differing from the other austral forms by its zoarial structure and small avicularia.

Holoptype: MZUC 9863; a ramified zoarial fragment; off Punta Nugurúe (35°40'S; 72°50'W); 350 m depth; 1980; collectors: A. Wendt & A. Rivera.

Paratypes: MZUC 9864. Several internodal fragments from the same locality of the holotype.

Cribralaria labiodentata sp. n.
Fig. 5

Diagnosis: Zoarium encrusting. Zooids large, white, glistening, separated by well marked furrows zoecial pericyst made of 12 to 14 frontal ribs; two rows of small pericystal holes separating every two ribs. Oral frame with two distal and two proximal spines; the two proximal with a serrated free border and the two distal with a pair of proximally directed lateral horns; the latter may be inconspicuos. Interzoecial avicularia large, asymmetrical, roughly squared latero-diagonally produced into the asymmetrical avicularian rostrum; avicularian mandibule large, falciform, reaching one half of the zoecial length. Ovicell endozoecial, inmersed in the avicularian chamber or not.

This species differentiates from those of the North Tropical Pacific and from those of the Australiam and New Zealand areas by its larger avicularium and the two rows of pores between each pair of frontal ribs.

Holotype: MZUC 9862; a large colony on a coral blade; Easter Island; 76 m depth; 1934; collector: Dr. Ottmar Wilhelm.

Escharoides molinai sp. n.
Fig. 23.

Diagnosis: Zoarium encrusting and unilaminar, or eschariform being composed of one or two lamellae. Zooids strongly calcified becoming very thick, with imprecise contours. Frontal wall a pleurocyst; the large marginal areolae being separated by radiating ribs. Secondary aperture proximally elevated, with a V-shaped sinus. Primary aperture not seen in frontal view and lacking any type of proximal or lateral denticles. Some strong, decidueous spines present in the distal part of the secondary aperture. Two types of latero-oral avicularia; a pair of small, pointed, triangular distally directed no longer than the apertural diameter; and one or two larger, pointed or spathulated, pointing latero-distally, lying obliquely at one or both sides of the secondary aperture; these larger ones with a huge perforated avicularian chamber. Ovicell imperforated, hyperstomial, having marginal areolae separated by ribs; becoming inmersed in strongly calcified zooids.

This species is dedicated to the abbott Juan Ignacio Molina who wrote the first Natural History of the Chilean Fauna at the end of the Eighteenth Century.

It seems to be very akin to *E. angela* (Hutton) and *E. excavata* (MacGillivray) from the Australian area. It differentiates, however, from the first one by the less developed peristome and for the two distally directed tiny avicularia and the two latero-distal giant ones; from the second because it lacks the central and lateral denticles inside the primary aperture and for frequently having four instead of two avicularia.

Holotype: MZUC 9960, a very calcified zoarial piece; Cumberland Bay, Más a Tierra island, April 1967; collector: G. Sanhueza.

Paratypes: MZUC 10968, several small pieces; off Cumberland Bay, Más a Tierra island; 60 m; October, 1964; collector: H. I. Moyano.

Fenestrulina microstoma sp. n.
Figs. 3, 9.

Diagnosis: Zoarium encrusting, unilaminar, white-yellow. Zooids large, hexagonal, very inflated, separated by deep furrows. Frontal wall a densely perforated tremocyst, leaving a central imperforated area proximal to the ascopore. Centrally situated ascopore separated from the oral aperture by two or three rows of pores; ascopore outline oval or reniform without spines or internal denticles. Small oral aperture separated from the distal zoecial rim by two rows of pores; oral spines rare. Ovicell hyperstomial, imperforated with short marginal costae.

Species differing from *E. malusi* by its larger size and the frontal wall almost completely perforated; it differentiates too, from the two new taxa of this genus proposed by Viviani (1969), by its more centrally placed aperture leaving more than one row of pores between it and the distal zoecial rim.

Holotype: MZUC 10979, one ovicelled zoarium; off Punta Carranza, IFOP Expedition (35°35'S; 72°42'W); 37 m depth; November, 1964; collector: H.I. Moyano.

Paratypes: MZUC 10980, several colonies; holotype collecting data.

Microporella areolata sp. n
Fig. 8

Diagnosis: Zoarium encrusting, unilaminar, light brown. Zooids large, almost hexagonal; frontal wall a convex tremocyst pierced by excessively small pores and, with apparent marginal areoles. Frontal ascopore in front of a low umbo, transversely oval. Oral aperture relatively small. A latero-distally directed avicularium with setiform mandibule. A densely perforated hyperstomial ovicell with marginal areoles.

Species characterized by its areolar pores and the almost inexistent tremocystal ones.

Holotype: MZUC 10959, one encrusting zoarium; Off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October, 1964; collectors: H.I. Moyano & E. Alarcón.

Paratypes: MZUC 10960, several colonies encrusting small stones; holotype collecting data.

Opaeophora browni sp. n.
Figs. 28, 29.

Diagnosis: Zoarium encrusting, small, patchy, unilaminar. Zooids yellow-white separated by deep furrows. Primary frontal wall membranous; a complete cryptocyst with a pair of lateral large round opesiules. Zoecial aperture semicircular, the proximal border straight, encircled by four long spines. Ovicell hyperstomial, large and smooth. Large interzoecial asymmetrical avicularia, slightly shorter than autozoecia; avicularian mandibule linguiform, laterally curved. Circular ancestrula with a complete cryptocyst pierced by two large round opesiules; provided with marginal spines.

Species dedicated to Dr. A. Brown, eminent Australian Bryozoologist. This species looks very similar to *O. lepida monopia* Brown from the upper Pliocene of New Zealand.

Holotype: MZUC 9698, Cumberland Bay, Más a Tierra island; 5 m depth; April 1967; collector: G. Sanhueza.

Paratypes: MZUC 9770, five small zoaria; holotype collecting data.

Parasmittina proximoproducta sp.n.
Figs. 6, 7.

Diagnosis: Zoarium encrusting. Zooids rhomboidal to irregularly squared. Frontal wall granulated, with small scattered pores being a pleurocyst. Oral area elevated and strongly produced proximally; primary aperture with moderate wide lyrule and a pair of lateral cardelles; secondary aperture bordered proximally by a tall vertical elevation and by four distal spines; with a long vertical furrow along the internal side of the oral vertical elevation. Two lateral oral narrowly triangular avicularia, one being always larger than the other; one or more additional and similar ones may be present around the apertural area. Hyperstomial ovicell globular, not inmersed.

Species different from other similar from the Indopacific area (Soule an Soule, 1973) by its long proximal elevation on the proximal apertural side.

Holotype: MZUC 9860; Easter Island, a zoarium on back side of a coral blade; 67 m depth; 1934; collector: Dr. Ottmar Wilhelm.

Paratypes: MZUC 9861. Holotype collecting data.

Phylactella problematica sp. n.
Fig. 19.

Diagnosis: Zoarium encrusting, unilaminar, white. Zooids large, strongly convex. Frontal a tremocyst with many small pores; areolae not clearly set apart. Oral area produced into a tall peristome. Primary aperture without lyrula or cardelles; secondary aperture proximally notched. A globular, densely perforated, hyperstomial ovicell looking as dependence of the distal part of peristome. No avicularia was observed.

Species notoriously different from those present along the Chilean coast, with dubious generic relations, therefore it has been tentatively adscribed to the genus *Phylactella*.

Holotype: MZUC 10961, a colony encrusting a stone; off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October, 1964; collectors: H.I. Moyano & E. Alarcón.

Paratypes: MZUC 10962; several colonies encrusting stones; holotype collecting data.

Retevirgula zoeciulifera sp.n.
Fig. 10.

Diagnosis: Zoarium encrusting, unilaminar loosely pluriserial. Zooids elliptical, separated by interzoecial spaces. Frontal wall membranous, covering a lateral narrow cryptocyst; gymnocyst proximally developed. Two small pointed spines on both sides of the oral valve. Many small zoeciules scattered between zooids; these have a round or elliptical opesia covered by a frontal membrane; zoeciule size variable measuring one fourth to one half of the zoecial length. No avicularia or avicularian mandibules on zoeciules. Hyperstomial ovicells round, with a very large dorsal non-calcified area.

Species close to a Tertiary New Zealand form of *R. acuta* (Hincks) referred to by Brown (1962), but lacking the avicularia present in the fossil form. Species easily identifiable by the large amount of zoeciules separating the autozoids.

Holotype: MZUC 9865; a colony encrusting a stone; off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October, 1964; collectors: H.I. Moyano & E. Alarcón.

Schizoporella maulina sp. n.
Fig. 12.

Diagnosis: Zoarium encrusting, thick, unilaminar, white. Zooids hexagonal, slightly convex; frontal wall a tremocyst with evenly distributed small pores. Oral aperture schizoporelloid, with a wide U-shaped proximal sinus. Hyperstomial ovicell closed by the operculum having a great less calcified transversely oval frontal area; periovicellar marginal pores present. Avicularia lacking.

Species adscribed to the genus *Schizoporella*, considered in a wide sense.

Holotype: MZUC 10963, a large zoarium encrusting a stone; off Punta Carranza (35°35'S; 72°42'W); 35 m depth; November 1964, collectors: H.I. Moyano & T. Antezana.

Paratypes: MZUC 10964; several colonies. Holotype collecting data.

Smittina fragaria sp. n.
Figs. 20, 21.

Diagnosis: Zoarium encrusting, unilaminar, white, glistening. Zooids rectangular to hexagonal with straight rims; frontal wall a tremocyst, without distinct marginal pores. Oral area moderately elevated; primary aperture lacking a lyrule but with two lateral denticles; secondary aperture at the end of a short peristome bearing a small proximally directed avicularium with a short semicircular mandibule. Hyperstomial ovicell with a large frontal densely perforated exposed area, these pores are relatively large.

This species has been adscribed to the genus *Smittina*, considered in a very wide sense.

Holotype: MZUC 10958, one zoarium encrusting a stone; off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October 1964; collectors: H.I. Moyano & E. Alarcón.

Smittina jacquelinae sp. n.
Figs. 11, 14.

Diagnosis: Zoarium encrusting, unilaminar, light yellow. Zooids hexagonal, gently convex; frontal wall an evenly pierced tremocyst. Oral area elevated in a proximally notched peristome; the two lateral sides of the peristome may coalesce leaving a suboral orifice; primary aperture with a slightly denticular small lyrule. A proximal oral avicularium completely or partially inside the peristome, settled just on the proximal notch; avicularian mandibule distally rounded, slightly linguiform. Hyperstomial ovicell becaming inmersed, with one or more small frontal pores. In very young zoecia there are four oral spines.

This species is a *S. purpurea* (Hincks)-like form, but being different in its colour and the poorly developed lyrule. On the other hand, this species has a large distribution from Melinka (43°54'S; 73°45'W) to Los Molles (32°12'S; 71°40'W) and it may grow side by side the "typical" *S. purpurea* (Hincks).

Holotype: MZUC 10975, a large zoarium on a stone; Reque Cove (36°45'S; 73°11'W); 10-20 m depth, 1982; collectors: César

Villalba & Jacqueline Fernández (to whom the species is dedicated).

Paratypes: MZUC 10976, one zoarium on a stone, Melinka, 1980; collectors C. Werlinger and E. Bay-schmith. MZUC 10977, an encrusting zoarium; Los Molles; 8-10 m depth; 1980; collector: E. Villouta.

Smittina undulimargo sp. n.
Figs. 1, 2.

Diagnosis: Zoarium encrusting, unilaminar, thick, brown. Zooids strongly calcified, shortly after their arising at the marginal growing rim. Mature zooids with an undulated border, clearly set off by a very narrow brown ribbon following the border and frequently crossing the inmersed ovicells in a diagonal way. Frontal wall nearly flat, evenly perforated. Apertural area not produced or elevated. Primary aperture with a moderate to wide lyrule flanked by two poined lateral denticles. Secondary aperture proximally notched, the peristome being as thick as the frontal thickness; with a minute, proximal-obliquely directed oral avicularium which is not seen from above owing to its place inside the peristome. Hyperstomial ovicell deeply inmersed, with an irregular row of radial large pores.

A typical smittinid distinctly different from all the others along the Chilean coast for its wavy outline.

Holotype: MZUC 10965, a colony encrusting a stone; off Punta Carranza (35°35'S; 72°42'W); 35 m depth; November, 1964; collectors: H.I. Moyano and T. Antezana.

Paratypes: MZUC 19066, some colonies with the holotype colecting data.

Smittina volcanica sp. n.
Fig. 13

Diagnosis: Zoarium encrusting, unilaminar, white and shining. Zooids large, irregularly quadrangular, lateral rims wavy; a thin epitheca covers the whole frontal wall. Frontall wall a densely perforated tremocyst; oral apertural area elevated in a tall peristome with four marginal spines, proximally notched. Primary aperture with a narrow lyrule but lacking cardelles. A tiny median elongated, oral avicularium inside the peristome, proximally and upwardly directed. Ovicell appearing as a huge inflation of the distal part of the peristome; its exposed walls having the same constitution of the frontal zooidal wall, so it looks as if it were inmersed in the distal zooid as an endozoecial ovicell.

This species seems to be different from all the other known smittinids in the South Eastern part of the Pacific Ocean. It is considered as part of the genus *Smittina*, by the presence of a lyrule and the oral avicularium placed over it and inside the peristome.

Holotype: MZUC 10978, one small zoarium on a stone; off Punta Curaumilla (33°06'S; 71°49'W); 137 m depth; October 1964; collectors: H.I. Moyano & E. Alarcón.

Smittina jullieni n. nom.

Smittia purpurea Jullien, 1888:54; pl. 2, Fig. 4.

Not *Smittia landsborovi* (Johnston) var. *purpurea* Hincks 1881:123.

Diagnosis: As described and illustrated by its author.

This species has a light purpurine colour making it different from the other smittinids present along the Chilean coast. It differentiates from the typical *Smittina purpurea* (Hincks) apart its lighter colour for having a very small oral avicularium completely inside the peristome and for its tendence to become very calcified.

Spiroporina reteporelliformis sp. n.
Figs. 24, 27.

Diagnosis: Zoarium vinculariform, white, calcareous, irregularly branching. Branches with two faces, the frontal one having autozooids and the dorsal one showing kenozooids and avicularia. Zooids irregularly hexagonal; frontal wall a pleurocyst with scattered marginal pores. Primary aperture with a U-shaped proximal sinus; secondary aperture with a pair of small triangular, distal-laterally directed avicularia. Hyperstomial ovicell, somewhat inmersed, its frontal wall lacking calcification. Dorsal (basal) zoarial wall covered by one or more kenozooidal superposed sheets. Ovate avicularia on dorsal kenozooids.

Species having *Reteporellina*-like or *Reteporella*-like form; clearly set off from other *Spiroporina* species for developing a dorsal zoarial face provided with kenozooids and avicularia as in the species of Reteporidae.

Holotype: MZUC 9666, a broken colony; on a guyot off Más a Tierra island; 220-280 m depth; October 1964; collectors: H.I. Moyano & E. Alarcón.

Paratypes: MZUC 9667, more than eighty fragments and small complete colonies. Holotype collecting data.

Crisia parvinternodata sp. n.
Figs. 38, 39.

Diagnosis: Zoarium small, white, articulated and branching. Free zooidal ends frontally and laterally curvated; zoecial aperture circular to ovate. Joints with short, disciform yellow nodes. Sterile internodes having 1-5 zooids, those with one or two in the basal part of the colony being more common. The new branches alternate to right and left, budding from the first autozooid of internodes with 3-5 zooids; fertil internodes with 4-7 zooids, the first producing most of times, a lateral branch, and the second being always the gonozooid. Pyriform gonozooid with a terminal oeciostome adnate to the third autozoecial tube in the internode; oecial aperture transversely oval facing frontally. Some autozooids with spiniform processes.

A small species, densely branched looking like *C. eburnea* (L.), but differing from it by the small number of autozooids per internode and by its proportionally smaller gonozooids. Fertile zoaria measure 2,0 to 3,4 mm high; gonozooidal length 0,7 to 0,95 mm; gonozooidal width 0,22 to 0,3 mm.

Holotype: MZUC 9792; one zoarium with three gonozooids; Punta Loberías, Cumberland Bay, Más a Tierra Island; April 1967; 2-5 m depth; collector: G. Sanhueza.

Paratypes: MZUC 9798; seven small fertile zoaria. Holotype collecting data.

Frondipora masatierrensis sp. n.
Fig. 36.

Diagnosis: Zoarium vinculariform, branched in one plane, white, becoming retiform by fusion of its branches. Stems giving short and alternate branches, but frequently irregular. Zooids in fascicular clusters facing frontally and laterally, projecting beyond the lateral border; among fascicules there are nude areas without zoecial tubes. Autozooidal tubes long, prismatic in the fascicles and circular when traversing the gonozooid. Dorsal zoarial side without zoecial apertures but with clear cut zoecial boundaries and pseudopores. Gonozooids as large as wide, pyriform or irregularly circular structures, developed between fascicles and traversed by many autozooids. Oeciostome in the centre or in the distal third of the gonozooid, slightly oval, associated with an autozooidal tube, from which it differentiates by its larger diameter and for facing proximally.

Species differing from other *Frondipora* species by its large gonozooid evenly traversed by zoecial tubes.

Holotype: MZUC 9662, a reticular zoarial piece; off Más a Tierra island; 220-280 m; October 1964; collector: H.I. Moyano.

Paratypes: MZUC 10967, zoarial fragments; Más a Tierra island; 60 m depth; October 1964; collectors: H.I. Moyano & E. Alarcón.

Desmeplagioecia irregularis sp. n.
Figs. 30, 31.

Diagnosis: Zoarium encrusting, fan shaped, very flat, widening distally, producing here and there lateral offshoots. Zooids emerging from a flat zoarial surface, distally and upwardly directed; emerging isolated in the younger part of the zoarium but becoming connate throughout forming clusters or fascicles towards the distal and mature zoarial part; clusters composed from two to six zooids each; zooids stout, very calcified. Gonozooid nearly flat, wider than long, small or very large; two or more gonozooids seemingly coalesce forming a larger one; this gonozooid is usually traversed by isolated zooidal tubes; oeciostome short and distally outflared, issueing from the central part of the gonozooid, always proximally connated to an isolated autozooidal tube; its distal transverse oval aperture facing proximally and upwardly.

This species seems to be more related to the genus *Desmeplagioecia* than to *Tubulipora*. It has the zooidal clusters and the large transverse gonozooid of the former and the fascicles of the latter. Considering the gonozooid structure as the basis of the cyclostome taxonomy this species comes nearer to *Desmeplagioecia* than to *Tubulipora*. It differentiates from *D. lineata* (MacGillivray) inhabiting the Magellanic and Australian regions by its fan-shaped instead of circular zoarium.

Halotype: MZUC 10973, a large zoarium measuring 18 mm in its larger diameter; Reque Cove (36°45'S; 73°11'W); 20-25 m depth; April 1982; collectors: J. Fernández and C. Villalba.

Paratypes: MZUC 10974, several small ovicelled zoaria; Algarrobo (33°21'S; 71°40'W); 8-12 m depth; May, 1982; collectors: J. Fernández and C. Villalba.

Tubulipora proteica sp. n.
Figs. 32, 33

Diagnosis: Zoarium encrusting, white-bluish, composed or irregularly branched lobules, widening where a gonozooid develops and becoming narrow distally. A completely developed zoarium becoming irregularly star-like, with lobules touching each other or fusing. Zooids 0,100-0,125 mm diameter, their free end rather produced, disposed in alternating series 2-6 tubes each, connate throughout or becoming free and separated at their distal ends; the zooidal tube pattern alterates where a gonozooid exists forming irregular series or fascicles. Gonozooid large, lobulated; the ramifying lobules occasionally fuse encircling series or fascicles; oeciostome cylindric, 0,075 mm diameter, not terminal; shorter, equal or longer than an autozoecial tube, associated with a tube or fascicle.

Species differing from the others described for the Magellanic region and the Pacific coast of America due to its zoarial pattern and large gonozooids.

Holotype: MZUC 10969, one large and irregularly stellate zoarium, 8.4 mm × 7.2 mm having nine gonozooids; Los Molles (32°12'S; 71°27'W); 8-10 m depth, 1981; collector: E. Villouta.

Paratypes: MZUC 10970, three zoaria encrusting a stone. Holotype collecting data.

Tubulipora tuboangusta sp. n.
Fig. 37.

Diagnosis: Zoarium encrusting, long and not bifurcated, or bifurcating into two opposed adhering elongated lobules; a basal lamina provided with several rows of apertures. Zooids disposed in transverse, oblique alternating series composed each of two to seven connate zoecial tubes, the more common having 5-6 per series. The series may fuse at the end of zoarial lobules originating transverse fascicles. Gonozooid inflated and dilatated between the series and fascicles; oecial tube long, narrow, one half to one third of the autozoecial diameter; adnate only by its base to the more internal tube of a series.

The name of the species indicates its narrow and long oecial tube, making it different from *T. stellata* Busk, *T. anderssoni* Borg and *T. spatiosa* Borg from the Magellanic region.

Holotypes: MZUC 9788, one zoarium measuring 6 mm diameter; Punta Loberías, Cumberland Bay, Más a Tierra island; April 1967, 2-5 m depth; collector: G. Sanhueza.

Paratypes: MZUC 9778; same collecting data as the holotype.

Tubulipora tubolata sp. n.
Figs. 34, 35.

Diagnosis: Zoarium encrusting, white-bluish, regularly stellated from its very beginning; wide zoarial lobes composed of regularly ordered and alternating zoarial series, 3-5 zooids each. Zooids stout 0,125-0,200 mm diameter, very calcified; their free ends moderately long. Gonozooids fairly abundant, inflated pyriform to irregular producing lobes beyond the oeciostome, occasionally encircling one or more zooids; oeciostome large, clearly set off, strongly dilatated and distally outflared,

Table I

CHILEAN BRYOZOA: SPECIES, DISTRIBUTION, POLYMORPHISM AND ZOARIAL DIVERSITY

Species	Geographical distribution																				Poly- morphism	Zoarial Diversity
	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS		
Order CTENOSTOMATA																						
1. *Alcyonidium australe* d'Hondt y Moyano. St. nov.																Ca+	+				–	Al
2. *Alcyonidium cellarioides* Calvet.															+						–	In
3. *Alcyonidium mamillatum* Alder.	0	0													+						–	In
4. *Alcyonidium mytili* Dalyell.											Vi+		Vi			+					–	In
5. *Alcyonidium nodosum* O'Donoghue y de Watteville.										+	+										–	In
6. *Alcyonidium polyoum* (Hassall).	0	0				Vi	Vi	Vi		Vi	Vi+		Vi	+			Lo				–	In
7. *Alcyonidium* sp.												+									–	In
8. *Bowerbankia francorum* Jullien.															+	J					–	In
9. *Bowerbankia gracilis* Leidy.	0	0	0			Vi	Vi	Vi			Vi		Vi								–	In
10. *Bowerbankia hanni* Jullien.																J					–	In
11. *Bowerbankia imbricata* (Adams).	0														+	+	Lo				–	In
12. *Bowerbankia minutissima* Jullien.																J					–	In
13. *Buskia australis* Jullien.																J					–	In
14. *Buskia setigera* (Hincks).			0		0					Vi	Vi		Vi								–	In
15. *Monastesia pertenuis* Jullien.																J					–	In
16. *Nolella gigantea* (Busk).	0	0	0												+						–	In
17. *Terebripora ramosa* d'Orbigny.						Vi	Vi	Vi		Vi	Vi+		Vi+	Vi+							–	P
18. *Terebripora comma* Soule.		0	0								+										–	P
19. *Triticella pedicellata* (Alder).	0														+						–	In
Order CYCLOSTOMATA																						
20. *Bicrisia biciliata* (MacGillivray).													+		+	+	A,B			MG	–	Ca
21. *Bicrisia edwardsiana* (d'Orbigny).	0	0			0	Vi	Vi	Vi		Vi	Vi		Vi				B		B	B	–	Ca
22. *Bientralophora regularis* (MacGillivray).																B	B			MG	–	V
23. *Calvetia dissimilis* Borg.																B+					–	V
24. *Crisia denticulata* Lamarck.												Ma									–	C
25. *Crisia eburnea* (Linnaeus).																B					–	C
26. *Crisia parvinternodata* sp. n.												+									–	C
27. *Crisia patagonica* d'Orbigny.														+	+	+	B	+			–	C
28. *Crisia* sp.									+	+		+									–	C
29. *Dartevellia cylindrica* Borg.																B					–	V

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Polymorphism	Zoarial Diversity
	Geographical distribution																					
30. *Desmeplagioecia lineata* (MacGillivray).															+	+				MG	–	In
31. *Desmeplagioecia irregularis* sp. n.										+	+										–	In
32. *Diaperoecia major* (Johnston).	0	0	0	0								+									–	In
33. *Diaperoecia* sp.												+									–	In
34. *Diastopora dichotoma* (d'Orbigny).															+	B+	B				–	In
35. *Diastopora reticulata* Borg.												+				B	B	A			–	In
36. *Diastopora ridleyi* Borg.												+				B+	B				–	In
37. *Disporella crassa* Borg.																B	B				–	In
38. *Disporella densiporoides* Moyano.														+		+					–	In
39. *Disporella fimbriata* Busk.		0?										Ma			+	+	B	A		B?	–	In
40. *Disporella nanozoifera* Moyano.										+	+										–	In
41. *Disporella octoradiata* Waters.				0?												B+		A			–	In
42. *Disporella* sp.									+												–	In
43. *Entalophora australis* (Busk).																B				B	–	V
44. *Entalophora buski* Borg.																B	A				–	V
45. *Entalophora intricaria* (Busk).										+						B?				BBu	–	V
46. *Entalophora proboscidea watersi* Borg.																B		A			–	V
47. *Entalophora* sp.															+	+					–	V
48. *Fasciculipora meandrina* Borg.															+	A	A				–	V
49. *Fasciculipora parva* Moyano.																+					–	V
50. *Fasciculipora ramosa* d'Orbigny.																B	B	+		BMG	–	V
51. *Frondipora masatierrensis* sp. n.												+									–	V
52. *Heteropora chilensis* Moyano.															+						–	V
53. *Hornera americana* d'Orbigny.															+	B+	Do				–	V
54. *Hornera antarctica* Borg.																B+		A			–	V
55. *Hornera falklandica* Borg.															+	+	A				–	V
56. *Idmidronea atlantica* (Forbes).												+					A	+		Ha	–	V
57. *Lichenopora canaliculata* Busk.																+	B	+		B?	–	In
58. *Lichenopora elegantissima* Borg.																B	B				–	In
59. *Lichenopora loveni* Borg.																B	B				–	In
60. *Lichenopora* sp.												+									–	In
61. *Nevianipora milneana* (d'Orbigny).															+	+	Do			BMG	–	V

Table I (Continued).

	Species	Geographical distribution																				Poly-morphism	Zoarial Diversity
		ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS		
62.	*Nevianipora pulcherrima* (Kirkpatrick).															+					Ha	–	V
63.	*Pseudidmonea fissurata* (Busk).																A+	B				–	V
64.	*Reptotubigera elegans* Borg.																+	B				–	In
65.	*Stomatopora eburnea* (d'Orbigny).										+?					+	+	Do				–	In
66.	*Stomatopora* sp.									+												–	In
67.	*Tubulipora anderssoni* Borg.																B	B	B			–	In
68.	*Tubulipora aperta* Harmer.												Ma									–	In
69.	*Tubulipora bocki* Borg.																B	B				–	In
70.	*Tubulipora carinata* Borg.																B					–	In
71.	*Tubulipora fasciculifera calveti* Borg.																Ca	B	A			–	In
72.	*Tubulipora organisans* d'Orbigny.													Vi	Vi	+	+	B	+			–	In
73.	*Tubulipora proteica* sp. n.										+											–	In
74.	*Tubulipora stellata* Busk															+	B+	B	A			–	In
75.	*Tubulipora tubigera* (Busk).															+	Ca	B	A			–	In
76.	*Tubulipora tuboangusta* sp. n.												+									–	In
77.	*Tubulipora tubolata* sp. n.										+											–	In
	Orden CHEILOSTOMATA																						
78.	*Aetea anguina* (Linnaeus).	0	0	So	0	0	Vi	Vi		+		Vi	Ma	Vi+	+	+	+	H				0	In
79.	*Aetea ligulata* Busk.	0	0	So	0		Vi	Vi	Vi+		Vi+	Vi+		Vi	Vi			Lo				0	In
80.	*Aetea recta* Hincks.			0	0		Vi	Vi	Vi		Vi	Vi		Vi								0	In
81.	*Aetea truncata* (Landsborough).		0		0	0					+											0	In
82.	*Aetea* sp. n. Viviani.						Vi	Vi	Vi		Vi	Vi		Vi								0	In
83.	*Adeonella lichenoides* (Lamarck).															+	W+					2 av	A
84.	*Aimulosia australis* Jullien.										+	+		+	+	+	+					1 av	In
85.	*Amastigia benemunita* (Busk).															+	J+	H				2 av	C
86.	*Amastigia gaussi* (Kluge).																+	H				2 av	C
87.	*Amastigia nuda* Busk.																+	H				2 av	C
88.	*Andreella megapora* Moyano y Melgarejo.										+	+		+		+						1 av	In
89.	*Andreella umbonata* (Busk).																Bu+	Lo				1 av	In

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
90. *Andreella uncifera* (Busk).															+	+	Lo				1 av	In
91. *Antropora paucicryptocysta* sp. n.										+	+*										1 av	In
92. *Aplousina gymnocystica* sp. n.												+									0	In
93. *Aplousina major* Osburn.		0	0	0							+*										0	In
94. *Aplousina sp. n.* Viviani.						Vi	Vi	Vi		Vi+	Vi		Vi	+							0	In
95. *Arachnopusia admiranda* Moyano																+					2 av	In
96. *Arachnopusia areolata* sp. n.										+	+*										1 av	In
97. *Arachnopusia monoceros* (Busk)													+	+	+	+	Bu+	+		WY	3 av	In
98. *Arthropoma circinatum* (MacGillivray)		0	0								+*								P	P	0	In
99. *Arthropoma biseriale* (Hincks).			0	0				Vi		Vi		+							P	P	0	In
100. *Aspidostoma giganteum* (Busk).														+	+	+	+				1 av	E
101. *Beania fragilis* (Ridley).																+	H				0	In
102. *Beania inermis* (Busk).																J+	H				1 av	In
103. *Beania magellanica* (Busk).			So		0	Vi	Vi	Vi		Vi	Vi+		Vi+	Vi+	+	+.	H				1 av	In
104. *Beania costata* (Busk).										Vi	Vi+		Vi	Vi+	+	+	Lo				1 av	In
105. *Beania maxilla* (Jullien).											Vi			+		J	H				1 av	In
106. *Beania unicornis* Hastings.																+	H				1 av	In
107. *Bellulopora bellula* (Osburn).		0	0	0						+	+										1 av	In
108. *Bicellariella ciliata* (Linnaeus).								+		Vi	Vi										1 av	Fd
109. *Buffonella rimosa* Jullien.															+	J+					1 av	In
110. *Bugula flabellata* (Thompson).		0			0	Vi					+										1 av	Fd
111. *Bugula hyadesi* Jullien.											+*					J+	H				1 av	Fd
112. *Bugula neritina* (Linnaeus).		0		0		Vi				+	+		Vi				H				0	Fd
113. *Caberea darwini* Busk.													Vi	+	+	+	H	+			2 av 1 v	C
114. *Caberea zelandica* (Gray).												H									2 av 1 v	C
115. *Caberea sp. n.* Viviani.												Vi									2 av 1 v	C
116. *Callopora deseadensis* López-Gappa.																+	Lo				0	In
117. *Callopora sp. n.* Viviani.							Vi														0	In
118. *Camptoplites asymmetricus* Hastings.																Bu	H				2 av	Fd
119. *Canda pecten* Thornely.									+												1 av 1 v	C

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
120. *Carbasea ovoidea* Busk.															Bu	+	Bu	+			0	F
121. *Cauloramphus spiniferum* (Johnston).	0	0		0		Vi	Vi	Vi		Vi+	Vi+		Vi+	Vi+							1 av	In
122. *Cauloramphus* sp.												+									1 av?	In
123. *Cellaria australis* (MacGillivray).																W					1 av	C
124. *Cellaria clavata* (Busk).															Bu						1 av	V
125. *Cellaria humilis* sp n.										+	+*										1 av	C
126. *Cellaria ornata* (d'Orbigny)													+	+	+	+	Bu				1 av	C
127. *Cellaria tenuirostris* (Busk).										+	+		+		+		Bu		Br	Br	1 av	C
128. *Cellaria variabilis* (Busk).															Bu	W+					1 av	C
129. *Celleporella bougainvillei* (d'Orb.).												+		+	+	+	Lo	+			0	In
130. *Celleporella chilina* (d'Orb.).						Vi	Vi	Vi		Vi	Vi										0	In
131. *Celleporella chiloensis* Moyano.														+							0	In
132. *Celleporella concava* Viviani.						Vi	Vi	Vi		Vi											0	In
133. *Celleporella discreta* (Busk).																Mo					0	In
134. *Celleporella patagonica* (Busk).														+	+	+	Lo				0	In
135. *Ceporella hyalina* (Linnaeus).	0	0	0	0	0	Vi	Vi	Vi		Vi+	Vi+		Vi+	Vi+	+	+	Lo		Mo	Br	0	In
136. *Celleporella yagana* Moyano y Gordon.													+	+	+	+	Lo+				0	In
137. *Cellarinella dubia* Waters.															+	W	HAY				1 av	V
138. *Celleporina costata* (MacGillivray).												+									2 av	Cel
139. *Celleporina costazi* (Savigny-Audouin).		0	0						+				Vi								2 av	Cel
140. *Celleporina* sp. 1.																+					2 av	Cel
141. *Celleporina* sp. 2.																+					2 av	Cel
142. *Celleporina sp. n.* Viviani.										Vi	Vi+		Vi								3 av	Cel
143. *Conopeum sp. n.* Viviani.											Vi		Vi	Vi							0	In
144. *Copidozoum planum* (Hincks).			0	0				Vi													1 av	In
145. *Cornucopina ovalis* Hastings.																W					2 av	Fd
146. *Crassimarginatella kumatae* Okada.												+									1 av	In

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
147. *Crassimarginatella sp. n.* Viviani.						Vi	Vi	Vi		Vi											1 av	In
148. *Crepidacantha anakenensis* Moyano.									+												1 av	In
149. *Crepidacantha crinispina* Levinsen.								+				+			+		Lo		Br	Br	1 av	In
150. *Cribellopora eatoni* (Busk).																+		+			0	In
151. *Cribralaria labiodentata* sp. n.									+												1 av	In
152. *Cribrilaria innominata* (Couch).				0	0							+									1 av	In
153. *Cribrilaria paschalis* Moyano.									+												1 av	In
154. *Cribrilaria sp.*									+												1 av	In
155. *Cryptosula pallasiana* (Moll).	0	0	0								+								P	P	1 av	In
156. *Chaperiella acanthina* (Quoy & Gaimard).						Vi	Vi	Vi		Vi	Vi		Vi+	Vi+	+	+	Lo		Br	Br	0	In
157. *Chaperiella cervicornis* (Busk).												+			+	+					0	In
158. *Chaperiella galeata* (Busk).											+		Vi		+	J		+			1 av	In
159. *Chaperiella sp.*										+											1 av	In
160. *Electra hastingsae* Marcus.			?H			Vi					+		Vi+			CA+					0	In
161. *Electra pilosissima* Moyano																+					0	In
162. *Ellisina antarctica* Hartings.																Br+	H		Br		1 av	In
163. *Ellisina incrustans* (Waters).															+	+	H+				1 av	In
164. *Ellisina levata* (Hincks).	0	0								+	+*										1 av	In
165. *Escharella spinosissima* (Hincks).															+	+	W		Br	Br	0	In
166. *Escharina longispinata* (Busk).															+	Bu+	Lo				1 av	In
167. *Escharina pesanseris* (Smitt).			0	0					+												1 av	In
168. *Escharoides molinai* sp. n.												+									2 av	A
169. *Escharoides sp.*										+											1 av	In
170. *Exochella longirostris* Jullien.															+	+	+	Ro			1 av	In
171. *Fenestrulina malusi* (Audouin).	0	0	0	0		Vi	Vi	Vi		Vi+	Vi+	+	Vi+	Vi+	+	+	Bu	+	Br	Br	0	In
172. *Fenestrulina mutabilis* Hastings.															+	+	H	D+		D	0	In/F
173. *Fenestrulina microstoma* sp. n.											+*										0	In
174. *Fenestrulina sp. n. 1* Viviani.							Vi	Vi		Vi+	Vi+		Vi+	+							0	In
175. *Fenestrulina sp. n. 2* Viviani.								Vi													0	In
176. *Figularia magellanica* (Calvet).															+	+					1 av	In

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
177. *Foveolaria elliptica* Busk															+	+	Bu			Bu	1 av	V
178. *Foveolaria falcifera* Busk.															+	+	Bu				1 av	In
179. *Flustrapora magellanica* Moyano.																+					0	F
180. *Hippadenella margaritifera* (Quoy & Gaimard).																Bu+	Bu				2 av	In
181. *Hippaliosina sp. n.* Viviani.						Vi	Vi	Vi		Vi+	Vi+		Vi								1 av	In
182. *Hippoflustra variabilis* Moyano.															+	+	HAY				1 av	F
183. *Hippomenella vellicata* (Hutton).												+			+	+			Br		1 av	In
184. *Hippopodinella adpressa* (Busk).				0										Bu		+	Lo		P		0	In
185. *Hippoporina chilota* Moyano.														+							1 av	In
186. *Hippothoa flagellum* (Manzoni).			0	0	0			+	+			+			+	+	+		G	Br	0	In
187. *Hippothoa divaricata* Lamouroux.	0	0	0	0						+			+			W	W		RG		0	In
188. *Inversiula nutrix* Jullien.										+			+	+	+	J+	HAY	+			1 av	In
189. *Jolietina latimarginata* (Busk).															+	+	Lo				1 v	In
190. *Lacerna hosteensis* Jullien.															+	J					0	In
191. *Lagenicella sp. n.* Viviani.						Vi	Vi	Vi+		Vi+	Vi+		Vi+	Vi+	+						1 av	In
192. *Lepralia gemelliporoides* Calvet.											+?			+	+	+	Lo				1 av	In
193. *Membranipora hyadesi* Jullien.								+		+	+		+	+	+	J+	Lo				0	In
194. *Membranipora isabelleana* (d'Orbigny).	0?	0?											+			Do	Lo				0	In
195. *Membranipora tenuis* Desor.		0	0		0			Vi													0	In
196. *Membranipora tuberculata* (Bosc).		0	SO		0	Vi	Vi	Vi	+	Vi	Vi+		Vi+	Vi			Lo				0	In
197. *Membranipora sp. n.* Viviani.						Vi	Vi	Vi		Vi	Vi										0	In
198. *Menipea flagellifera* Busk																A	H				2 av	C
199. *Menipea patagonica* Busk.															+	+	H				2 av	C
200. *Micropora brevissima* Waters.														+	+	W+	HAY	+			1 av	In
201. *Micropora coriacea* (Johnston).	0	0		0								Ma+									1 av	In
202. *Microporella areolata* sp. n.										+	+										1 av	In
203. *Microporella ciliata* (Pallas).	0	0	0	0		Vi	Vi	Vi	+	Vi	+	+	+	+	+	+	Bu	+	Br	Br	1 av	In
204. *Microporella hyadesi* (Jullien).															+	J+	Lo		P		1 av	E
205. *Microporella lunifera* (Haswell).												+								Ha	1 av	In
206. *Notoplites elongatus* (Busk).														+	+	+	H				2 av	C
207. *Ogivalia elegans* (d'Orbigny).											+*	+		+	+	W+	Do				1 av	V
208. *Opaeophora browni* sp. n.												+									1 av	In

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
209. *Opaeophora lepida* (Hincks).											+		+	+					Br	Br	1 av	In
210. *Orthoporidroides erecta* (Waters).															+	+					2 av	V
211. *Orthoporidroides petiolata* (Waters).																W	HAY				2 av	V
212. *Orthoporidroides robusta* Moyano.											+*										2 av	V
213. *Osthimosia bicornis* (Busk).															+	J+	Bu	Ro+			2 av	Cel
214. *Osthimosia eatonensis* (Busk).															+	J+	Bu	Ro+			2 av	Cel
215. *Osthimosia magna* Moyano.															+	+	Lo				2 av	V
216. *Osthimosia mamillata* Moyano.															+						2 av	Cel
217. *Osthimosia signata* (Busk).																+					2 av	Cel
218. *Odontionella cyclops* (Busk).																J			Br		1 av	In
219. *Parasmittina dubitata* Hayward.															+	+	HAY				2 av	Cel
220. *Parasmittina pluriavicularis* Moyano.															+						1 av	In
221. *Parasmittina proximoproducta.* sp. n.									+												2 av	In
222. *Phoenicosia jousseaumei* Jullien.																J					0	In
223. *Phylactellipora* sp.															+						0	In
224. *Phylactella problematica* sp. n.										+											0	In
225. *Plesiothoa australis* Moyano y Gordon.													+						G		0	In
226. *Plesiothoa coquimbana* Moyano y Gordon.								+													0	In
227. *Plesiothoa dorbignyana* (Viviani).						Vi	Vi				+										0	In
228. *Porella hyadesi* Jullien.																J+					1 av	In
229. *Porella rouzaudi* Calvet.															Ca	+					2 av	In
230. *Porella sp.*										+	+*										1 av	In
231. *Retevirgula areolata* (Canu y Bassler).	0									+	+			+							1 av	In
232. *Retevirgula zoeciulifera* sp. n.										+											0	In
233. *Romancheina martiali* Jullien.											+				+	J+					1 av	In
234. *Sertella magellensis* (Busk).															+	+	Bu				2 av	R
235. *Schizoporella chondra* Marcus.												Ma+									1 av	In

Table I (Continued).

Species	Geographical distribution																				Poly-morphism	Zoarial Diversity
	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS		
236. *Schizoporella maulina* sp. n.											+										0	In
237. *Schizoporella ornata* Calvet.																Ca+					0	In
238. *Scruparia ambigua* (d'Orbigny).	0	0					Vi	Vi		Vi	Vi		Vi	Vi+		+	H				0	Ca
239. *Scrupocellaria ornithorhynchus* Thompson.																H					1 av 1 v	C
240. *Scrupocellaria sp.*									+												1 av	C
241. *Smittina ectoproctolitica* Moyano.																+					1 av	Cel
242. *Smittina ehrlichi* López-Gappa.															+	+	Lo				1 av	E
243. *Smittina euparypha* Marcus.												Ma									1 av	In
244. *Smittina fragaria* sp. n.										+											1 av	In
245. *Smittina undulimargo* sp. n.										+											1 av	In
246. *Smittina jacquelinae* sp. n.										+	+			+							1 av	In
247. *Smittina jullieni* nom. n.														+	+	J+					1 av	In
248. *Smittina lebruni* (Waters).																W+	Lo				1 av	E
249. *Smittina malouinensis* (Jullien)																+	J				1 av	In
250. *Smittina maplestonei* (MacGillivray).							Vi	Vi		Vi+	Vi+	+	Vi+	+					P	P	2 av	In
251. *Smittina molarifera* Moyano.																+					1 av	In
252. *Smittina purpurea* (Hincks).											+	Ma	+	+	+	J+			P	Br	1 av	In
253. *Smittina sigillata* (Jullien).																J	J				1 av	In
254. *Smittina volcanica* sp. n.											+										1 av	In
255. *Smittina sp. 1*									+												1 av	In
256. *Smittina sp. 2.*									+												1 av	In
257. *Smittipora angustilobata* Moyano.															+	+					1 av	In
258. *Spiroporina pentagona* (d'Orbigny).												+			+	+	Do		Br		1 av	V
259. *Spiroporina reteporelliformis* sp. n.												+									2 av	V
260. *Tricellaria aculeata* (d'Orbigny).										Vi	Vi		Vi	Vi+	+	J+	H				1 av	C
261. *Tricellaria sp. n.* Viviani													Vi								1 av	C
262. *Turbicellepora sp. 1.*																+					2 av	Cel
263. *Turbicellepora sp. 2.*															+						2 av	Cel

Table I (Continued).

Species	ALA	ORE	PAN	GAL	PER	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	ATS	ANT	NZE	AUS	Poly-morphism	Zoarial Diversity
	Geographical distribution																					
264. *Turbicellepora sp. 3.*											+										2 av	Cel
265. *Turritigera stellata* Busk.															+	+	BuW				2 av	V
266. *Umbonula alvareziana* (d'Orbigny).					0	Vi	Vi	Vi		Vi+	Vi+		Vi+	Vi+	+	Bu+					1 av	In
267. *Vittaticella elegans* (Busk).											+						HAY				1 av	Ca
Total number of "Chilean" species.	20	29	25	22	12	27	28	34	18	61	69	41	49	46	92	148	104	28	23	31		

KEY TO TABLE I.

Authors' records: A = Androsova, 1968, 1972; B= Borg, 1926, 1944; Bu = Challenger Exped.; Br= Brown, 1952; Ca = Calvet, 1904a, 1904b; Do = d'Orbigny, Voyage dans L'Amérique Méridionale; Ha = Harmer, Siboga Exped.; H= Hastings, 1930, 1943; HAY= Hayward, 1980; J = Jullien, 1888; Lo = López-Gappa, 1978; MG = MacGillivray (*fide* Borg, 1944); Ma = Marcus, 1921; O = Osburn, 1950, 1952, 1953; D = d'Hondt, 1979; P = Powell, 1967; Ro = Rogick, 1965; RG = Ryland and Gordon, 1977; G = Gordon *in* Moyano y Gordon, 1980; Mo = Morris, 1980; So = Soule, 1963, 1964; Vi = Viviani, 1969, 1977; WY = Wass and Yoo, personal communication; W = Waters, 1904, 1905; + = Moyano.

Zoarial diversity: In = encrusting; Cel = celleporiform; F = flustriform; Fd = buguliform; E = eschariform; A = adeoniform; V = vinculariiform; C = cellariiform; R = reteporiform; Ca = catenicelliform; P = perforant; Al = alcyonidiiform.

Polymorphism: O = no polymorphs, only autozooids; av = avicularium; v = vibracularium.

Localities: ALA = Alaska-Vancouver; ORE = Vancouver-Southern California; PAN = Gulf of California-Guayaquil; PER = Guayaquil-18°S; CH1 = Chile, 18°S-22°S; CH2 = Chile, 22°S-26°S; CH3 = Chile, 26°S-30°S; CH4 = Chile, Easter Island; CH5 = Chile, 30°S-34°S; CH6 = Chile, 34°S-38°S; CH7 = Chile, Juan Fernández Archipelago; CH8 = Chile, 38°S-42°S; CH9 = Chile, 42°S-46°S; CH10 = Chile, 46°S-52°S; CH11 = Chile, 52°S-56°S; ATS = South Atlantic Region; ANT = Antarctic coasts; NZE = New Zealand; AUS = Australia.

facing proximally, associated to an autozooidal tube.

Species related to *T. stellata* Busk and *T. anderssoni* Borg but being different in the form of the oecial tube.

Holotypes: MZUC 10971, a large stellate zoarium, 16 mm diameter, having 18 lobules; Los Molles (32°12'S; 71°27'W), 1980, 8-10 m depth; collector: E. Villouta.

Paratypes: MZUC 10972, two stellated zoaria. Holotype collecting data.

B. The Chilean Bryozoan Fauna

This fauna, excluding the antarctic species, is composed of 19 species of the order Ctenostomata (7.11%), 46 of the Cyclostomata (17.22%) and 202 of the Cheilostomata (75.65%). These 267 species (Table I) inhabit the continental shelf from Arica (18°29'S; 70°19'W) to Diego Ramírez islands (56°30'S; 68°45'W) and the shelves of the Juan Fernández and Easter islands. As the bryozoan assemblages in each of these areas are different, they will be analized separately in the folowing paragraphs.

1. *The Magellanic Bryozoan Fauna:* The general features of this fauna have been recently revised by Moyano (1982). It may be summarily characterized as having 7.69% of ctenostome species, 23.59% of cyclostome species and 68.75% of cheilostome species. These figures indicate a proportionally larger amount of cyclostome forms when compared with the whole Chilean Bryozoa. The Cheilostomata show 74.62% of species having one or more polymorphs, and the total fauna a zoarial diversity (H'/H'max.100) reaching 62.95%. Endemic elements are the families Calvetiidae and Pseudidmoneidae, and the genera *Andreella* Jullien, *Flustrapora* Moyano, *Orthoporidroides* Moyano and *Jolietina* Jullien. Zoogeographically it extends to the Southern Atlantic Ocean reaching the archipelagos Tristan da Cunha and Falkland, and Kerguelen in the Indian Ocean.

2. *The Northern and Central Chile Bryozoan Fauna:* A general account of it was first given by Viviani (1969). This author studied the littoral entoprocts and ectoprocts from Arica (18°29'S) to Quellón (43°08'S) describing 52 ectoproct species. This number is now elevated to 107 species. This assemblage, as now understood is characterized by the excessive predominance of encrusting species, which make up the main bulk of any sample collected from the intertidal zone to the border of the continental shelf (ca. 200 m depth). Taxonomically, the ctenostome ectoprocts comprise 7 species, the cyclostomes 12 and the cheilostome 88. The intertidal forms are almost the same from Arica to Quellón, because many have very large latitudinal ranges, for instance *Alcyonidium mamillatum, A. polyoum, Bowerbanka gracilis, Buskia setigera, Bicrisia edwardsiana, Aetea anguina, A. ligulata, A. recta, Beania magellanica, Bugula neritina, Cauloramphus spiniferum, Celleporella hyalina, Chaperiella acanthina, Electra hastingsae, Fenestrulina malusi, Hippothoa flagellum, Hippothoa divaricata, Membranipora hyadesi, M. tuberculata, Microporella ciliata, Scruparia ambigua, Smittina maplestonei, Smittina purpurea* and *Umbonula alvareziana.*

Several new species *sensu* Viviani pertaining to the genera *Aetea, Aplousina, Fenestrulina, Hippaliosina, Lagenicella* and *Membranipora*, also have a great latitudinal distribution (See Table I).

The study of several samples from 35 m depth to more than 350 m depth has revealed the existence of a relevant bryozoan faunule altogether different from the intertidal and the upper subtidal ones. In it, many of the new species appearing in Table I were found. Some of the new and the known species belong to genera hitherto unknown or nearly so for the Chilean fauna, namely: *Antropora, Bellulopora, Retevirgula, Arthropoma* and *"Phylactella"*.

Several species uknown north to 42°S were now discovered as normal components of the encrusting communities at 10-30 m depth in central Chile. Among these, two are particularly important: *Inversiula nutrix* Jullien, a typical antarctic and subantarctic species now extending to 30°S along the Chilean coast, and *Romancheina martiali*, hitherto known only from the southernmost Chilean archipelagos, proves to be a very common encrusting element at 10-20 m depth near Concepción (36°S). This means that it is necessary to explore and systematically study the narrow Chilean continental shelf from 18°S to Chiloé island.

3. *The Juan Fernández Archipelago Bryozoan Fauna:* In 1921 Marcus published the first account of the Bryozoa collected by several expeditions to these islands. He reported 20 species including 5 Cyclostomata and 15 Cheilostomata. Now that number elevate to 41 as indicated in Table I, and comprises 1 ctenostome (2.43%), 13 cyclostomes (31,7%) and 27 cheilostomes (65.85%). The cyclostome component is marked by two diastoporids known only from the Magellanic area and by *Frondipora masatierrensis* sp. n., which is the first record of the genus for the eastern south Pacific. The Cheilostomata characteristically show two species of *Caberea*, the subantarctic *Ogivalia elegans*, the australasian *Microporella lunifera* and *Arthropoma biseriale*, the north Pacific *Crassimarginatella kumatae*, and new species of the genera *Escharoides Opaeophora, Aplousina* and *Spiroporina*. Among these *Spiroporina reteporelliformis* sp. n. shows a reteporidan condition in having vibice-like kenozooids covering the rear part of the zoarial branches. The endemic elements include at least 10 species making 24.39%.

4. *The Easter Island Bryozoan Fauna*: In a previous paper (Moyano, 1973) ten species comprising one cyclostome and nine cheilostomes were reported. Now that number is elevated to 16. It is most likely that many species remain to be discovered because only two sets of samples have been examined. One littoral survey yielded the first ten known species, and a second one on coral blades obtained beyond 50 m depth provided the rest described here. This whole and incomplete assemblage is principally characterized by 3 smittinids, 3 cosmopolite forms and 3 cribrimorphs, with an endemism reaching 25%. The analysis in Table I proves that this fauna is composed of 8 (50%) of species having a pantropical or cosmopolite character.

C. Zoogeography of the Chilean Bryozoan Fauna.

Having a core of 80 "bryozoan species" (ectoprocts plus endoprocts) and a large bibliographic information, Viviani (1969) proposed a zoogeographical scheme for the Chilean coast. This scheme included four provinces: a. Peruvian (2°S-20°S), b. Chilean (20°S-40°S), c. North-Patagonian (40°S-46°S), d. South-Patagonian (46°S-56°S).

If we take such a fact into account: a. Viviani's scheme did not considered the subtidal bryozoans until 200 m depth, which is the average extension of the submarine environment normally used in zoogegraphical analises (Ekman, 1953; Briggs, 1974; Schopf, 1979), b. the number of ectoprocts has duplicated since the Viviani's study; c. the Peruvian bryozoan fauna was in 1969 and is until now almost unknown and, therefore, not allowing a clear and sound zoogeographical relation between it and the Chilean bryozoan fauna, and d. the convenience of comparing the Bryozoa from Juan Fernández and the continental ones, makes it necessary to deeply study the Chilean Bryozoogeography.

In Table II Viviani's Chilean ectoprocts are zoogeographically analized through the values of the Kulczinsky-2 index applied to each pair of compared localities from A to R. On the left side of the diagonal we find the numbers of common species for each pair of areas, and on the right, the corresponding Kulczinsky-2 index values. If the locality A is examined, it is possible to see that all the localities have more than 50% of affinity; locality E with 31 species shows the same feature as well as localities C, D and F. If now a median locality is analized, for instance K, the same feature is present; the same is true of the species richest one, i. e. locality L. These results confirm the general impression that an observer of the intertidal fauna of the Chilean coast obtains, that is, the existence of a large amount of common species extending from the far north to a point between Concepción and Chiloé island. From Table II it is possible to see that the zoogeographical affinity of locality A steadily decreases to the south, and the reverse occurs when looking at the values of locality R which decrease towards the north.

Table III analyzes by means of the Kulczinsky-2 index values all the known Chilean ectoprocts listed in Table I, that have been recorded during more than a century

Table II
ZOOGEOGRAPHY OF THE CHILEAN ECTOPROCTA AFTER THE DATA BY VIVIANI (1969) USING THE KULCZINSKY-2 INDEX.

Localities	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
(Number of species per locality)	20	20	23	29	31	29	20	14	22	26	25	33	22	1	18	14	19	16
A. Arica (18°28'S).		65	79	71	65	67	60	66	57	62	67	56	57	0	57	61	61	51
B. Iquique (20°12'S).	13		79	88	82	80	85	66	72	79	72	71	62	0	68	60	62	51
C. Tocopilla (22°02'S).	17	17		90	83	86	79	57	80	74	79	66	67	0	69	63	67	58
D. Antofagasta (23°35'S).	17	21	23		87	86	76	69	76	80	78	71	64	0	68	64	65	58
E. Coquimbo (30°03'S).	16	20	22	26		87	78	67	78	74	76	69	62	0	66	62	64	57
F. Los Molles (32°18'S).	16	19	22	25	26		42	69	80	77	82	75	68	0	72	64	74	63
G. Zapallar (32°50'S).	12	17	17	18	19	10		61	76	75	72	64	67	0	69	67	62	56
H. Isla Negra (33°28'S).	11	11	10	13	13	13	10		64	66	67	61	64	0	70	79	74	74
I. Llico (34°45'S).	12	15	18	19	19	20	16	11		71	81	76	68	0	71	70	69	59
J. Iloca (34°55'S).	14	18	18	22	21	21	17	12	17		75	86	63	52	75	71	64	71
K. Tomé (36°40'S).	15	16	19	21	21	22	16	12	19	19		77	68	0	76	72	74	62
L. Mehuín (39°20'S).	14	18	18	22	22	23	16	12	20	25	22		76	52	77	71	75	74
M. Pelluco(39°35'S).	12	13	15	16	15	17	14	11	15	16	16	20		0	80	82	74	81
N. Carboneros(39°50'S).	0	0	0	0	0	0	0	0	0	1	0	1	0		53	54	0	53
O. Maullín (41°40'S).	11	13	14	15	15	16	13	11	14	16	16	18	16	1		89	76	83
P. Pargua (41°47'S).	10	11	11	12	12	13	11	11	12	13	13	14	13	1	14		81	87
Q. Lacúi (41°50'S; 74°03'W).	12	14	14	15	16	17	12	12	14	14	16	18	15	0	14	13		75
R. Quellón (43°08'S; 73°35'W).	9	10	11	12	12	13	10	11	11	14	12	16	15	1	14	13	13	

and a half of bryozoan research. Table III also includes several localities from Perú to Alaska in the eastern Pacific and from the south Atlantic to Australia in the south Pacific. Localities I and L show very small affinity values with all other regions becoming separate entities. Locality R compared from A to L shows still lower values; but these increase rapidly to locality Q making evident the obvious relations between the subantarctic and antarctic areas when compared with the Chilean bryozoan fauna. Locality F has great affinity with localities G, H, J, K and M, that is, from Arica (18°S) to a point near Chiloé island; the same is true of each of these six geographical points. Locality N is closer to locality M, which is closer in turn to the six indicated above. On the other hand, locality O is closer to P, which in turn is closer to Q.

The above analysis indicates that the Chilean bryozoan fauna may be divided in four zoogeographical groups, namely: a. Easter Island Bryozoa (Locality I); b. Juan Fernández islands Bryozoa (Locality L); c. North and Central Chile Bryozoa (Localities F. G, H, J, K, M and N), and d. Southern Chile Bryozoa (Localities O and P). The first has greater affinity with the Panamic zoogeographical area owing to its cosmopolite and pantropical elements; the second is simultaneously closer to the Galapagos islands, New Zealand and Australia because of its large amount of cosmopolite or "panpacific" components. The third, North and Central Chile, shows a northernmost subgroup composed of the localities F, G, H, being closer each other probably because their littoral elements are the only ones known; a second subgroup of the following three J.K. and M is the richest in species number and the core of the non-Magellanic Chilean bryozoan fauna; locality N being the link with the Magellanic region exhibits, however, closer affinity to localities M an K owing to the fact that its known elements are principally littoral, nevertheless, species obtained in deeper waters —*A. giganteum* for instance— favours its inclusion with localities O and P. The fourth, including localities O and P, has the richest and most diversified bryozoan fauna; this is probably related to a larger disponibility of coast and continental shelf. It near 200 species extend to the South Atlantic and Indian Oceans (Moyano, 1982), which is

Table III

ZOOGEOGRAPHY OF THE CHILEAN BRYOZOA AFTER THE DATA FROM TABLE I USING THE KULCZINSKY-2 INDEX

Localities	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
("Chilean" species per locality)	20	29	25	22	12	27	28	34	16	61	68	41	49	46	92	148	104	28	23	31
A. Alaska-Vancouver.		76	45	43	20	39	43	36	11	33	39	19	39	29	24	20	33	9	28	21
B. Vancouver-California	18		56	52	41	43	35	35	19	36	44	18	38	25	16	14	29	11	27	23
C. Gulf of California-Guayaquil.	10	15		64	43	35	34	42	31	31	36	19	33	22	18	16	22	8	37	29
D. Galapagos Islands.	9	13	15		32	37	32	30	22	31	30	28	26	24	14	21	25	12	36	31
E. Perú.	3	7	7	5		36	36	39	22	35	39	16	36	26	19	23	28	0	19	17
F. Chile, 18°S-22°S.	9	12	9	9	6		87	73	15	59	65	9	52	41	19	18	26	7	20	17
G. Chile, 22°S-26°S.	10	10	9	8	6	24		81	15	63	63	12	59	49	19	17	25	7	20	20
H. Chile, 26°S-30°S.	9	11	12	8	7	22	25		14	57	55	16	52	43	16	16	25	7	33	28
I. Chile: Easter Island.	2	4	6	4	3	3	3	3		12	12	17	12	13	11	10	14	5	16	14
J. Chile, 30°S-34°S.	10	14	11	10	7	22	24	25	3		67	10	59	42	30	17	22	8	24	19
K. Chile, 34°S-38°S.	12	18	13	10	8	25	25	25	3	43		12	58	51	31	21	26	8	26	21
L. Chile: Juan Fernández Islands.	5	6	6	8	3	3	4	6	4	5	6		9	16	19	19	20	18	31	28
M. Chile, 38°S-42°S.	11	14	11	8	7	18	21	21	3	29	33	4		61	33	31	39	17	32	26
N. Chile, 42°S-46°S.	8	9	7	7	5	14	17	17	3	22	28	7	29		46	43	49	26	25	22
O. Chile, 46°S-52°S.	8	7	7	5	4	8	8	8	3	22	24	11	21	28		63	61	40	27	32
P. Chile, 52°S-56°S.	7	7	7	8	5	8	8	9	3	15	20	12	23	30	72		74	57	33	35
Q. South Atlantic.	11	13	9	9	6	11	11	12	4	17	21	12	26	31	60	91		50	35	42
R. Antarctica.	2	3	2	3	0	2	2	2	1	3	3	6	6	9	17	27	22		8	24
S. New Zealand.	6	7	9	8	3	5	5	9	3	8	9	9	10	8	10	13	13	2		61
T. Australia.	5	7	8	8	3	5	6	9	3	8	9	10	10	8	15	18	20	7	16	

reflected by the Kulczinsky-2 index values of locality Q in Table III.

According to the evidences acumulated so far, the Chilean Bryozoan Fauna can be divided into four provinces:

a. *Chilean:* from Arica to Chacao Channel (18°S-42°S).
b. *Magellanic:* from Chacao Channel to Diego Ramírez islands (42°S-56°30'S).
c. *Juan Fernández Islands.*
d. *Easter Island.*

The limit between the Chilean and Magellanic provinces is only approximated, because most of their known Bryozoa are shallow water forms including many littoral ones. Species obtained at deeper waters have proved to be typically Magellanic. This is the reason for considering the Chacao Channel, where the austral archipelagos begin, as the southernmost limit of the Chilean bryozoan province. Probably the actual limit be at a point near 40°S, as suggested by several zoogeographers when discussing the general zoogeography of the Chilean coast (Ekman, 1953; Briggs, 1974).

D. THE SOUTHERN PACIFIC BRYOZOAN FAUNAS.

In the following account these faunas will be featured and compared in a threefold scheme: the taxa, the polymorphism and the zoarial diversity.

The taxa: From a taxonomic point of view the Southern Pacific Bryozoan Fauna can be divided into three large groups corresponding to the Australian, Antarctic and South-American elements.

a. The Australian area has the largest number of species reaching near 400 in the southern part of the Australian continent (MacGillivray, 1887, 1895); *ca.* 350 in the northern coasts between the continent and New Guinea, and amounting to 640 between the Philippines and the former (Schopf et al. 1978). This vast area has a number of endemic, or nearly so, families such as Eurystomellidae, Euthyrisellidae, Conescharellinidae, Euthyroididae and Parmulariidae. On the other hand the Reteporidae, Adeonidae, Onchoporidae, Orbituliporidae and Catenicellidae are principally represented there.

Families giving a special distinction to this area are the Catenicellidae, Conescharellinidae and Reteporidae. Their species are characterized by very specialized zoaria and high polymorphism values and contribute to a large extent, to the great zoarial diversity of the Western Pacific Bryozoa.

The cyclostome Bryozoa are also well represented both fossil and recent (MacGillivray, 1887, 1895). Some genera are seemingly endemic to this area, viz. *Favosipora* and *Densipora.* Other specialized forms, e.g. *Crisina radians* and *Desmeplagioecia lineata,* make connections with the Antarctic and Subantarctic regions respectively.

The Australian Bryozoan Fauna as a whole shows features corresponding to more K-selected species owing to its high polymorphism, what means a keen zoecial division of the work at colonial level (Table IV), a higher zoarial diversity (Table V) and an extreme taxonomic diversity of the species compared in number and specializations with other regions of the world. (MacGillivray 1887, 1895; Harmer, 1926, 1933, 1957; Bock, 1982).

b. The antarctic and subantarctic zones have been carefully characterized by Hastings (1943), Borg (1944), Rogick (1965), Androsova (1968) and Moyano (1975, 1978). Rogick indicated, with some hesitation, the existence of 321 species inside the Antarctic Convergence. Among these, 179 were considered endemic (55.94%), being composed of 1 entoproct, 2 ctenostomes, 18 cyclostomes, 89 anascan cheilostomes and 69 ascophoran cheilostomes.

To these figures many new species have been added in the last years (Moyano, 1978) causing the endemism to be higher. In fact, along the Antarctic peninsula the endemism varies from 70% to 90% on a basis of 128 species (Moyano, 1978).

Taxonomically the Antarctic Bryozoan Fauna is marked by a large number of species belonging to the genera: *Amastigia, Beania, Camptoplites, Notoplites, Cellaria, Chaperiella, Cornucopina, Cellarinella, Escharoides,* and *Smittina.* At family level, this fauna is sharply

Table IV

POLYMORPHISM OF SOME RECENT PACIFIC CHEILOSTOMATOUS BRYOZOAN FAUNAS

Faunas	Species number	No polymorphs	1 or more polymorphs	2 or more polymorphs	3 or more polymorphs
Philippine region (Canu & Bassler, 1929).	296 (100%)	68 (22.97%)	228 (77.03%)	52 (17.56%)	3 (2.36%)
Indo-pacific area (Harmer, 1926, 1934, 1957).	437 (100%)	66 (15.10%)	371 (84.90%)	109 (24.94%)	37 (8.46%)
Antarctic region (Moyano, 1975).	194 (100%)	37 (19.07%)	157 (80.92%)	46 (23.71%)	15 (7.73%)
Magellanic region (Moyano, 1982).	134 (100%)	34 (25.37%)	100 (74.62%)	34 (25.37%)	2 (1.49%)
Chile, 42°S-18°S (Viviani, 1969; Moyano)	91 (100%)	41 (45.05%)	50 (54.94%)	7 (7.69%)	3 (3.29%)
Galapagos islands (Osburn, 1950, 1952, and 1953).	126 (100%)	30 (23.80%)	96 (76.20%)	31 (24.60%)	6 (4.76%)
Arctic region (Kluge, 1962).	200 (100%)	57 (28.50%)	143 (71.50%)	31 (15.50%)	4 (2.00%)

defined by the Bugulidae, Scrupocellariidae, Flustridae, Cellarinellidae, and Smittinidae. Among these, Cellariidae has the endemic genera *Cellariaeforma*, *Mawsonia* and *Paracellaria*. Cellarinellidae shows only one species —*C. dubia* Waters— beyond the Antarctic Convergence to the north. The family Reteporidae is fairly well represented with 8 species; in this feature the Antarctic Bryozoa come nearer the Australian fauna where the largest number of reteporids exists.

c. The South-American coast from the Galapagos islands to the south shows at least two different bryozoan faunistic components: the more austral is also the more studied one having abouth 200 species (Moyano, 1982), and the northernmost one from *ca.* 40°S to the Galapagos is beginning to be known. In this study more than 100 species are adscribed to it. The Galapagos Bryozoan Fauna itself comprises 150 species and is closer to the Panamic zoogeographical region, so it shares most of the species with the Gulf of California (Osburn 1950, 1952, 1953, Soule, 1963; Moyano, 1982). The continental shelf from Guayaquil (02°00'S) to Arica (18°69'S) is poorly known but it is possible to presume that it has, at least in part, a mixed bryozoan fauna composed of panamic, peruvian and chilean elements. (See Table I).

The polymorphism: The measure of polymorphism can feature a given Bryozoan Fauna reflecting its evolutive history (Schopf, 1973). This criterium has been used by Schopf to characterize tropical and polar cheilostome faunas. According to this author the defensive polymorphs are increasingly K-selected from the arising of the Cheilostomata up to the present time (Schopf, 1977). On the basis of these ideas, a measure of the polymorphism for Recent and Tertiary Pacific Bryozoan Faunas is presented.

Table IV shows that the Indo-Pacific and the Antarctic have the highest values, and Chile has the lowest ones. Highest values seem to be associated with the tropics, being the Antarctic an exception. When considering the polymorphism of the Tertiary Bryozoan Faunas (Table V) it is possible to see that it increases from South-America to Australia, but New Zealand has a larger proportion of species having two or more polymorphs. The

Table V

POLYMORPHISM AND ZOARIAL DIVERSITY OF SOME TERTIARY BRYOZOAN FAUNAS OF THE SOUTHERN PACIFIC REGION

ZOARIAL FORMS	Argentine Canu, 1904 1909, 1911		New Zealand Brown, 1952	South Australia MacGillivray, 1895	
	A	B	B	A	B
Encrusting (In).	54	45	86	103	83
Celleporiform (Cel).	11	8	8	14	14
Flustriform (F).	0	0	0	2	2
Buguliform (Fd).	0	0	0	0	0
Eschariform (E).	8	7	11	27	27
Adeoniform (A).	3	3	13	16	16
Vinculariiform (V).	14	3	27	55	16
Lunulitiform (Lu).	3	3	3	9	9
Conescharelliniform (Co)	0	0	0	3	3
Catenicelliform (Ca).	0	0	0	42	42
Cellariiform (C).	14	13	5	29	20
Reteporiform (R).	4	4	9	20	20
Total					
a. Species number.	111	86	162	320	254
b. Zoarial form number.	8	8	8	11	11
a. H'=	2.33	2.23	2.18	2.88	2.92
b. H' max =	2.99	2.99	2.99	3.46	3.46
c. H'/H' max 100 =	77.92	74.58	72.90	83.23	84.39

CHEILOSTOMATA POLYMORPHISM	Argentine	New Zealand	S. Australia
Species Number	86 (100%)	162 (100%)	254 (100%)
No polymorphs.	28 (32.55%)	41 (25.30%)	60 (23.62%)
One or more polymorphs.	58 (67.44%)	121 (74.70%)	194 (76.37%)
Two or more polymorphs.	9 (10.46%)	32 (19.75%)	32 (12.59%)
Three or more polymorphs.	3 (3.48%)	8 (4.94%)	13 (5.12%)

possible significance of these figures will be discussed later.

The zoarial diversity: Stach (1936, 1938) developed a new approach for considering the bryozoan species as a whole within a given faunule. He classified the extant bryozoan colonies in nine zoarial forms, namely: Membraniporiform, Petraliform, Catenicelliform, Eschariform, Reteporiform, Vinculariform, Cellariform, Flustriform, and Lunulitiform, correlating them with particular conditions existing where they grow. He applied this view to estimate the batimetry of Lower Cenozoic formation fossils. From the beginning he stressed the idea of the variability of the zoarial form possessed by certain species, for instance, *Caleschara denticulata* (MacGillivray) which becomes eschariform in shallow waters of the Southern Australian coast, but it becomes vinculariform from 30-200 fathoms in Bass Strait. The number of zoarial forms has grown from the times of Stach to the present day, but the basic types he described are the more common and easier to identify.

In previous works (Moyano, 1978, 1982) the zoarial diversity of both tropical and polar Recent Bryozoan Faunas was calculated. These calculations showed that different values were present, being higher in the Indo-pacific and Antarctic regions. This finding was associated to environmental stability. It was also demonstrated that the highest values of Zoarial diversity correspond to the highest figures of polymorphism.

Now, in this work the same ideas have been applied to several bryozoan faunas of the Pacific basin. In Table VI, the main Pacific Bryozoan Faunas from the Arctic to the Antarctic and from the western to the eastern continental shelves are compared in this sense. The zoarial diversity expresed as H'/H' max attains the highest values from the Antarctic to the Philippine islands (71%-82,6%), median values from the Magellanic area to the Arctic, and the lowest one for 107 species of the Chilean coast between 18°S to 42°S. This means that there are two different large assemblages around the whole Pacific basin when considering the zoarial types and the probability of finding one of them in studying a given fauna; one includes the tropical Western Pacific plus the Antarctic, and the other the Eastern cold temperate, temperate and tropical Pacific plus the Arctic. If the idea that environmental stability favours higher zoarial diversity values were true, then the Eastern Pacific Bryozoa Faunas would have born a certain degree of environmental uncertainty having been higher than the one affecting the Western Pacific Faunas. This idea can hold true when considering that one of the world areas supposed to have been very unstable during the last million years is the Arctic, where the zoarial diversity attains low values. Then, why the Chilean coast Bryozoan Fauna has the lowest value? One response could be: the incomplete knowledge of its fauna, and the other one supposes this area to have been affected by great environmental unstability during the Tertiary.

On the other hand, the Argentinean Tertiary Patagonian Bryozoa exhibit ca. 78% eveness whereas New Zealand has 72.9% and South Australia 83.23% when analyzing the Cheilostomata plus the Cyclostomata. If only the zoarial diversity of the Cheilostomata is analyzed, the Argentinean figure diminishes to 74.58% and the Australian one increases to 84.39%. If the Tertiary Argentinean Bryozoan extended to the present Magellanic region, then, during the Patagonian in the Tertiary period the environmental conditions were different, since the present zoarial diversity values are lower. In the Australian area, the Victorian Tertiary Bryozoa had higher diversity values than those from today, indicating conditions not very different from the Recent ones. Nevertheless, it is always necessary to remember that the fossil record has always the danger of being incomplete and then conducing to wrong deductions, if not properly evaluated.

From the threefold analysis just finished one aspect seems to emerge: the Western Pacific Bryozoa are marked by high values of polymorphism, zoarial diversity, and taxonomic diversity. This characteristic can be also extended to the Antarctic. Thus, the Antarctic and the Australian area converge in this sense although being far apart today. This convergence also extends to the family Reteporidae which has its greater

Table VI

ZOARIAL DIVERSITY OF SOME PACIFIC BRYOZOAN FAUNAS

Zoarial forms	Bryozoan faunas and number of species per zoarial form										
	Philippine region Canu & Bassler 1929	Indo-pacific. Harmer, 1926, 1934 1957	Victoria South Australia MacGillivray, 1886	Antarctic. Rogick, 1965, Moyano 1978.	Magellanic area Moyano, 1982.	Chile 42"S-18"S Moyano Viviani, 1969, 1977	Galapagos Islands Osburn, 1950-1953	Gulf of California Osburn 1950 1953; Soule 1963	34" N - 23" N. Osburn, 1950-1953	Alaska-Vancouv. Osburn, 1950-1953	Arctic region Kluge, 1962.
Encrusting (In).	180	172	150	97	112	87	91	109	155	148	153
Celleporiform (Cel).	20	27	30	6	13	3	19	24	23	11	7
Flustriform (F).	0	6	13	14	5	0	0	2	1	9	13
Buguliform (Fd).	2	30	31	24	8	4	6	5	13	11	19
Eschariform (E).	18	15	9	10	3	0	4	4	6	16	3
Adeoniform (A).	7	14	7	13	2	0	1	2	2	1	10
Vinculariiform (V).	52	34	17	28	28	3	10	12	15	14	10
Cellariiform (C).	24	53	30	29	19	7	13	17	25	19	15
Reteporiform (R).	8	29	21	7	2	0	1	2	2	1	3
Lunulitiform (Lu).	9	10	1	0	0	0	3	3	3	0	0
Conescharelliniform (Co).	36	22	0	0	0	0	0	0	0	0	0
Catenicelliform (Ca).	0	31	43	3	3	3	2	1	7	4	0
Total											
a. Species number.	356	443	352	231	195	107	150	181	252	234	233
b. Zoarial form number.	10	12	11	10	10	6	10	11	11	10	9
Zoarial diversity											
a. H' =	2.36	2.96	2.71	2.65	2.09	1.11	1.99	2.03	2.03	1.98	1.88
b. H' max =	3.32	3.58	3.46	3.32	3.32	2.58	3.32	3.46	3.46	3.32	3.17
c. H'/H' max 100 =	71.07	82.68	78.32	78.82	62.95	43.02	59.93	58.67	58.67	59.63	59.30

diversification in both areas; in comparison, the Magellanic area has at most two reteporidan species which reach to 8 in the Antarctic and more than 30 in the Australian area.

Although the differences stressed above between the western and easter sides of the Pacific basin, many connections among them can be established when studying their taxa. The physical connecting element providing relatively similar conditions in the Subantarctic Pacific area is the West-Wind-Drift. Probably, to its intermission 33 species have a circumaustral or nearly so distribution (Moyano, 1982).

Each of the four Chilean bryozoan provinces defined above has some common elements with the Australian area. The Magellanic province has the 33 species already indicated. The Chilean province shares the genera *Retevirgula, Heteropora, Opaeophora, Arthropoma, Aspidostoma, Plesiothoa, Crepidacantha, Cryptosula, Ellisina, Escharoides, Hippomenella, Hippopodinella, Inversiula, Osthimosia, Spiroporina, Vittaticella* and *Bicrisia*. The Juan Fernández province has the following species also present in the Australian area: *Arthropoma biseriale* (Hincks), *Caberea zelandica* (Gray), *Celleporina costata* (MacGillivray), *Crepidacantha crinispina* Levinsen, *Chaperiella cervicornis* (Busk), *Hippomenella vellicata* (Hutton), *Microporella lunifera* (Haswell), *Spiroporina pentagona* (d'Orbigny), *Smittina maplestonei* (MacGillivray) and *Smittina purpurea* (Hincks). The Easter island province shares with the Australian area the genera *Escharina, Cribralaria* and *Canda*.

DISCUSSION

The Chilean Bryozoan Fauna is defined by a large amount of encrusting species and low values of zoarial diversity and polymorphism. A close examination of its components and its distribution shows that there is a Magellanic zone, richer in species and having higher polymorphism and zoarial diversity values, and a Northern zone with less species and very small values of the other parameters. The Magellanic area is directly influenced by the West-Wind-Drift waters, and the shelf north to 40°S under the regime of the cold Humboldt current which flows north affecting the western South-american coast reaching Guayaquil. This cold flow deflects the superficial isotherms to the north; being that corresponding to 20°C near the Equatorial Line. Thus the whole Chilean coast is affected by cold waters. Nevertheless, the presence of warmer, more saline and less oxigenated waters running to the south under the Humboldt current is not negligible for their effects acting on pelagic and benthic species under 100 m depth along Central and Northern Chile. This has been tested with mesopelagic fishes (Craddock and Mead, 1970) and it is probalby the explanation of the presence to the latitude of Valparaiso of the tropical bryozoan *Bellulopora bellula*.

If the present oceanographic conditions had been present during the whole Tertiary period or during large part of it, making this area more stable, then the Bryozoan Fauna perhaps would have had polymorphism and zoarial diversity figures similar or near to the present antarctic ones. Fleming (1979) states that during the Neogene, the Chilean Fauna was hit more than other cool temperate regions by thermic and faunistic oscillations causing many Panamic and Indo-pacific elements to arrive from the north during warmer periods, and which were extinct during the cooler ones along the Ice Ages. These facts mean instability and, probably, these are the cause that have featured the extant Chilean Bryozoa, easily detected in its low polymorphism and zoarial diversity.

Taxonomically the Chilean Bryozoan Fauna shows traces of the facts depicted above, being composed of Indo-Pacific, Panamic Subantarctic, Antarctic and endemic elements. Some species apparently show an antitropical distribution, viz. *Membranipora isabelleana* (? = *M. villosa*) associated to

Macrocystis kelps, as do too *M. hyadesi*. If Nicholson's (1979) view is correct, this species came from the Northern Hemisphere when the genus *Macrocystic* invaded the Southern Hemisphere.

The division of the Chilean Bryozoan Fauna into four provinces, two continental and two insular, results from the data in Tables, I, II and III. This agree with most of the zoogeographical models already proposed for the Chilean Fauna (Ekman, 1953; commented and summarized in Briggs, 1974). The present knowledge does not support Viviani's proposal of dividing continental Chile into four provinces. In the littoral zone (intertidal and upper subtidal) many species —those wich Viviani dealt with— go far south, whereas in the sublittoral below ten meters depth others go far north. The littoral *Retevirgula areolata* reaches as far as the Guaitecas archipelago (44°S), whereas the antarctic and subantarctic *Inversiula nutrix* reaches 30°S, and the magellanic *Romancheina martiali* 36°S. This fact would support the existence of an intermediate "mixed" province between the Magellanic and the Northern one, composed of a mixing of southern and northern elements. Nevertheless, the study of samples collected below 35 m depth to 200 or more m depth shows that in Central Chile there exists a particular Bryozoan fauna different from the Magellanic one at the same depth. The probability exists that north Valparaíso the same species which have been found between Lebu and Punta Curaumilla may appear at 100-150 m depth.

The present-day bryozoan diversity around Australia is substantially higher than in the South-american coast. Polymorphism and zoarial diversity have the highest values in Australia and in the Indo-Pacific region. This feature also characterizes the Antarctic. An interpretation of the latter could be to consider the long and stable isolation of the Antartic being separated from Australia by the circumantarctic current (30-25 Ma; Grant Mackie, 1979). Although the extreme environmental conditions now present in the Antarctic, its persistence for several million years rendered it an stable environment; this probably caused the bryozoan species to be K-selected, what means slow growth, long life as in *Cellarinella* species forming annual marks that indicated that they have a life span of several years, and the development of very specialized avicularian and vibracularian polymorphs. Australia was drifting to the north while the Antarctic and the water mases around it were progressively cooler, this fact provided it with a more favourable environmental condition than that occurring at that time in the southermost part of South America (Grant Mackie, 1979; Kennet in Knox, 1979).

If environmental unstability is one of the factors that induces species to be r-selected and stability to become K-selected (Pianka 1970, in Schopf, 1977), then the Bryozoan Faunas from the Antarctic to the Philippines would translate an evolutive history having as frame a long environmental stability. On the contrary, the Bryozoan Faunas from the Arctic to Magellanic region are marked by low zoarial diversity and lower values of polymorphism showing a more r-selected set of species indicating a less stable environment in the long term.

The closer Tertiary connections between Australia and Antarctica are perhaps still observed in the existence of a relative large amount of reteporidan species. Reteporine species are highly specialized exhibiting an important degree of polymorphism with up to four different types of avicularia. On the other hand, three of the Antarctic Reteporidae belong to the genus *Hippellozoon* , wich is also represented in New Zealand, meaning perhaps, some connections between these islands and the Antartic, at least, in their hydrological conditions during, the early Pliocene to the late early Pleistocene (Knox, 1979).

CONCLUSION

The present study further shows that:

a. The Chilean Bryozoan Fauna comprises 267 species, including 19 Ctenostomata (7.11%), 46 Cyclostomata (17.22%) and 202 Cheilostomata (75.65%).

b. Twenty four species and a name are described as new:

ba. The Cheilostomata *Aplousina gymnocystica* sp. n., *Antropora paucicryptocysta* sp. n., *Arachnopusia areolata* sp. n., *Cellaria humilis* sp. n., *Cribralaria labiodentata* sp. n., *Escharoides molinai* sp. n., *Fenestrulina microstoma* sp. n., *Microporella areolata* sp. n., *Opaeophora browni* sp. n., *Parasmittina proximoproducta* sp. n., *Phylactella problematica* sp. n., *Retevirgula zoeciulifera* sp. n., *Schizoporella maulina* sp. n., *Smittina fragaria sp.* n., *Smittina jacquelinae* sp. n., *Smittina undulimargo* sp. n., *Smittina volcanica* sp. n., *Spiroporina reteporelliformis* sp. n.

bb. The Cyclostomata *Crisia parvinternodata* sp. n., *Desmeplagioecia irregularis* sp. n., *Frondipora masatierrensis* sp. n., *Tubulipora proteica* sp. n., *Tubulipora tuboangusta* sp. n. and *Tubulipora tubolata* sp. n.

bc. The new name *Smittina jullieni* n. nom. for the preoccupied *Smittia purpurea* Jullien, 1888.

c. From a bryozoogeographical point of view the Chilean fauna is divided into four units or provinces:

ca. *Magellanic*, from Chacao Channel to Diego Ramírez islands (42°S -56°30'S).

cb. *Chilean*, from Arica to Chacao Channel (*ca.* 18°S-42°S).

cc. *Juan Fernández*, (33°38'S; 75°52'W).

cd. *Easter island*, (27°07'S; 109°22'W).

d. From a taxonomic point of view, in the Eastern South Pacific Ocean, the families Reteporidae, Vittaticellidae, Adeonidae and Scrupocellariidae are poorly represented in relation to the Australian area, whereas, the Eurystomellidae, Euthyrisellidae, Conescharellinidae, Euthyroididae and Parmulariidae are altogether absent.

e. In the whole Pacific basin plus the adjacent polar areas the polymorphism of the Cheilostomata and the zoarial diversity of all marine living bryozoan orders attain highest values in the western side from the Antarctic to the Philippines, and lowest ones from the Magellanic area to the Arctic.

f. The calculated figures of polymorphism and zoarial diversity for the Tertiary Bryozoa from Argentine, New Zealand and South Australia also increase to the west. Nevertheless, the actual zoarial diversity figures of New Zealand being slightly lower than the Argentinean ones.

g. On the basis of zoarial diversity and Cheilostomata polymorphism, the Western Pacific plus the Antarctic have a more specialized -that is, a more K-selected- Bryozoan Fauna reflecting perhaps a history of greater stability in the long term. The Eastern Pacific, on the contrary, shows substantially lower values; this implies more generalized or more r-selected bryozoan species extending from the Magellanic region to the Arctic.

h. The lowest polymorphism and zoarial diversity figures of the whole Pacific basin belong to the Chilean coast between 18°S and 42°S. This could be explained, at least in part, by the great variability of the environmental conditions during a large part of the Tertiary.

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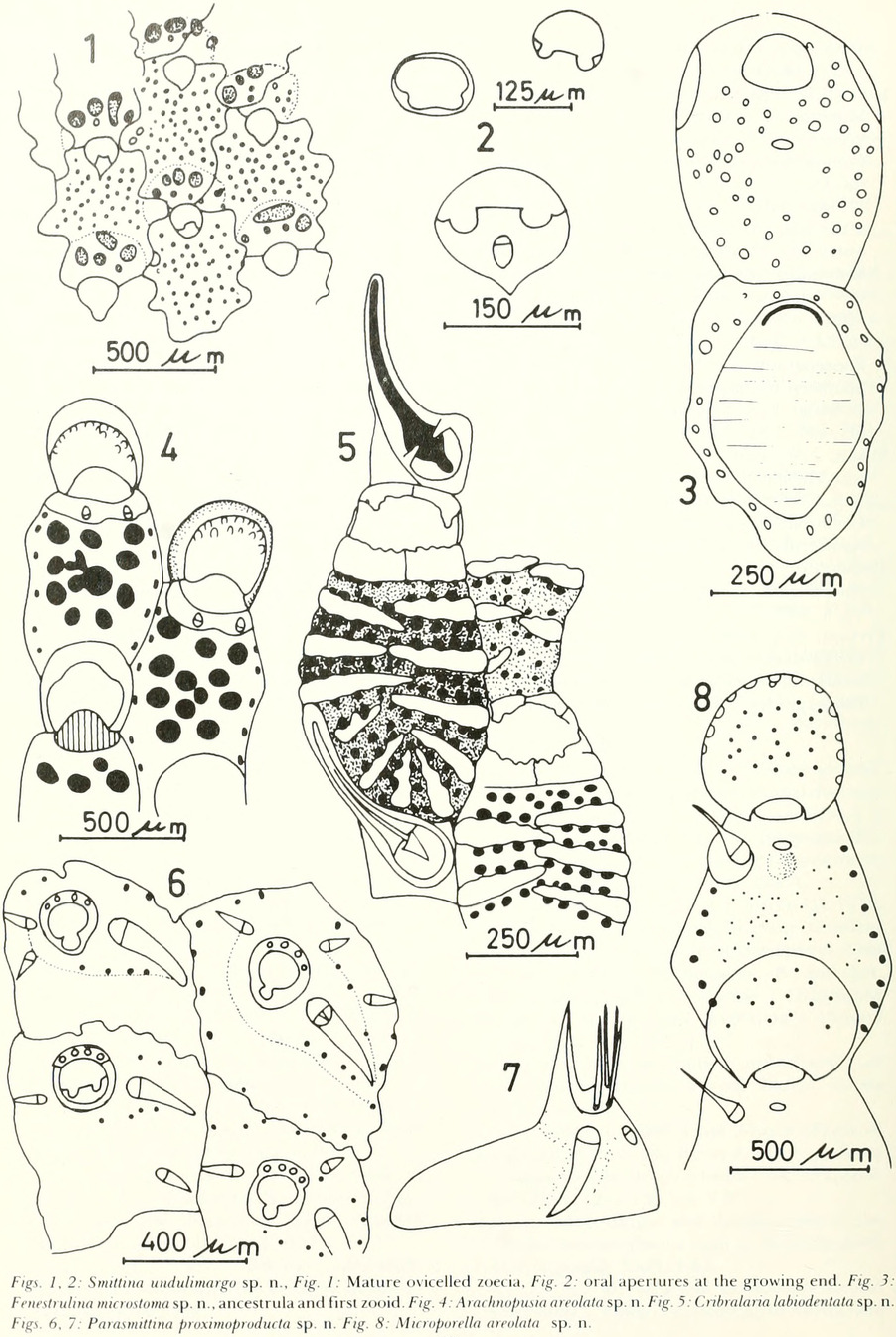


Figs. 1, 2: Smittina undulimargo sp. n., *Fig. 1:* Mature ovicelled zoecia, *Fig. 2:* oral apertures at the growing end. *Fig. 3: Fenestrulina microstoma* sp. n., ancestrula and first zooid. *Fig. 4: Arachnopusia areolata* sp. n. *Fig. 5: Cribralaria labiodentata* sp. n. *Figs. 6, 7: Parasmittina proximoproducta* sp. n. *Fig. 8: Microporella areolata* sp. n.

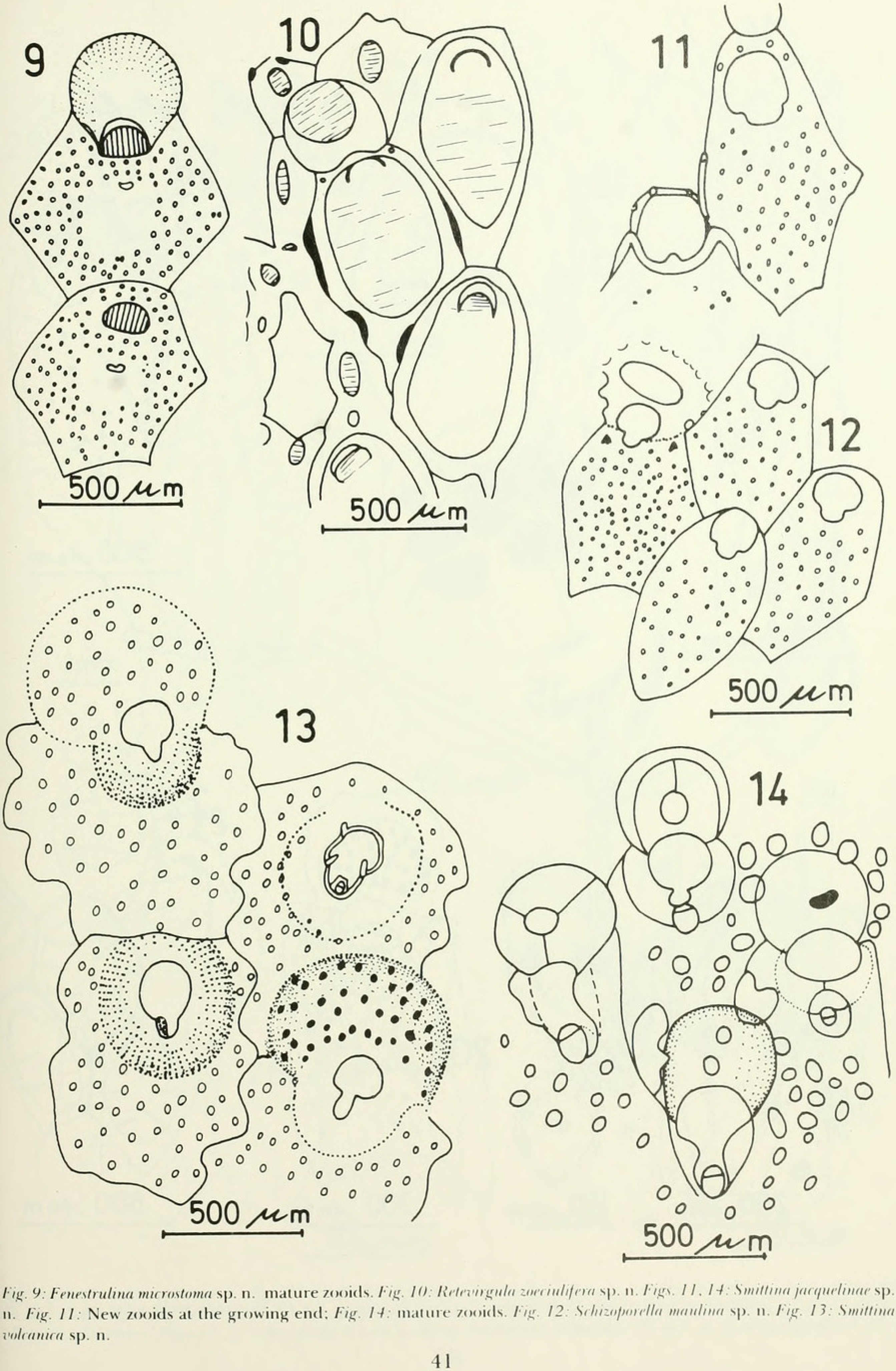
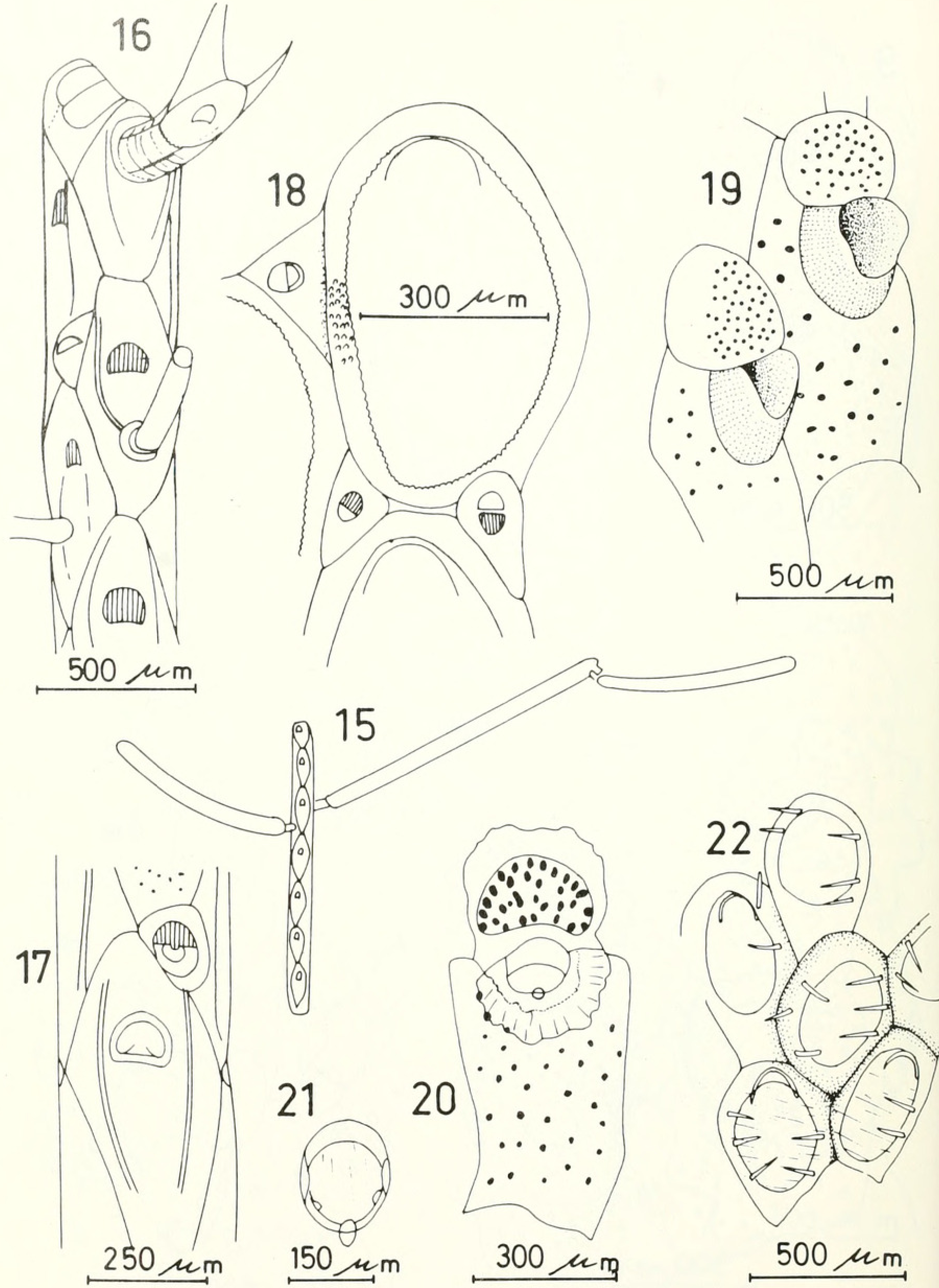


Fig. 9: Fenestrulina microstoma sp. n. mature zooids. *Fig. 10: Retevirgula zoeciulifera* sp. n. *Figs. 11, 14: Smittina jacquelinae* sp. n. *Fig. 11:* New zooids at the growing end; *Fig. 14:* mature zooids. *Fig. 12: Schizoporella maulina* sp. n. *Fig. 13: Smittina volcanica* sp. n.



Figs. 15, 16, 17: Cellaria humilis sp. n. *Fig. 18: Antropora paucicryptocysta* sp. n. *Fig. 19: Phylactella problematica* sp. n. *Figs. 20, 21: Smittina fragaria sp. n. Fig. 22: Aplousina gymnocystica* sp. n.

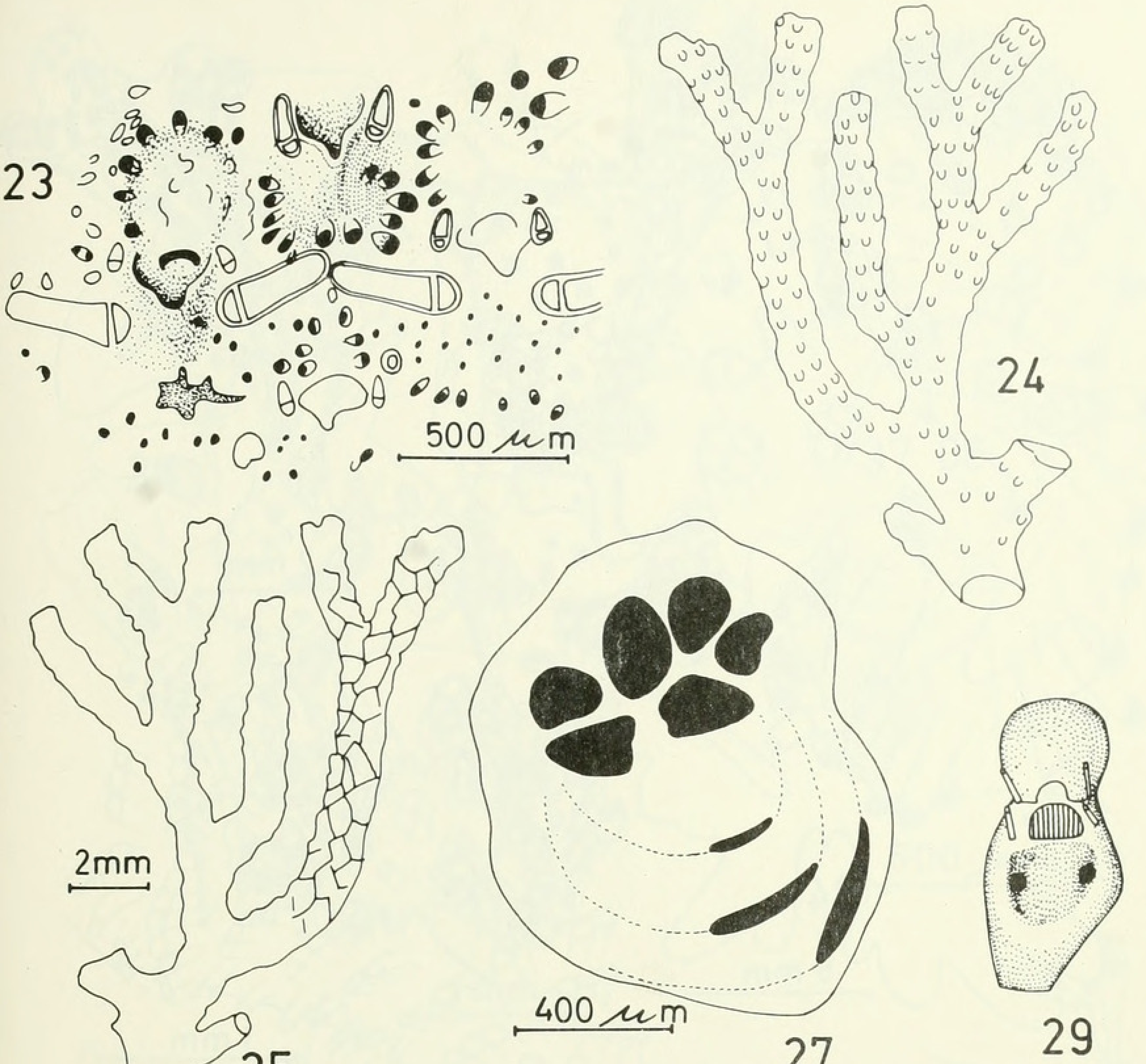
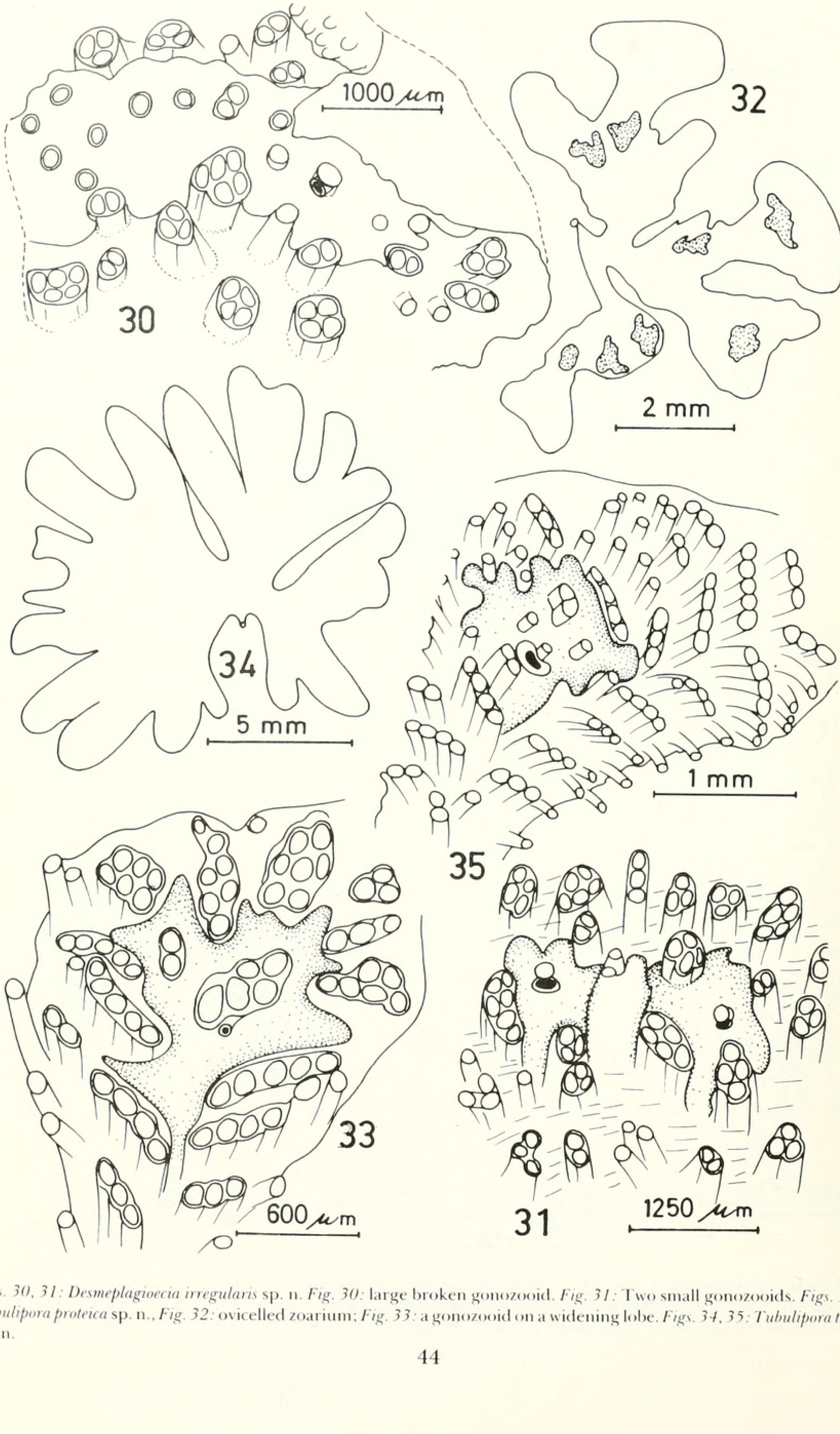


Fig. 23: Escharoides molinai sp. n. *Figs. 24, 25, 26, 27: Spiroporina reteporelliformis* sp. n. *Fig. 24:* frontal zoarial view. *Fig. 25:* dorsal zoarial view. *Fig. 26:* frontal and dorsal views of growing tip. *Fig. 27:* transverse section of a branch showing three kenozooidal layers. *Figs. 28, 29: Opaeophora browni* sp. n.



Figs. 30, 31: Desmeplagioecia irregularis sp. n. *Fig. 30:* large broken gonozooid. *Fig. 31:* Two small gonozooids. *Figs. 32, 33: Tubulipora proteica* sp. n., *Fig. 32:* ovicelled zoarium; *Fig. 33:* a gonozooid on a widening lobe. *Figs. 34, 35: Tubulipora tubolata* sp. n.

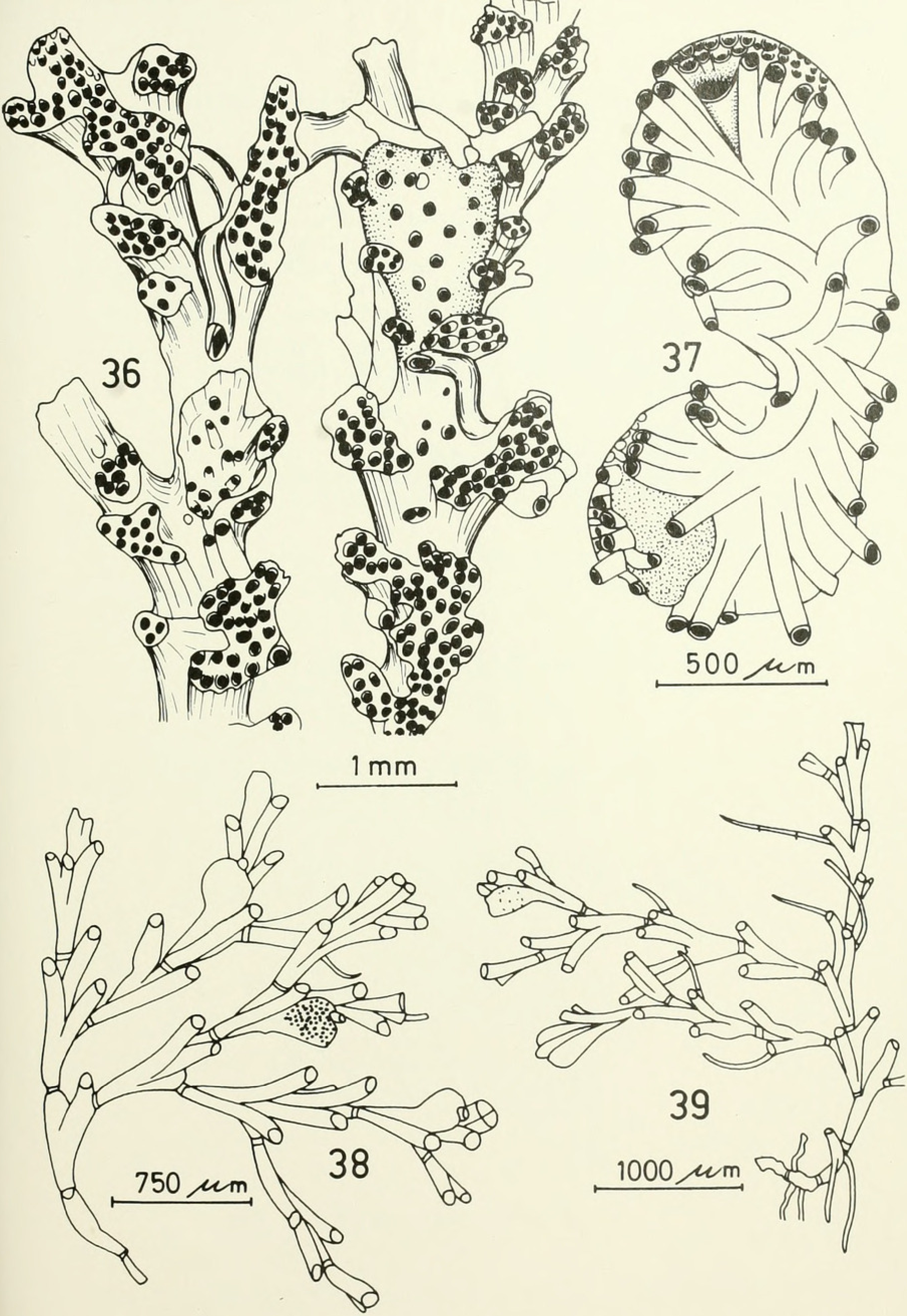


Fig. 36: Frondipora masatierrensis sp. n. *Fig. 37: Tubulipora tuboangusta* sp. n. *Figs. 38, 39: Crisia parvinternodata* sp. n.