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BRYOZOA MARINOS CHILENOS VI. CHEILOSTOMATA HIPPOTHOIDAE: SOUTH EASTERN PACIFIC SPECIES*

Bryozoa Marinos Chilenos VI. Cheilostomata Hippothoidae: Las especies del Pacífico Sudoriental

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ABSTRACT

Nineteen South Eastern Pacific Hippothoan species are described from samples collected along the Chilean coast, the Antartic Peninsula, Easter Island and Juan Fernández Archipelago. Three are new to science: *Celleporella (Celleporella) retiformis* sp. n., *Celleporella (Celleporella) uberrima* sp. n. and *Celleporella (Neothoa) vivianii* sp., n. The first two belong to the *C. (C.) hyalina* complex and the latter to the tatiform ancestrula-bearing *Celleporella* species.

The ancestrula and the early astogeny is described for all the species with one exception: *C. (N.) vivianii* sp. n. The latter in presumed to have a tatiform ancestrula according to its zoarial and zoecial structural pattern. The new and already known findings in Eastern South Pacific waters allow to distinguish the following groups: a. four tatiform ancestrula-bearing species b. one kenozooidal ancestrula-bearing species; c. fourteen schizoporelloid ancestrula-bearing species.

The zoogeographical distribution of the south eastern Pacific Hippothoan species agrees with the provincial division of the south eastern coast of South America; thus, two zoogeographical components are distinguished. The northern Chile-Peruvian one is specially characterized by *Plesiothoa dorbignyana* and *Celleporella (C.) concava* and the southern Magellanic one by *C. (N.) chilocnsis* and *C. (A) bougainvillei*. The Antarctic region with only three Hippothoan species is clearly related to the Magellanic Bryozoan fauna. The Juan Fernández and Easter islands seem to have no endemic Hippothoan species.

The generic diagnosis of the genus *Hippothoa* is modified to include uniserial species with tatiform, schizoporelloid and kenozooidal ancestrulae. The genus *Celleporella* is divided into four subgeneric groups: *Celleporella* for unilaminar or bilaminar species with a schizoporelloid ancestrula giving off a laterodistal first zooid producing a spiral early astogeny; *Antarctothoa* subgen. n. for unilaminar species having a schizoporelloid ancestrula that buds two latero-distal symmetrical first zooids; *Neothoa* subgen. n. for uniserial tatiform ancestrula-bearing species, and *Austrothoa* subgen. n. for pluriserial tatiform ancestrula-bearing species.

KEYWORDS: Bryozoa. Hippothoidae. Systematics. South Eastern Pacific. New Taxa. Zoogeography.

RESUMEN

Se estudiaron 19 especies de la familia Hippothoidae del Pacifico Sudoriental de muestras obtenidas a lo largo de Chile continental, del archipiélago de Juan Fernández, de la Isla de Pascua y de la Península Antártica.

Se describen tres especies nuevas: *Celleporella (Celleporella) retiformis* sp. n., *C. (C.) uberrima* sp. n. y *C. (Neothoa) vivianii* sp. n. Las dos primeras pertenecen al complejo *C. (C.) hyalina* y la segunda al grupo de *Celleporella* con ancéstrulas tatiformes.

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Por primera vez se informa de la ancéstrula y astogenia temprana de las nuevas especies, así como de todas las otras tratadas aquí con excepción de *C. (N.) vivianii* sp. n. Sin embargo, se supone que ésta posee una ancéstrula tatiforme basándose en sus estructuras zoeciales y zoariales. Los hallazgos nuevos y conocidos permiten distinguir los siguientes grupos de especies: a. cuatro con ancéstrula tatiforme; b. una con ancéstrula quenozooidal; c. catorce con ancéstrula esquizoporeloide.

Zoogeográficamente las especies de Hippothoidae del Pacífico Sudoriental se distribuyen según el patrón clásico en un grupo septentrional peruano-chileno y en otro austral magallánico. El septentrional se caracteriza esencialmente por *Plesiothoa dorbignyana* y *Celleporella (C.) concava*, y el austral por *C. (N.) chilocnsis* y *C. (A.) bougainvillei*. La Antártica con sólo tres especies está claramente relacionada con la fauna briozoógica magallánica.

Se modifican las diagnosis genéricas de *Hippothoa* y *Celleporella*. En *Hippothoa* se incluyen especies uniseriales con ancéstrulas tatiformes, esquizoporeloides y quenozooidales. Se divide al género *Celleporella* en 4 grupos subgenéricos: *Celleporella*, para especies con zoarios uni o bilaminares con ancéstrulas que yeman disto-lateralmente un primer zooide que genera una astogenia espiral; *Neothoa*, para especies uniseriales provistas de ancéstrula tatiforme; *Austrothoa* para especies multiseriales provistas de ancéstrula tatiforme y *Antarctothoa* para aquéllas de zoarios multiseriales, unilaminares cuya ancéstrula esquizoporeloide yema distolateral y simétricamente los dos primeros zooides.

INTRODUCCION

Hippothoan Bryozoa are an extremely common component of intertidal, subtidal and fouling communities everywhere in the World Ocean, growing in all kind of substrates, living or dead. The number of the known recent species reaches *ca.* 40 (Morris, 1980; Ryland & Gordon, 1979; Viviani, 1977; Ryland, 1979; Moyano & Gordon, 1980; Moyano, 1982; Hayward & Fordy, 1982; Gordon, 1984; López-Gappa, 1985). Their correct identification is difficult owing to the paucity of characters involved in identification and the similar structural pattern of apparently unrelated species. The confusions are probably frequent in the actual identities of the species that the workers study and name in papers caming from different places in the world. Thus, their identification are not necessary equivalent and correct. Old and recent authors have included up to five different species under the universal name of *Celleporella hyalina* (Linn.) supposed to be cosmopolite. Thus, Calvet (1909) under the name *C. hyalina* also included *C. patagonica, C. yagana, C. discreta, C. bougainvillei* (López-Gappa, 1985).

The confusion has persisted until recent years. From 1975 on, a series of papers have clarified this dark subject. Emphasis has been made on the communication between adjacent zooids (Gordon & Hastings, 1979), the early astogeny (Ryland & Gordon, 1977; Gordon, 1984), fossil and recent forms of *Hippothoa s. l.* (Morris, 1980); polypidian structure (Gordon, 1975a, 1975b), general systematics of the genus *Hippothoa* (Hastings, 1979); new taxa specially from the Southern Hemisphere (Ryland, 1979; Moyano & Gordon, 1980; Ryland & Gordon, 1977; Morris, 1980; Gordon, 1984; Hayward and Fordy, 1982; Moyano, 1982 and López-Gappa, 1985).

Although the contributions cited above have solved many problems, others have remained, namely: correspondence between hard and soft parts in order to asses the actual relationship among fossil and recent species; early astogeny of a considerable number of recent species; presence of a gizzard in related or unrelated species; species complexes, e. g. *C. bougainvillei*-like species and its geographical variations; characterization of the hitherto known species and the new ones through SEM techniques; redefinition of the supraspecific taxa and phylogeny.

All these problems and the efforts to solve them have special relevance to the Southern Hemisphere due to the large number of species inhabiting the

Australian-New Zealand area and the western coast of South America (Moyano & Gordon, 1980). The extremely long coast of Chile proves to be an active site of perhaps present and past evolution of the Hippothoidae. 18 species are presently known from 18° to 56° S latitude and the Antarctic Peninsula. The first work dealing with Chilean Hippothoidae is that of d'Orbigny (1847) who described four species. Busk (1852, 1854, 1884), Ridley (1881), Jullien (1888), Calvet (1904), Waters (1904, 1905), added new taxa and new records. More than a half century later, Viviani (1977) monographed the family Hippothoidae in Chilean waters dealing with seven species including two new ones. Moyano and Gordon (1980) and Moyano (1982) described other five new species.

The revision of the Hippothoan taxa in the zoological collections (MZUC) of the University of Concepción, Chile plus the bibliographic information dealing with Chilean waters revealed the presence of at least 18 species. Fifteen were previously known and three are different from all known species. Thus, the aim of this work is to describe the new taxa, the ancestrulae and early astogeny of almost all the species studied, demonstrate the structures through SEM microphotographs and convey a general discussion of the family Hippothoidae.

MATERIALS AND METHODS

The samples studies were collected in the places, data, by the collectors and in the substrata indicated hereinafter:

a. Arica: 18° 30'S; 69° 50'W. 1985; 5 m; coll. Villalba. Rocks: *P. dorbignyana, C. (C.) hyalina, C. (C.) concava, C. (C.) chilina.*

b. Iquique: 20° 13'S; 70° 10'W. 1985; 5 m; coll. C. Villalba, Fernández. Rocks: *P. dorbignayana; C. (C.) hyalina.*

c. Antofagasta: 23° 39'S; 70° 23'W. 1985; 30 m; coll. M. Oliva. *Lessonia sp. talli: C. (C.) retiformis* sp. n.

d. Easter Island: 27° 07'S; 109° 22'W. 1934; 76 m; coll. O. Wilhelm. Coral blades: *H. flagellum.*

e. Caldera: 27° 04'S; 70° 50'W; 1982; 0-5 m; coll. Mariana Rodríguez. Scallop shell. *H. flagellum; H. divaricata.*

f. Cruz Grande: 29° 26'S; 71° 19'W. 1978; littoral; coll. Villouta. *Austromegabalanus psittacus* shells: *P. coquimbana.*

g. Coquimbo: 29° 58'S; 71° 21'W. 1964; littoral; coll. Moyano. Rocks: *C. (C.) hyalina.*

h. Guanaqueros: 30° 09'S; 71° 25' W. 1984; littoral; coll. Moyano. Rocks: *C. (C.) concava, P. coquimbana, P. dorbignyana.*

i. Juan Fernández Ids.: 33° 38' S; 78° 58'W. 1964; littoral; coll. H. Moyano. Algae and rocks: *C. (A.) muricata.*

j. Algarrobo: 33° 2'S; 71° 40'W; Rocks: *C. (C.) hyalina; C. (C.) chilina; P. dorbignyana.*

k. Tomé: 36° 37'S; 72° 57'W; Bivalve shells: *C. (C.) hyalina.*

l. Mocha Id.: 38° 22'S; 75° 53'W; 1971; 6-8 m; coll. A. Ramírez. *Ballia* sp.: *P. australis.*

ll. Maullín: 41° 38'S; 73° 37'W; 1956; intertidal zone; coll. G. Illies. Bivalve shells: *C. (A.) bougainvillei; C. (C.) hyalina.*

m. Punta Tentén, Castro: 42° 29'S; 73° 45'W. 1967; sublittoral; coll H. Saelzer. Large volutid shell; *C. (N.) chiloensis.*

n. Guarello Id.: 50° 23'S; 72° 50'W. 1986. 10-20 m; coll. Navarrete. *Hornera* sp. basal disc: *H. flagellum.*

o. Puerto El Hambre: 53° 38'S; 70° 56'W. 1985; littoral; coll. C. Villalba; *Serolis* sp.: *C. (C.) uberrima* sp. n.

p. Bahía Inútil: 53° 00'S; 70° OO'W. 1972; 18 m. coll. M. A. Retamal. Rodhophytes: *C. (A.) bougainvillei; C. (A.) yagana; C. (N.) patagonica.*

q. Puerto Toro: 55° 04'S; 67° 04'W; Rocks: *C. (N.) chiloensis; C. (A.) yagana.*

r. Antartic Peninsula:
Algae: *C. (A.) bougainvillei; C. (A.) antarctica.*

s. Ross Sea:
A. colony of *Phylactellipora lyrulata: H. flagellum.*
Zoaria of *Cellaria vitrimuralis: C. (A.) antarctica.*

t. Unknown locality in Central Chile (probably near Valparaíso): rocks: *C. (N.) vivianii* sp. n., *P. dorbignyana, C. (C.) chilina, C. (C.) hyalina.*

u. Uknown locality in the Argentinian continental shelf near Río de La Plata. Mytilid shells: *C. (N.) chiloensis.*

Most of the samples were preserved dry, except those of the Magellan Strait, Antarctic Peninsula and Ross Sea, preserved originally in formaldehyde and then kept into ethanol 70%.

Drawings were prepared from dry or wet samples examined under a disecting microscope and drawn with aid of a *camera lucida.*

Materials for SEM microscopy were initially boiled in a concentrated water solution of NaClO, rinsed with running water, transferred to alcohol 96%, dried at 40° C and coated with gold.

Type material is deposited in the Museum of Zoology of the University of Concepción, Chile (MZUC).

Synonymies are reduced to the last and more important papers dealing with a given species.

No numbers or letters have been marked on the plates. Instead, the following combinations of capital letters have been employed: TR top right; TL top left; MR middle right; ML middle left; BR bottom right, and BL bottom left.

RESULTS

A. THE RECENT HIPPOTHOIDAE

According to the largest and most comprehensive paper on recent Hippothoidae (Morris, 1980) the following list accounts for all the *Hippothoa*-like species and the authors that have dealt with them since 1975. The genera *Chorizopora, Gemellipora, Haplopoma* are not included in Hippothoidae following Harmer, 1957 and Gordon, 1984.

TABLE I. The recent Hippothoidae and the authors dealing with them from 1975.

*Species	Authors and years									
	**Mr 80	RG 77	VI 77	RD 79	MG 80	Mo 82	HF 82	GO 84	LG 85	MO 86
1. *Tecatia sinaloensis* Morris, 1980	x									
2. *Hippothoa hyalina* (Linnaeus, 1767)	x	x	x						x	x
3. *H. hyalina marcusi* Morris, 1980	x									
4. *H. santacruzana* Pinter, 1973	x									
5. *H. cornuta* (Busk, 1854)	x									
6. *H. discreta* (Busk, 1854)	x									x
7. *H. annularis* (Pallas, 1766)	x									
8. *H. patagonica* Busk, 1852	x				x				x	x
9. *H. muricata* (Busk, 1876)	x									x
10. *H. delta* Ryland & Gordon, 1977	x	x						x		
11. *H. delta persimilis* Morris, 1980	x									
12. *H. holostoma* Levinsen, 1909	x									
13. *H. tuberculata* (Hincks, 1880)	x									
14. *H. meridionalis* Morris, 1980	x									
15. *H. divaricata* Lamouroux, 1821	x	x								x
16. *H. aruensis* Morris, 1980 (1)	x							x		
17. *H. distans* MacGilivray, 1869	x							x		?
18. *H. expansa* Dawson, 1859	x									
19. *H. minitumulosa* Morris, 1980	x									
20. *H. brasiliensis* Morris 1980	x									
21. *H. trigemma* Ryland & Gordon, 1977 (3)	x	x								
22. *H. flagellum* Manzoni, 1870 (2)	x	x	x					x	x	x
23. *H. watersi* Morris, 1980	x									
24. *H. gigerium* Ryland & Gordon, 1977 (3)		x								
25. *H. tongima* Ryland & Gordon, 1977		x								
26. *H. bathamae* Ryland & Gordon, 1977		x								
27. *H. dorbignyana* Viviani, 1977			x							x
28. *H. bougainvillei* (d'Orbigny, 1847) (4)			x		x				x	x
29. *H. concava* Viviani, 1977			x							x
30. *H. chilina* (d'Orbigny, 1847)			x							x
31. *Celleporella carolinensis* Ryland, 1979				x						
32. *Plesiothoa australis* Moyano & Gordon, 1980					x				x	x
33. *P. coquimbana* Moyano & Gordon, 1980					x					x
34. *Celleporella yagana* Moyano & Gordon, 1980					x					x
35. *C. antarctica* Moyano & Gordon, 1980					x					x
36. *C. chiloensis* Moyano, 1982						x				x
37. *Hippothoa musivaria* Hayward & Fordy, 1982							x			
38. *Hippothoa calciophilia* Gordon, 1984								x		
39. *H. divaricata pacifica* Gordon, 1984								x		
40. *H. peristomata* Gordon, 1984								x		
41. *Celleporella tehuelcha* López-Gappa, 1985									x	
42. *Celleporella uberrima* sp. n.										x
43. *Celleporella retiformis* sp. n.										x
44. *Celleporella vivianii* sp. n.										x

*Species names are after the authors dealing with them in the years appearing in this Table.

** Authors: GO= Gordon; HF= Hayward & Fordy; LG= López-Gappa; MG= Moyano & Gordon; Mo= Moyano; MR= Morris; RD= Ryland; RG= Ryland & Gordon; Vi= Viviani.

(1) This species is considered a synonym of *H. flagellum* (Gordon, 1984).

(2) Viviani (1977) recognized and described this species under the name *H. distans*.

(3) Gordon & Hastings (1979) proposed the new genus Plesiothoa for those Hippothoan species having a gizzard. They included in it this two species. Moyano and Gordon (1980) introduced two new species of this genus: *australis* and *coquimbana*.

(4) Morris (1980) included this species under *H. annularis*.

B. SPECIES GROUPS IN HIPPOTHOIDAE

Before Gordon and Hastings (1979) and Morris (1980) the family Hippothoidae comprised a variable number of genera according to different authors. Osburn (1952) included the genera *Chorizopora*, *Hippothoa*, *Hincksipora*, *Trypostega* and *Harmeria*. Bassler (1953) added the fossil genera *Dacryoporella* and *Diplotresis* and the recent *Haplopoma*. Harmer (1957) separated *Chorizopora* in a new family, considered *Haplopoma* as probably belonging to another family, and opposed *Diazeuxia* Jullien to *Hippothoa* on zoarial grounds. Recently, Morris (1980) expanded the family including the genera indicated above, the new fossil genera *Kronothoa*, *Boreas* and *Atacama* and *Tecatia* for recent and fossil species. This author mantained the genus *Hippothoa* for almost all the recent species of the family lacking avicularia and frontal ascopore.

Gordon and Hasting (1979) grouped (I): the crustose species with tubular pore-chambers and lacking zoeciules under *Celleporella* and (II): uniserial species with rounded and/or conical pore-chambers and frecuently having zoeciules in *Hippothoa*. They proposed in addition a (III): third genus, *Plesiothoa* for species having schizoporelloid ancestrulae, uniserial to loosely pluriserial zoaria and a gizzard in the fore gut. This last character will prove its utility when all recent species will be tested for a gizzard; so its validity at present is relative. This arrangement and the species (known at that time) *sensu* Gordon & Hastings (op. cit.) is transcribed hereinafter:

I: genus *Hippothoa* Lamouroux, 1821: *distans*, *divaricata*, *flagellum*.

II: genus *Celleporella* Gray, 1848: *annularis*, *aporosa*, *bathamae*, *bougainvillei*, *brongnartiana*, *buskiana*, *cancer*, *cornuta*, *delta*, *discreta*, *expansa*, *hyalina*, *kerguelenensis*, *patagonica*, *pellucida*, *santacruzana*, *tongima*, *tuberculata*

III: genus *Plesiothoa* Gordon & Hastings, 1979: *abstersa*, *gigerium*, *trigemma*.

In 1980, Morris proposed several new genera created specially for fossil forms. *Tecatia* was defined as an *Hippothoa*-like taxon lacking male and female zooids. In addition, the genus *Atacama* was proposed for Miocene fossils from northern Chile. *A. foramina*, its type species, closely agree with compact zoaria of the recent *Hippothoa dorbignyana* Viviani (see Pl. V. fig. TL) and *Plesiothoa coquimbana* Moyano & Gordon (Pl. IV). As *A. foramina* shows the peripheral pores of these an other recent Hippothoan species from northern Chile and considering that Morris (1980) pointed them out as fundamental in defining *Atacama*, it is here considered congeneric with *P. coquimbana* and *H. dorbignyana*. Thus *A. foramina* should be put into *Plesiothoa* s.l.

It is now necessary to reevaluate this arrangement in the light of new data referring principally to ancestrulae and early astogeny. A monothetic analysis of the south eastern Pacific Hippothoidae plus other recent and fairly well-known species yields the following groups and subgroups (the subgeneric names are not included in species names):

I. Tatiform ancestrula-bearing species
Uniserial: *Celleporella chiloensis, C. patagonica* and *Hippothoa distans*.
Pluriserial: *Celleporella yagana.*

II. Kenozooidal ancestrula-bearing species
Uniserial with known ancestrula:
Hippothoa flagellum, H. calciophilia; H. divaricata pacifica.
Uniserial with unknown ancestrula:
H. peristomata.

III. Schizoporelloid ancestrula-bearing species.

Uniserial to loosely pluriserial gizzard-bearing species:
Plesiothoa australis; P. gigerium; P. trigemma.

Uniserial to loosely pluriserial supposed to have a gizzard:
P. coquimbana.
Uniserial with known ancestrula supposed to lack a gizzard:
H. dorbignyana; H. divaricata.

Uniserial with unknown ancestrula supposed to lack a gizzard:
H. minitumulosa; C. expansa Celleporella vivianii sp. n.

Pluriserial, unilaminar, with asymmetrical ancestrular budding and spiral early astogeny:
C. chilina; C. concava; C. santacruzana; C. cornuta.

Pluriserial, bilaminar, with asymmetrical ancestrular budding and spiral early astogeny:
Celleporella hyalina; C. uberrima sp. n. C. retiformis sp. n.

Pluriserial, with symmetrical or nearly so ancestrular budding giving off two latero-distal zooids:
C. bougainvillei; C. bathamae; C. tongima C. discreta; C. delta; C. antarctica; C. muricata; C. carolinensis.

IV. Uniserial species lacking gonozooids.
Tecatia sinaloensis.

The Chilean species fit into the first three groups. The less represented is the second, containing only *H. flagellum*, but this group has other three in the South Western Pacific (Gordon, 1984). The whole Chilean Hippothoan fauna is shown in fig. 1 in a visual key. The early astogeny and some other features pertaining to these species and not illustrated in the photographic plates are depicted in fig. 4.

The groups appearing in fig. 1 do not fit exactly in the extant genera indicated above. Thus in *Hippothoa sensu* Gordon and Hastings, 1979 should be included species having the three known ancestrular types, i. e. *H. flagellum, H. distans* and *H. divaricata*. On the other hand, *Plesiothoa* has been proposed for species having a gizzard in fore gut, schizoporelloid ancestrula, zoeciules and uniserial to loosely pluriserial zoaria. Although the gizzard is still unknown in *H. dorbignyana* and *P. coquimbana* they were included in this genus (Moyano & Gordon, 1980). Nevertheless, this generic grouping seems to be more natural than *Hippothoa* to include all known species with schizoporelloid ancestrula and a similar zoarium in spite of zoeciules are wanting in *Plesiothoa coquimbana* and *P. australis*. These two species plus *H. dorbignyana* from northern Chile, *H. gigerium* from the British Isles and *H. trigemma* from New Zealand have in common a female zooid with an oecial aperture not too different from the autozoecial one. The five also exhibit a suboral fenestra (that is, a hole proximal to the orificial sinus) (See Ryland & Gordon, 1977, and the plates of this paper).

Celleporella based on *C. hyalina* as the type species is the more specious, genus with, at least, nine species in the South Eastern Pacific. On the way the ancestrulla buds, two groups are distinguished: the *bougainvillei*-like species whose ancestrula gives off two laterally

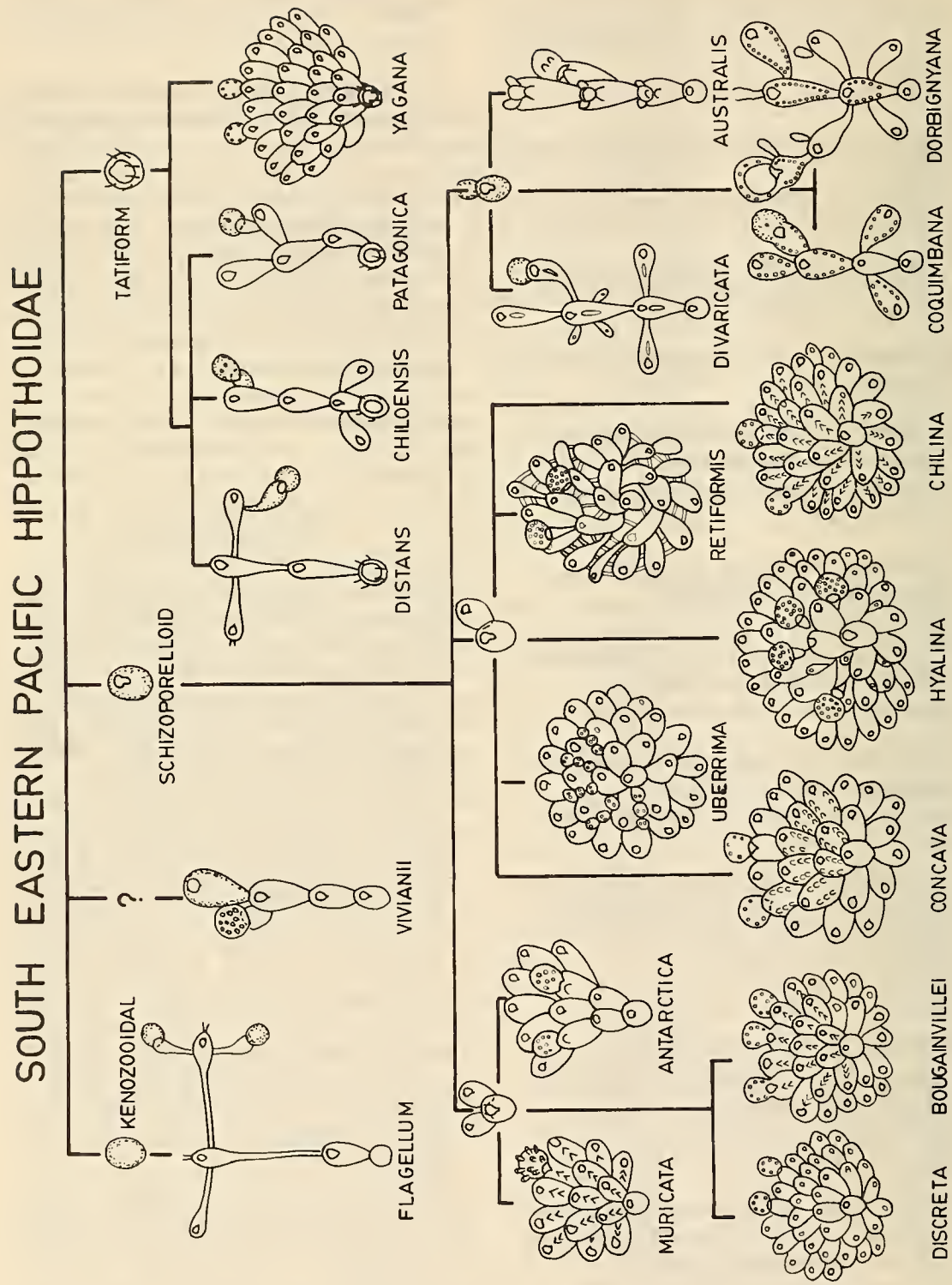

Fig. 1. Pictorial Key of the south eastern Pacific Hippothoidae.

directed distal first zooids and the *hyalina*-like group of species whose ancestrula gives but one latero-distal zooid. The latter shows spiral early astogeny instead of the more symmetrical astogeny of the former. In addition, the *hyalina*-group proves to be formed of two subgroups: one of unilaminar and less specialized species including *concava* and *chilina* and another gathering *uberrima* sp. n., *retiformis* sp. n. and *hyalina*. The latter containing bilaminar specialized taxa is characterized for the large quantity of gonozooids increasing from *C. retiformis* to *C. uberrima* sp. n. These two large groups within *Celleporella* might be considered as two cosmopolitan subgenera.

Does *yagana* belong to *Celleporella?* If the ancestrula is given a large weight, then it would not. Nevertheless, it has a pluriserial zoarium and tubular porechambers as all celleporellids discussed above. But, on the other hand, 1) it seems to produce no male zooids in spite of the many produced by the other eight celleporellids; 2) its ancestrula buds only one distal zooid differing from the "bilateral" or unilateral distal budding of the celleporellids *s. str.*

Do *C. chiloensis, C. patagonica* and *H. distans* form a natural group with *C. yagana?*. If the tatiform ancestrula is supposed to be the principal and fundamental character indicating a common ancestor then they do. But if the zoecial structures are compared many fundamental differences appear. *C. chiloensis* and *C. patagonica* exhibit the same type of female gonozooid, which is smaller than autozooids. Also the ovicellar aperture is very different from the autozooidal ones, being in this respect similar to the apertures of the *hyalina*-like complex; *H. distans* instead, shows zoeciules as those of *H. divaricata*, and female gonozooids similar to autozooids both in size and zoecial apertures. With the exclusion of the tatiform ancestrula these four species seem to form three groups. The place of *C. vivianii* sp. n. seems to be near or close to *C. patagonica* and *C. chiloensis* in spite of the information wanting on its ancestrula. The principal character separating *C. vivianii* from the other two is the evenly perforated ovicell.

Many of the characters of *H. flagellum* and similar species recently described by Gordon (1984) appear to be of apomorphic nature in comparison with those of the other unilaminar tatiform ancestrula-bearing species. These are: 1) the reduction of the ancestrula to its minimum state, the kenozooidal one; 2) the decrease of zoecial size seems to cause the communication pores to be reduced in turn, to one distal and two lateral; 3) the small female zooids and 4) its very long and thread-like zoecial caudae. As *Hippothoa* was founded on *H. flagellum*, then this genus should be reserved to the *flagellum*-group. However, the position of *H. divaricata* appears to be closer to the *Hippothoa* group than *yagana* to *Celleporella*. It agrees with the *Hippothoa* group in the zoarial form, the thread like caudae and in the condile-bearing female apertures. It is here envisioned as a more generalized species in comparison with the other four. But it also agrees with *Plesiothoa* in the suboral fenestra and in having zoeciules. Its fore gut is not known to have a gizzard. If this were the case it should be part of *Plesiothoa*, but in the present state of knowledge it seems to fit better in *Hippothoa*. As a whole, *H. distans* seems to be evolutively one step lower than *H. divaricata*. It has the same general characters of *divaricata*, having a tatiform ancestrula instead. In the progression of this uniserial species having condilate oecial orifices, *distans* looks as the more primitive, for its female zooids are not reduced in size and its plesiomorphic ancestrula. Considering this, it should also be part of *Hippothoa*.

Four species remain to be put in a generic group. The three Chilean species *C. vivianii* sp. n., *C. chiloensis* and *C. patagonica* agree in having reduced, wide aperture-bearing female zooids, and a reduced -if actually present- cauda. A tati-

form ancestrula common to the last two, buds distally or latero-distally as two of the three groups in fig. 1. For its situation in the classification scheme two solutions are possible. One is to create a new genus and the other is to include them in an extant one. The first solution is not convenient beacause no information on the ancestrulla of *C. vivianii* exists; the second is to consider them as an independent group within *Celleporella* on the basis of the specialized female zooids. The fourth species *C. yagana* does not need a genus of its own, but it could form another independent group inside *Celleporella* close to the *C. bougainvillei* complex.

The discussion of the precedent paragraphs suggests the following supraspecific taxa:

THE RECENT HIPPOTHOAN GENERA AND SUBGENERA

1. Genus *Hippothoa* Lamouroux, 1821

Type species *H. flagellum* Lamouroux.

Diagnosis: As in Gordon & Hastings, 1979: 576; plus: ancestrula mostly kenozooidal but also schizoporelloid or tatiform.

2. Genus *Plesiothoa*, Gordon & Hastings, 1979.

Type species *H. gigerium* Ryland & Gordon, 1977.

Diagnosis: As in Gordon & Hastings, 1979; 577. It also includes the genus *Atacama* Morris, 1980.

3. Genus *Celleporella* Gray, 1848.

Type species *Cellepora hyalina* Linné, 1767.

Diagnosis: As in Gordon & Hastings, 1979.

It is here proposed to divide this genus in the four following subgenera:

3a. Subgenus *Celleporella*

Type species: *Cellepora hyalina* Linné, 1767.

Diagnosis: Zoarium pluriserial, unilaminar, bilaminar or loosely pluriserial. The ancestrulla buds one distolateral first zooid. Early astogeny spiral.

3b. Subgenus *Antarctothoa* subgen. n.

Type species: *Escharina bougainvillei* d'Orbigny, 1847.

Diagnosis: Zoarium pluriserial and unilaminar. The ancestrula buds two disto-lateral symmetrical or subsymmetrical first zooids.

3c. Subgenus *Neothoa* subgen. n.

Type species: *Hippothoa patagonica Busk, 1859.*

Diagnosis: Zoarium uniserial. Female zooids reduced, female aperture with a wide sinus, lacking condiles. Ancestrula tatiform.

3d. Subgenus *Austrothoa* subgen. nov.

Type species: *Celleporella yagana* Moyano & Gordon, 1980.

Diagnosis: Zoarium pluriserial. Female zooids not very different from autozooids. Ancestrula tatiform.

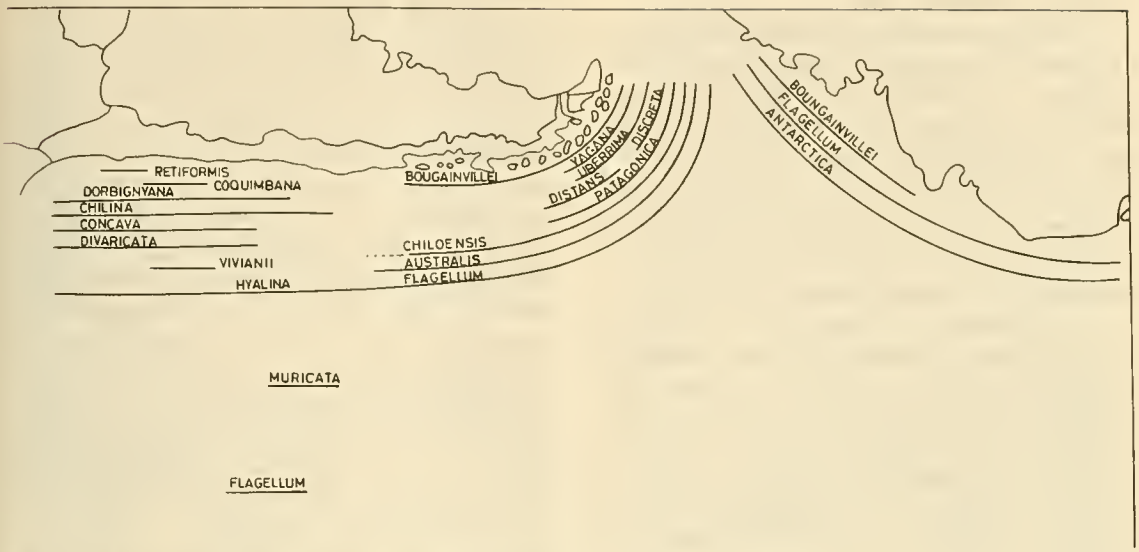

Fig. 2. Geographical distribution of the South Eastern Pacific Hippothidae.

C. ZOOGEOGRAPHY

In a previous work Moyano (1983), divided the Chilean coasts on the basis of its bryozoofauna in four provinces: 1) Chilena, from 18° S to 42° S; 2) Magallánica, from 42° S to 56° S; 3) Juan Fernández including Juan Fernández Archipiélago and San Félix and San Ambrosio Islands and 4) Pascua, including Easter and Sala y Gómez Islands. When this zoogeographical scheme was proposed, the Hippothoidae were imperfectly known. Then it seems worth to know if this scheme continues to be valid when Hippothoan species are included as revised herein. In Fig. 2 the latitudinal range of these species along the western South America and along the Antarctic Peninsula coasts is presented. The analysis of this figure clearly shows that the Hippothoan Fauna is at present divided in four zoogeographical units:

1) A northern Chilean Hippothoan Fauna composed of *Celleporella (C.) retiformis* sp. n., *C. (C.) chilina, C. (C.) concava, C. (N.) vivianii* sp. n., *Plesiothoa coquimbana, P. dorbignyana, H. Divaricata,* plus the so-called cosmopolite *C. (C.) hyalina* and *H. flagellum*. According to Viviani (1977) and with the exception of the last two, *C. (C.) chilina* is the only to reach Concepción Bay (37° S).

2) A southern species group comprising eight species: *Celleporella (A.) bougainvillei, C. (A.) yagana, C. (C.) uberrima* sp. n., *C. (N.) chiloensis, C. (N.) patagonica, C. (A.) discreta, H. distans* and *Plesiothoa australis*. The latter was originally found in Mocha Island (38° S) and New Zealand (Moyano & Gordon, 1980) and recently in Puerto Deseado (south Argentinian coast; López-Gappa, 1985). Thus, it is assumed that it extends from Mocha Island to the south.

3) In Juan Fernández islands has been found only *C. (A.) muricata* which is also present in Kerguelen islands (Morris, 1980).

4) From Easter Island it is at present known only *H. flagellum*.

These four grups partially confirm the previous zoogeographical scheme. Juan Fernández has a single apparently relictual species. It is also present in the very isolated -in relation to Juan Fernández- Kerguelen Archipelago. The presence of *H. flagellum* in Easter Island does not define a special fauna for this island because of the extreme distribution of this

species (Gordon, 1984).

If the quasi-cosmopolitan *C. (C.) hyalina* and *H. flagellum* are excluded, the southern and northern groups along the Chilean coast seem not to overlap. Thus, the southernmost known limit of a northern species *C. (C.) chilina)* is Concepcion Bay, and the northernmost known limit of a southern species *(P. australis)* is Mocha Island. This pattern of distribution is somewhat different from the more generalized one along the Chilean coast, in which the northern and southern elements overlap south to Concepción and diverge at about 40° -42° S. It is, however, possible that future research will demostrate the existence of the overlap of both southern and northern Hippothoan faunas what has been clearly evident for most of the other zoological groups. (Brattström & Johanssen, 1983).

Along the Antarctic peninsula, and probably around the whole Antarctic Continent there exist at least three species: the Magellanic *Celleporella (A.) bougainvillei*, the cosmopolitan *H. flagellum* and the endemic *C. (A.) antarctica*. The latter with a schizoporelloid ancestrula giving off two distally diverging first zooids belongs to the *C. (A.) bougainvillei* complex, which is fairly represented in an apparently circumsubantarctic belt. This demostrates that the Antarctic Hippothoan Fauna is proportionally poorer than the Magellanic one, and evidently more related with the subantarctic *C. (C.) bougainvillei* complex.

D. THE SOUTH EASTERN PACIFIC TAXA

1. *Hippothoa distans* MacGillivray, 1869
Fig. 3.

Hippothoa distans MacGillivray, 1869:30
Hippothoa distans: Hastings, 1979: 542, fig. 4, A-E.; Gordon, 1984: 110, fig. 10B, Pl. 42,D-H.
Hippothoa aruensis Morris, 1980:25, figs. 6, 34; pl. I, 3,4,6.

Diagnosis: Colony encrusting, unilaminar, uniserial. Zooids caudate, tending to have paralell lateral sides; aperture longer than wide with a wide V-shaped sinus; two pairs of lateral pores; frontal wall smooth. Female zooids budded laterally, as large as autozooids, having an aperture similar to that of autozooids but wider; a suboral fenestra; ovicell prominent with three or nearly so fronto-apical pores. Zoeciules budded off laterally from proximal pore-chambers of both autozooids and female zooids. Ancestrula tatiform with an opesia proportionally larger than those of *C. (A). yagana* and *C. (N.) patagonica.*

Material examined: Several ancestrulae and young colonies apparently belonging to this species from southern Chile, and now lost.

Remarks: Some years ago this author found a sample from southern Chile containing tatiform ancestrulae budding distally one hippothoan-like zooid. In addition there were in the sample adult colonies with *H. distans*-like or *H. flagelllum*-like zooids. Unfortunately the samples are now lost, but some sketches remained. Then it is possible to hipothesize the existence of this species in the South Eastern Pacific or the presence of a new species of the tatiform ancestrula-bearing species complex. The remaining drawings (Fig. 3) show an elongated tatiform ancestrula with two to four distal spines. These features make this ancestrula different from the other known hippothoan ancestrulae, but in the absence of the samples, it is not possible to propose a new species formally. Considering that species features vary geographically, it is also possible that the observed ancestrulae might correspond to *H. distans.*

Distribution: Australia to Indonesia according to Gordon, 1984, and probably in the South Eastern Pacific.

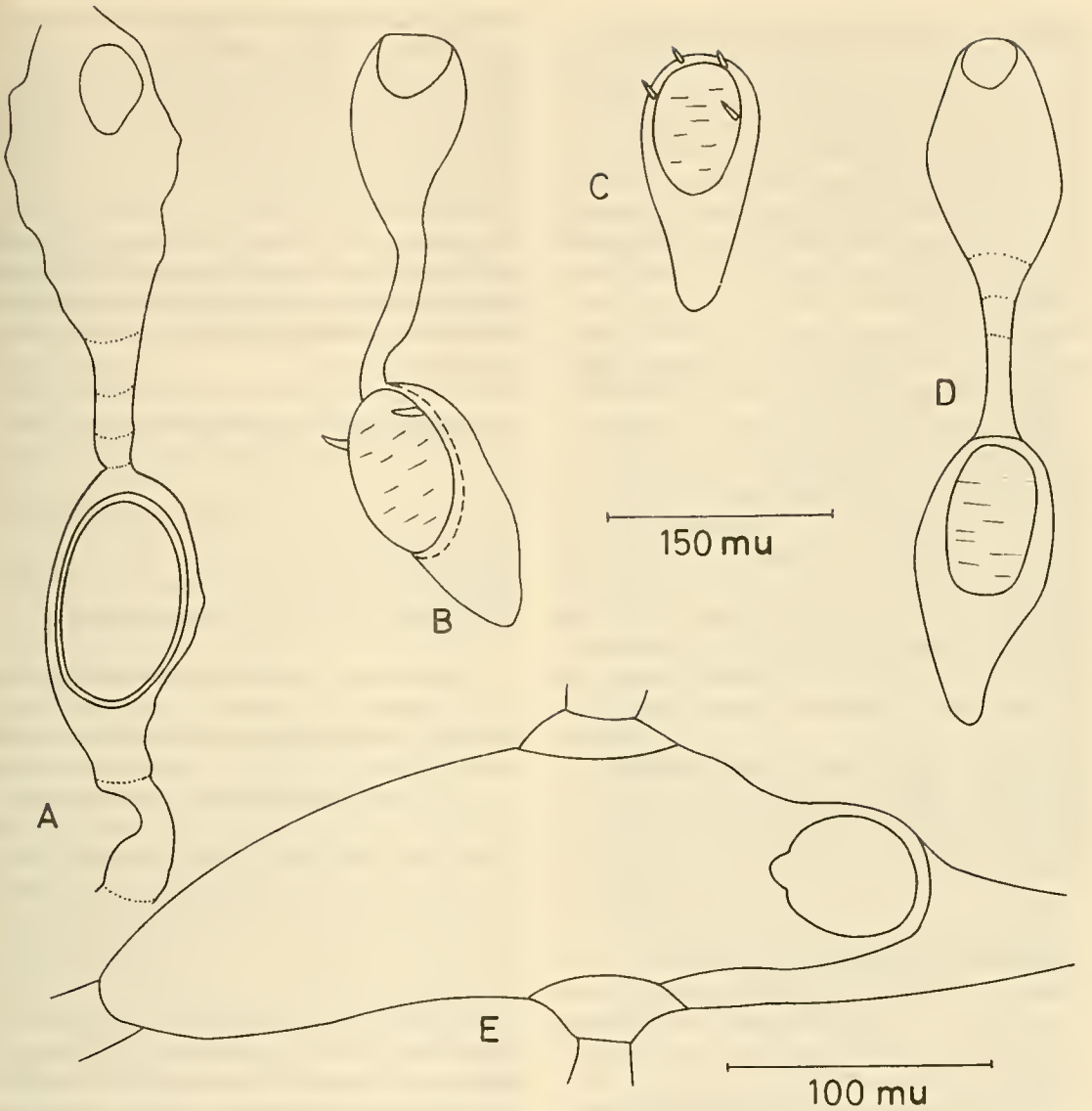

Fig. 3. *Hippothoa distans ?* A. tatiform ancestrula without spines giving off two opposite autozooids; B. tatiform ancestrula budding the first distal zooid; C. elongate pyriform ancestrula with four spines; D. tatiform ancestrula and first zooid; E. adult zooid with two lateral porechambers.

2. *Hippothoa divaricata* Lamouroux, 1821 Pl. I.

Hippothoa divaricata Lamouroux, 1821:82, pl. 80, figs. 15, 16.
Hippothoa divaricata: Ryland & Gordon, 1977: 19, figs. 1, 2 B,C *(Cum synonymia).*
Hippothoa divaricata: Viviani, 1977:41, figs. 1, J, K; Pl. I, 2, 3. (*Pars*).

Diagnosis: Zoarium encrusting uniserial, ramified, forming an open network. Zooids elongate with a variable slender cauda; zoecial aperture longer than wide with a V-shaped sinus and condiles; a central suboral keel in autozooids and female zooids; lateral pore-chambers two to more on each side. Female zooids as large as autozooids; its aperture slightly

wider but with a similar sinus and condiles, originated laterally from autozooids or more rarely from other female gonozooids. Male zooids or zoeciules originating laterally from autozooids or gonozooids, little wider than zoecial caudae; having an oval aperture. Ancestrula schizoporelloid having an aperture similar to that of autozooids; its first bud is distal and symmetrical.

Material examined: Several zoaria encrusting a scallop shell coming from Caldera, Northern Chile.

Remarks: This species can be differentiated from *P. dorbignyana* and from *H. flagellum* in the frontal keel always present. It differs from *H. flagellum* in having more than one lateral pore per zooid and for its less marked cruciform lateral budding. Viviani (1977) states that this species is common along the Chilean coast. This should be rejected because he included more than one species under *divaricata*. His fig. 3 in pl. 3 actually illustrates the zoarial pattern of *P. coquimbana* Moyano & Gordon and the female gonozooids of *H. flagellum*. On the other hand, he indicates that *H. divaricata* is very common in the austral fiords, a distribution shared with other two species with a similar zoarial habit, *C. (N.) chiloensis* and *C. (N.) patagonica*. These two species have tatiform ancestrulae instead of the schizoporelloid one of *H. divaricata*.

Gordon (1984) proposed a new subspecies of *H. divaricata* from the western Pacific. *H. divaricata pacifica* Gordon 1984 has fewer, more conical porechambers and a kenozooidal ancestrula. If our schizoporelloid ancestrula-bearing specimens are actually *H. divaricata*, then Gordon's subspecies should be raised to the species rank, joining to other uniserial species having a kenozzoidal ancestrula: *H. flagellum, H. calciofilia* and *H. peristomata*. In order to definetively solve this problem it would be necessary to discover and describe the ancestrula in the European specimens of the typical *H. divaricata* Lamouroux.

It is provisionally suggested that eastern and western South Pacific *H: divaricata* are different species. If the European material has schizoporelloid ancestrulae, *H. divaricata pacifica* Gordon should be named *H. pacifica*.

Distribution: Northern Atlantic, Mediterranean Sea, eastern coasts of North America (Ryland & Gordon, 1977). Typically atlantic in distribution *sensu* Gordon, 1984. Eastern South Pacific acording to our records.

3. *Hippothoa flagellum* Manzoni, 1870
Pl. II

Hippothoa flagellum Manzoni, 1870:328, pl. 1, fig. 5.
Hippothoa flagellum: Ryland & Gordon, 1977, figs. 2A, 3 *(Cum synonymia)*.

Diagnosis: Zoarium unilaminar, uniserial, delicate, forming a widely open net. Zooids elongate-pyriform with a long thread-like cauda which accounts for more than two thirds of the zoecial length; zoecial aperture horizontal, with a wide and somewhat deep U-shaped sinus, laterally flanked by tiny condiles. Two lateral pore-chambers causing the cruciform pattern of budding of autozooids or gonozooids. Female gonozooids shorter than autozooids; ovicell imperforate; female aperture wider than long with a very shallow sinus showing two tiny condiles. Male zooids or zoeciules sometimes present, as wide as cauda but shorter with an elongated frontal aperture. Ancestrula kenozooidal, lacking aperture, budding symmetrically the first distal zooid. This lacks the typical cauda of normal autozooids.

Material examined: One colony encrusting the expanded base of a zoarium of *Hornera* sp. from Madre de Dios Archipielago; three incomplete zoaria encrusting the basal side of *Phylactellypora lyrulata* from Antarctica; several zoaria encrusting the valval furrows of a *Plagioctenium* sp. shell from Caldera, and two zoaria encrusting the "dorsal"

side of a coral blade from Easter island.

Remarks: The specimens studied closely agree with the description of this species by Ryland and Gordon (1977). The cauda is variable in lenght depending on the availability of space. Specimens from Caldera show short caudae due to its development into the furrows of a scallop shell. However, the kenozooidal ancestrula, the cruciform pattern of growing and the typical gonozooids identify this species.

Distribution: According to its more recent revisor (Gordon, 1984) this species inhabit waters of New Zealand, Southern Australia, North Sea (Norway and Britain), Western Atlantic from Cape Hatteras to Brazil, Eastern Atlantic (Azores and West Africa). According to this report it also inhabit the Eastern Pacific from Northern Chile to the Antarctica and also Easter Island.

4. *Plesiothoa australis* Moyano & Gordon, 1980

Pl. III.

Plesiothoa australis Moyano & Gordon, 1980:76, fig. 1 A-M, 2 A-E.
Plesiothoa australis: López-Gappa, 1985:54, Fig. 4-6.

Diagnosis: Zoarium encrusting algae, uniserial to loosely pluriserial. Zooids ovate to elongate pyriform, very convex, with up to five lateral marginal pores; zoecial aperture horseshoe-shaped, with a prominent proximal V-shaped sinus and strong condiles; a suboral fenestra proximal to the sinus is generally present; oral area produced in a kind of peristome with lateral ear-like extentions. Female zooids slightly smaller than autozooids, having a prominent suboral umbo and frecuently a bimucronate imperforate ovicell. Male zooids or zoeciules apparently wanting. Ancestrula longer than wide with orifice and oral area similar to those of autozooids; budding distal and symmetrical.

Material examined: The type material (MZUC 9911, 9912) consisting of zoaria with ancestrula encrusting small algae, and hundreds of zooids washed off singly from algae.

Remarks: Except for the absence of lateral pore-chambers, the ancestrula resembles exactly the autozooids. It also has the lateral orificial lappets and the suboral pore. It does not develop, however, the prominent umbo of autozooids and female zooids. Ovicells frequently develop a pair of frontal umbos which are also present in New Zealand material (Moyano & Gordon, 1980) and in Ría Deseado Argentine (López-Gappa, 1985).

This austral species and the northernmost *P. dorbignyana* and *P. coquimbana* have in common a similar ancestrula several lateral pores per zooid, a blunt V-shaped sinus and a suboral fenestra. Only *P. australis* is known to have a gizzard and it is likely the other two have the same structure. If this is the case, then all three should be included in genus *Plesiothoa*.

Distribution: Mocha Island in southern Chile and New Zealand (Moyano & Gordon, 1980) and Ría Deseado in the southern Argentinian coast (López-Gappa, 1985).

5. *Plesiothoa coquimbana* Moyano & Gordon, 1980

Pl. IV.

Plesiothoa coquimbana Moyano & Gordon, 1980:80, Fig. 3A-G.

Diagnosis: Zoarium encrusting, uniserial and unilaminar. Zooids convex, bulging, elongate pyriform with a moderate developed cauda; no frontal umbos; zoecial aperture longer than wide with a relatively wide U-shaped sinus; a suboral fenestra typically present; with generally five pairs of conical and round lateral pores on a moderately developed margin. Female zooids budded laterally or distally from autozooids and rarely from other female zooids; female aperture similar to that of autozooids; ovicell typically smooth with one medial frontal

opening and other marginal ones. Male zooids or zoeciules apparently wanting. Ancestrula schizoporelloid which buds distally and symmetrically the single first zooid. This in turn gives off three buds, one distal and two proximo-lateralley directed.

Material examined: The holotype (MZUC 9916) and the paratypes (MZUC 9917) which encrust *Austromegabalanus psittacus* shells coming from Cruz Grande in northern Chile. Other zoaria from Guanaqueros growing side to side with *P. dorbignyana, C. (C.) hyalina, C. (C.) chilina* and *C. (C.) concava.*

Remarks: This species is closely allied to *P. dorbignyana* from which differs in 1) the smaller development of the lateral body extention, 2) the larger lateral pores in autozooids and female zooids, 3) the apparently missing zoeciules, 4) the early astogeny in which the first zooid buds off three instead of five secondary zooids. *P. coquimbana* was considered to have a gizzard but without dissecting zooids to demonstrate it (Moyano & Gordon, 1980). It was included in *Plesiothoa* on the basis of an apparently similar structure. The hard parts of both *P. coquimbana* and *P. australis* actually show the following similarities: 1) uniserial to loosely pluriserial zoarium, 2) generally five pairs of lateral pores, 3) suboral frontal pore or fenestra, 4) almost identical structure of female zooid and autozooid apertures, 5) schizoporelloid ancestrula giving off one single distal symmetrical first zooid. Although having these similarities they differ in the following structures: 1) frontal and ovicelar umbos present only in *P. australis*; 2) the triradiate pattern of the early astogeny in *P. coquimbana*, 3) the latero-oral lappets of the ancestrula and zooids exclusive of *P. australis*, 4) the more developed cauda in *P. coquimbana*, 5) the association of *P. australis* with algae in Chile, Argentine and New Zealand (Moyano & Gordon, 1980; López-Gappa, 1985).

Distribution: Known only from Guanaqueros to Cruz Grande in northern Chile.

6. *Plesiothoa dorbignyana* (Viviani, 1977)
Pl. V, VI; Fig. 4, H.

Hippothoa dorbignyana Viviani, 1977:42, fig. 1, L-M; pl. I,4; pl. II 9A,9B.

Diagnosis: Zoarium encrusting, uniserial to loosely pluriserial, tortuose, irregularly ramified and highly variable both zooidally and zoarially. Zooids variable in lenght and width, generally with a cauda wide or filiform depending on the substrate and available space; cauda and zoecial body extended laterally in a wide rim which shows a conspicuous series of more than five lateral external pores, communicating with pore-chambers; zoecial aperture with a V-shaped sinus, a proximal ascoporiform fenestra and condiles. Female zooids as large as autozooids or slightly wider, with a shorter cauda and the wide rim and aperture similar to those of autozooids; ovicell somewhat spheric and also with the expanded rim and periferic pores. Male zooids or zoeciules very small and as wide as caudae, with an elliptic aperture closed by an operculum; they are laterally budded from autozooids or female zooids or from the marginal pores of ovicell. Female zooids terminal or not; frequently they bud laterally or distally female zooids, autozooids and/or zoeciules. Ancestrula schizoporelloid that buds distally and symmetrically the first zooid.

Material examined: Many colonies collected between Guanaqueros and Arica in Northern Chile, encrusting rocks and shells.

Remarks: This is a highly variable species with a wide zoecial rim as its author clearly stated in the original description. Although zoarial and zoecial pattern change among specimens some characters stand always present, these are: the wide to very wide margin, the V-shaped sinus, the globular ovicell laterally expanded and the series of lateral holes around the zoecial body and cauda of both autozooids and gonozooids. The cauda is highly variable in length measuring from

one third to several times the zoecial length; it is also variable in width looking sometimes almost as wide as the zoecial body. When describing this species, Viviani stated that the female gonozooid was terminal and conical with an ovicell wider than long, but this is also highly variable. Thus, if Fig. 4 H is examined, many female zooids look like as autozooids budding the three types of zooids in the colony. Male zooids are lateraly found on autozooids or gonozooids, but also along the caudae connecting zooids laying very much appart.

P. dorbignyana differs from *H. divaricata* in its more robust construction, the wider rim and the many lateral pores surrounding its zooids. It can be confused, however, with *P. coquimbana* in having a similar zoarial pattern; nevertheless, they differ in the zoecial pattern and in the lesser variability of *P. coquimbana*.

Distribution: From Central Chile to Arica and probable southern Peru according to ours and Viviani's (1977) records.

7. *Celleporella (Neothoa) chiloensis* Moyano, 1982.
Pl. VII; fig. 4, C, D.

Celleporella chiloensis Moyano, 1982:95, fig. 3, J,K.L.

Diagnosis: Zoarium encrusting, uniserial to loosely pluriserial. Zooids elongate-pyriform, white, more opaque than translucent, with fine growth lines; zooidal cauda variable in lenght and presence according to space availability; zoecial aperture longer than wide, with a V-shaped sinus flanked by condiles. Female gonozooids laterally budded and terminal, smaller than autozooids; its aperture much longer than wide with a very wide and shallow proximal sinus; ovicell hemispheric having two or three small frontal pores. Male zooids or zoeciules apparently wanting. Ancestrula tatiform having two distal and two proximal tiny spines; it buds distally and symmetrically the first zooid, which in turn can bud two laterally directed zooids and also the distal one.

Material examined: The holotype and several paratypes (MZUC 7112) from Castro, Chiloé Island having compact zoaria growing inside a large volutid shell. Several dendritic and widely open zoaria encrusting a large rock from Puerto Toro in Navarino Island. Two small zoaria and several ancestrulae just settled inside a mytilid shell, coming from the outer edge of the continental shelf near Río de La Plata, Argentina.

Remarks: This species can be confused with *C. (N.) patagonica* due to the similar zoecial pattern, but they can be distinguished by the early astogeny. The ancestrula of *C. (N.) chiloensis* is longer than wide and provided with only four marginal spines; the one of *C. (N.) patagonica* instead is almost circular with a proportionally smaller opesia bordered by six spines. The first zooid in *C. (N.) patagonica* is latero-distally budded, whereas it is distally and simmetrically budded in *C. (N.) chiloensis*. The known zoaria from Chiloé Island belonging to *C. (N.) chiloensis* differ from those from Navarino Island in developing no cauda and budding female gonozooids closely applied to the distal neighbouring zooid. Caudae in zoaria from Navarino Island are conspicuously developed making them to look as a different species, but the ancestrula and the early astogeny is the same as in those from Chiloé. The specimens from near Río de La Plata are morphologically allied to those of Chiloé Island both zoarially and ancestrularly.

Distribution: Around southern South America from Chiloé Island to Río de La Plata.

8. *Celleporella (Neothoa) patagonica* (Busk, 1852)
Pl. VIII.

Hippothoa patagonica Busk, 1852:30, pl. 27, 1.
Celleporella patagonica: Moyano & Gor-

don, 1980:82, figs. 4A-I, 6A. *(Cum Synonymia)*. López-Gappa, 1985: 58, figs. 14-15.

Diagnosis: Zoarium encrusting, uniserial, to loosely pluriserial. Zooids elongate-pyriform, hyaline, with marked growth lines; zoecial aperture with U-shaped sinus flanked by tiny condiles; two to four lateral pore-chambers. Female zooids shorter than autozooids, curvate-conical; ovicell rounded having a much wider than long aperture; apertural ovicellar sinus slightly marked. Male zooids or zoeciules apparently lacking. Ancestrula tatiform having a rounded opesia bordered by six spines; first zooid budded latero-distally which buds symmetrically or asymmetrically producing an irregularly uniserial dendritic colony.

Material examined: More than ten zoaria growing on algae collected in the Magellan Strait.

Remarks: The early stages of this very characteristic species can be confused with those of *C. (A.) yagana* because both have an almost identical ancestrula both in form and number of spines. They differ, however, in the way they bud: *C. (A.) yagana* produces a distal symmetric zooid instead of a distolateral one as does *C. (N.) patagonica*. The zoarial series of *C. (N.) patagonica* may be close or appart depending of the space availability. Its possible confusion with *C. (N.) chiloensis* has been already discussed under this last name.

Distribution: Southern Chile (Moyano & Gordon, 1980); Patagonian coasts of Argentina (López-Gappa, 1985).

9. *Celleporella (Neothoa) vivianii*
sp. n.
Pl. IX.

Diagnosis: Zoarium uniserial to loosely pluriserial encrusting rocks. Zooids elongate, apparently with a short to very short cauda; moderately convex, slightly expanded laterally, with well marked growth lines; zoecial aperture with an U-shaped sinus and small condiles; lateral pores apparently two per zooid. Female zooids conical, shorter than autozooids; its orifice much wider than long, without condiles and with a central very wide shallow sinus; ovicell almost as large as female zooid, its frontal wall evenly perforated by large pores. Male zooids or zoeciules apparently wanting. Ancestrula not found.

The species name is dedicated to C. Viviani who has contributed to the knowledge of this group in Chile.

Material examined: Holotype MZUC 14686, an ovicellate zoarium composed of *ca.* 15 zooids. Paratypes MZUC 14687, several ovicellate zoaria growing on the same rock containing the holotype. This sample comes from an unknown locality in central Chile.

Remarks: This species, *C. (N.) patagonica* and *C. (N.) chiloensis* are closely related having in common, mainly uniserial zoaria, two to four lateral pores per zooid, lateral-budded female zooids and a similar orifice of female zooids. *C. (N.) patagonica* and *C. (N.) chiloensis* mainly differ in ancestrula and both are different in turn from *C. (N.) vivianii* sp. n. in ovicellar structure. They are also allopatric: *C. (N.) vivianii* inhabits the central waters of Chile and the two others the waters south of Chiloé Island. Unfortunately the available samples of *C. (N.) vivianii* sp. n. are devoid of ancestrulae for a better comparison. At first glance, the distinctive traits of the new species are: short and irregular zooids, only two lateral pores per zooid and a perforated ovicell.

Distribution: Central Chile according to the type material.

10. *Celleporella (Austrothoa) yagana*
Moyano & Gordon, 1980
Pl. X.

Celleporella yagana Moyano & Gordon, 1980:87; figs. 5A-H, 6B-C.
Celleporella yagana: López—Gappa, 1985:58, figs. 16, 17.

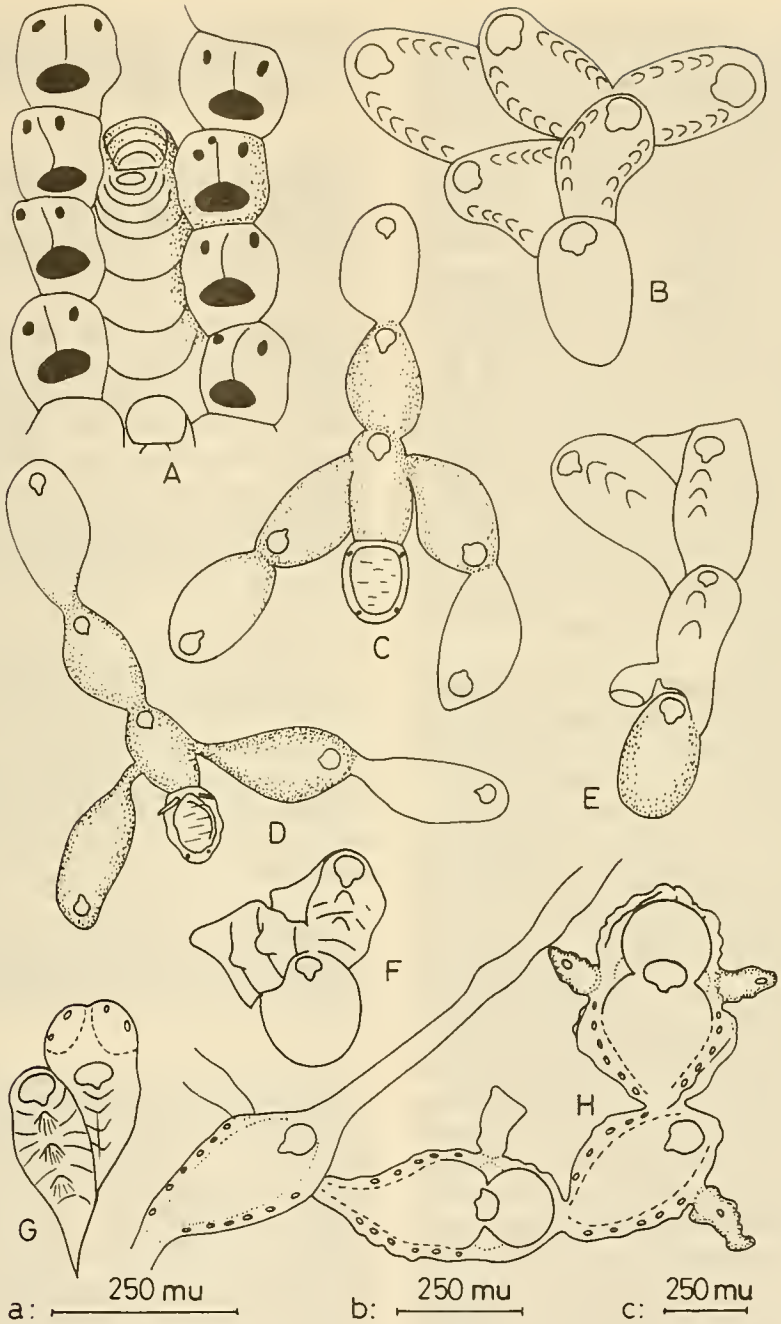

Fig. 4. Early astogeny and some special features of selected south eastern Pacific Hippothoidae.

A. *C. (C.) uberrima* sp. n. two autozoids and interzoecial superimposed small female gonozooids.

B. *C. (C.) concava*. Schizoporelloid ancestrula giving off somewhat irregularly the first zooid.

C. and D. *C. (N) chilocnsis*. Early astogeny starting in the tatiform ancestrula. C is part of type material from Chiloe and D which shows more caudate zooids comes from Navarino Island.

E. and F. *C. (C.) chilina*. Two ancestrulae budding distolaterally the first zooid.

G. *C. (C.) chilina*. Auto and gonozooid showing the frontal umbos.

H. *P. dorbignyana*. The long caudate autozooid at left laterally gives off a female zooid; this in turn buds distally an autozooid; the latter produces two lateral offsprings, the right one is a "male" or zoeciule and the left one a female wich finally gives off two lateral zoeciules.

Diagnosis: Zoarium encrusting, unilaminar, pluriserial, coherent, white to hyaline. Zooids somewhat hexagonal to fusiform, in quincunx, moderately elongated, with growth lines; zoecial aperture with an U-shaped deep sinus and ledge-like condiles; frontal zoecial umbones moderately developed. Female zooids smaller than autozooids budded terminally or latero-terminally, grown in the basal zoarial layer; ovicell longer than wide with lateral holes; oecial aperture much longer than wide with a narrow U-shaped sinus. Male zooids apparently wanting. Ancestrula tatiform having a subcircular opesia encircled by six spines; the first zooid is budded distally and symmetrically, which in turn buds several autozooids producing a pluriserial coherent zoarium.

Material examined: Several colonies growing on red algae collected in the western part of the Magellan Strait. This species grows with *C. (N.) patagonica, C. (C.) hyalina* and *C. (A.) bougainvillei.*

Remarks: For more than a century this and *C. (N.) patagonica* were considered a single species showing a great deal of variation both astogenetically and zoarially (Hastings, 1979; Gordon & Hastings, 1979). Gordon & Hastings, 1979:573, Fig. 9 F, pointed out the duality of the patagonian tatiform ancestrula-bearing bryozoan species, when dealing with *Hippothoa* specimens coming from Puerto Deseado (Argentine). In 1980 Moyano & Gordon described them as *Celleporella yagana.* This species has nothing in common with *C. (N.) patagonica* but the tatiform ancestrula. It is not possible to confuse them except when having single isolated ancestrulae. The first budded zooid gives a clear-cut differentiation between both species: one having an asymmetrical first bud, *C. (N.) patagonica*, and the other a symmetrical and terminal first bud, *C. (A.) yagana.*

Distribution: Pacific and Atlantic waters from the southernmost tip of South America.

11. *Celleporella (Antarctothoa) antarctica* Moyano & Gordon, 1980
Pl. XI.

Celleporella antarctica Moyano & Gordon, 1980:91, figs. 8A-K.
Hippothoa delta Ryland & Gordon: Morris, 1980:21 *(pars)*, pl. 4, fig. 4.

Diagnosis: Zoarium encrusting, unilaminar, pluriserial. Zooids elongated, convex with conspicuos growth lines giving them a wavy surface; zoecial aperture longer than wide, with a deep and moderately wide U-shaped sinus and with bicuspidate condiles. Female zooids with a prominent suboral wide umbo; its aperture much wider than long with a narrow V-shaped sinus; ovicell spheric evenly perforated with *ca,* ten frontal pores. Male zooids uncommon, smaller and more slender than autozooids, vicariously situated or regenerated inside other type of zooids. Ancestrula schizoporelloid, with a produced oral area giving it a lageniform aspect; it buds disto-laterally the first two zooids.

Material examined: Many colonies encrusting *Cellaria vitrimuralis* Rogick (Ross Sea) and *Flustra*-like zoaria (Antarctic Peninsula).

Remarks: This is an abundant antarctic endemic species that has been confused with *C. (A.) bougainvillei* (see Moyano & Gordon, 1980). It can be differentiated, however, by its proportionally smaller zoarial and zoecial size, its unique umbo on female zooids, and its lageniform ancestrula. It has the same early astogeny of *C. (A.) bougainvillei* and *C. delta,* but it is different from the latter in lacking the frontal umbos of autozooids, in having an evenly perforated ovicell and in its early astogeny. The ancestrula of *C. delta* buds two lateral zooids being completely set apart by a third, whereas in *C. (A.) antarctica* the first two zooid coalesce in a half of their total length. On

the other hand, *C. delta* seems to inhabit New Zealand waters and *C. (A.) antarctica* only waters inside the Antarctic Convergence.

C. (C.) antarctica seems to prefer small or ephemerous substrates other than bryozoan colonies to grow. Thus, it has been reported to encrust sponge spicules and the very slender branches of the bryozoan *Filicrisia* sp. (Moyano & Gordon, 1980). It also behaves as an r-selected species in producing very early female gonozooids in very small and young zoaria.

Distribution: Antarctic waters along the Antarctic Peninsula and the Ross Sea (Moyano and Gordon, 1980).

12. *Celleporella (Antarctothoa) bougainvillei* (d'Orbigny, 1847)
Pls. XII, XIII.

Escharina bougainvillci d'Orbigny, 1847:42, pl. 4, figs. 9-12.
Hippothoa bougainvillei: Viviani, 1977:44, figs. 1 A,B; pl. 2, fig. 6.
Celleporella bougainvillei: Moyano & Gordon, 1980:89, figs. 6D-E, 7A-I *(Cum synonymia)*. López-Gappa, 1985: 60, figs. 18-20.

Diagnosis: Zoarium encrusting, unilaminar and multiserial. Zooids elongate hexagonal, closely coherent or slightly discrete; frontal wall having 3 to 6 blunt to pointed umbos; latero-oral spines slightly to highly developed; zoecial aperture varying from U-shaped to omega-shaped depending on the development of latero-proximal condiles. Female zooids, replacing one autozooid in a series, as large as autozooids, having the characteristic frontal umbos; its aperture with narrow and deep U-shaped or omega-shaped sinus; ovicell large, centripetally developed, very convex varying from almost evenly perforated to marginally perforated. Male zooids present, variable in lenght and width in relation to autozooids having a similar aperture but smaller in size. Ancestrula schizoporelloid, wide, budding latero-distally the first zooids; the third budded between the latter does not separate them.

Material examined: Several colonies from diverse sites between Chiloé Island and the Antarctic Peninsula.

Remarks: When describing this species d'Orbigny pointed out its existence, although rare, in Malvinas Islands, that is, in the Magellanic area. Thus, its existence from Chiloé Island to the south and from Tierra del Fuego to the north is common (Moyano & Gordon, 1980; López-Gappa, 1985). It is also present al least in the northern tip of the Antarctic peninsula, where it grows side to side with *C.(A).) antarctica.* Within this large area of distribution many variations in zoecial characters occur. There exist a large variation in development of umbos between populations near Bahía Inútil in the Magellan Strait and others from Navarino Island (See Pls. XII, XIII). Samples from Chiloé Island show slightly developed umbos and a shallow and narrow female aperture sinus. A similar pattern is observed in samples encrusting laminarial algae coming from the Shetland Islands.

This species and *C. (A.) muricata* from Juan Fernández Islands and Kerguelen Archipielago plus *C. delta, C. tongima* and *C. bathamae,* from the New Zealand area and *C. (A.) antarctica* form a complex of closely related species. They all have the same type of ancestrula, which shows a similar budding pattern of the first two zooids. The early astogeny is therefore very similar, varying slightly in the way the two first zooids relate each other (see Ryland & Gordon, 1977, fig. 12; Moyano & Gordon, 1980, figs. 7, 8). Their geographical distributions are also meaningful in the sense they inhabit waters around the Antarctic Continent inside and outside the antarctic convergence. Two other species, *C. holostoma* and *C. cancer* from the New Zealand area would probably integrate this complex. Until

more informations is gathered on soft and hard parts of this complex of species, it is better to mantain them as separate taxa. Then it is possible that in the near future they will be considered as subspecies of *C. (A.) bougainvillei,* the senior species.

Morris (1980) considered *C. (A.) bougainvillei:* Rogick, 1956 as a synonym of *C. delta* Ryland and Gordon, but as Moyano & Gordon 1980 have demostrated, *C. (A.) bougainvillei sensu* Rogick 1956 is actually *Escharina bougainvillei* d'Orb. in part and also *Celleporella antarctica* Moyano & Gordon also in part. On the other and, Morris also included *C. (A.) bougainvillei* in *Eschara annularis* Pallas *(= Celleporella annularis* (Pallas). It is not possible to agree with Morris because *C. annularis* and *C. (A.) bougainvillei* are phenetically diferent and have different zoogeographical distributions: the former from South Africa and the latter from South America and the Antarctica. It is probable they are likely to be related, but there is no information yet on the ancestrula of *C. annularis* and its early astogeny.

Distribution: Magellanic Region *(sensu* Ekman, 1953 and Briggs, 1974), Antarctic Peninsula and probably other subantarctic archipelagos. (Moyano & Gordon, 1980; Rogick, 1956; López-Gappa, 1985).

13. *Celleporella (Antarctothoa) discreta* (Busk, 1854)

Lepralia discreta Busk, 1854:85, pl. 101, figs. 3, 4.
Hippothoa discreta (Busk): Morris, 1980:18, figs. 15, 24.
Celleporella discreta (Busk): López-Gappa, 1985:54, figs. 7-9.

Diagnosis: Zoarium encrusting, unilaminar, pluriserial, discrete. Zooids subcylindric, elongate, frontally undulated instead of umbonated; zoecial aperture with a wide and shallow sinus; zooids separated by lacunae formed between interconnecting zooidal tubes. Female zooids peripheric, vicarious, its aperture with a wide shallow sinus; ovicell having only marginal pores. Male zooides similar to autozooids but smaller. Ancestrulla schizoporelloid which buds disto-laterally the two first zooids; the third zooid is budded distally between the first two.

Material examined: None. This species is at present absent from the collections at MZUC.

Remarks: The diagnosis here included is based on that of López-Gappa, 1985. According to it and the illustrations this author gives, this species belongs to the complex dealt with under *C. (A.) bougainvillei.* Thus is has the typical ancestrula giving off two disto-lateral first zooids. It differs from *C. (A.) bougainvillei* in its wider apertural sinus and the lesser development of frontal umbos.

It is here considered part of the south eastern Pacific Bryozoan fauna because it has been found in Beagle Channel, a seaway south of the Magellan Strait, connecting also the Pacific and Atlantic oceans.

Distribution: Malvinas Islands, South Georgia, Tierra del Fuego Archipelago and the south Argentinian coast (López-Gappa, 1985).

14. *Celleporella (Antarctothoa) muricata* (Busk, 1876).
Pl. XIV.

Lepralia hyalina var. *muricata* Busk, 1867:197, pl. 10, fig. 11.
Chorizopora hyalina var. *bougainvillei* Busk, 1884:148, pl. 22, fig. 4.
Diazeuxia kerguelensis Jullien, 1888:33.
Hippothoa hyalina (L.): Marcus, 1921:102, fig. 5.
Hippothoa muricata (Busk): Morris, 1980:20, figs. 15,27.

Diagnosis: Zoarium unilaminar, pluriserial. Zooids very convex, with several medial umbos and a wavy surface; aperture with a proximal wide U-shaped sinus

and ocasionally latero-distal spines. Female zooids smaller than autozooids replacing an ordinary zooid in a series; its aperture with a narrow omega-shaped sinus; ovicell with tubular hollow extensions giving it a prickled appearence. Male zooids uncommon, smaller than autozooids. Ancestrula schizoporelloid, that buds two disto-lateral first zooids.

Material examined: Several colonies encrusting small pieces of algae coming from Juan Fernández Islands.

Remarks: This is the Juan Fernández species that Marcus (1921) described and illustrated under *H. hyalina*. His fig. 5 is extremely clear in depicting the wavy surface of zooids and the prickled ovicell. The same is valid for the illustration in the **Challenger** report by Busk. Our specimens differ from those described and illustrated by Morris (1980) in having a more wide sinus in autozooids. This seems normal in so widely separated populations, e.g. Juan Fernández Islands and Kerguelen Islands. On the other hand this and *C. (A.) bougainvillei* are closely related as Busk (1884) apparently suspected.

Distribution: Kerguelen and Marion Islands (Morris, 1980). Juan Fernández Islands (Marcus, 1921).

15. *Celleporella (Celleporella) chilina* (d'Orbigny, 1847)
Pl. XV; fig. 4, E, F, G.

Escharina chilina d'Orbigny, 1847, Pl. 4, figs. 5-8.
Hippothoa chilina (d'Orb.): Viviani, 1977:45, figs. E, F; pl. II, 8, 9D.

Diagnosis: Colony unilaminar, pluriserial, coherent. Zooids strongly calcified, extremely convex, triangular in cross-section; frontal wall with a series of medial umbos; zoecial aperture with deep and wide U-shaped sinus and with well developed condiles. Peripheric female zooids shorter than autozooids; its aperture semicircular with a deep, and wide V-shaped sinus; ovicell subsquared or round, very calcified, with a few large marginal pores. Male zooids similar to autozooids but smaller and vicarious. Ancestrula schizoporelloid buds the first zooid latero-distally.

Material examined: Several ancestrulated colonies growing on subtidal rocks in northern and central Chile. They grow together with *C. (C.) hyalina, P. dorbignyana, C. (C) concava* and *C. (N.) vivianii* sp. n.

Remarks: This species is fairly abundant from central Chile to the north. It grows with *C. (C). hyalina,* from which it is quite different in its prickled aspect due to the frontal umbos, the scarce number of peripheral ovicells, the very small zoaria and the deep apertural sinus. Although d'Orbigny's drawings are idealized and somewhat inaccurate, our specimens and those studied by Viviani should belong to this species for the following reasons: 1) original material described by d'Orbigny was collected at Valparaíso, 2) this is the only, species in central and northern Chile having several medial frontal umbos clearly described and depicted by d'Orbigny, 3) Waters' (1905) revision of d'Orbigny's material *(Fide* Viviani, 1977:45) indicated that the ovicell had a few lateral pores as shown by our material.

Distribution: Concepción Bay to Arica (Chile) according to Viviani 1977.

16. *Celleporella (Celleporella) concava* (Viviani, 1977).

Pl. IX. SD,MR,BR; fig. 4, B.

Hippothoa concava Viviani, 1977:45, fig. 1,C-D; Pl. II,7,9C.

Diagnosis: Zoarium encrusting, coherent, unilaminar and multiserial. Zooids roughly hexagonal, wide, very calcified, hyaline to opaque; frontal wall nearly depressed between one or more pairs of fronto-lateral blunt umbos; zoecial aperture with a wide and moderately deep

U-shaped sinus and ledge-like condiles. Female zooids significantly less abundant than autozooids; slightly shorter than autozooids; its aperture wider than long with a wide shallow proximal sinus; ovicell large, longer than wide with a row of large marginal pores. Ancestrula schizoporelloid, budding disto-laterally the first zooid.

Material examined: Several zoaria encrusting stones coming from intertidal or subtidal places between central Chile and Arica.

Remarks: This species was frequently found growing side to side with *C. (C.) chilina, P. dorbignyana, C. (C.) hyalina, C. (N.) vivianii* sp. n. and *P. coquimbana.* The samples agree exactly with Viviani's description except in the number of lateral umbos on zooids; these vary from one pair to three or four, but most of zoaria had only one distal latero-suboral pair. For its large zooids it looks at first glance like *C. (C.) hyalina,* but the presence, of a few female zooids replacing ordinary zooids in zoecial series prevents its missidentification.

Distribution: From Central Chile to the north probably along the Humboldt current span.

17. *Celleporella (Celleporella) hyalina* (Linnaeus, 1767)

Pls. XVI, XVII.

Cellepora hyalina Linnaeus, 1767:1286
Escharina brongnartiana d'Orbigny, 1847:14, pl. 6, figs. 9.12
Hippothoa hyalina: Ryland & Gordon, 1977:38, figs. 11, 12C.
Viviani, 1977:43, fig. 1, G,H,I; pl. 2, fig. 5; Morris, 1980:13, figs, 10-14, 45-46, pl. 2: 1-2,4-6; pl. 4: 1; pl. 6: 1-2.

Diagnosis: Zoarium encrusting, multiserial and bilaminar to loosely plurilaminar. Zooids hyaline to opaque, elongate subhexagonal; growth lines well marked; zoecial aperture almost round with a wide low proximal sinus and moderately developed condiles. Gonozooids developed as a second central sheet; males elongate and shorter than autozooids developing first than females from the central part of zoarium; female zooids conical very short, apparently as numerous as autozooids, its aperture wider than long, having a proximal arquate border or a slightly developed wide sinus; ovicell globose evenly perforated with more than ten pores in most zoaria. Ancestrula schizoporelloid, wide, budding latero-distally and asymmetrically the first zooid; early astogeny spiral.

Material examined: Many colonies coming from Arica to the Magellan Strait. They were growing on all kind of substrates: stones, algae (including *Macrocystis* sp.), plastic debris, shells, glass, etc.

Remarks: This species is easily identified when fully developed and having female zooids, because it is bilaminar to irregularly plurilaminar in its central part. The ovicellar pores are more numerous than those in other species growing associated with it, namely: *C. (C.) chilina, C. (C.) concava, C. (A.) bougainvillei* or *C. (C.) uberrima* sp. n. It differs from *C. (C.) retiformis* sp. n. in its normally coherent zoarium and in having superimposed dwarf males. Zoaria from the Magellan Strait look somewhat different having more slender ancestrulae and less perforated ovicells; they also show more organized zoaria with a well marked early generation of male zooids followed by a posterior one of females.

Distribution: A cosmopolitan species according different authors, which in the south western coasts of South America extends at least from 18° S to 55° S.

18. *Celleporella (Celleporella) retiformis* sp. n.
Pl. XVIII.

Diagnosis: Zoarium encrusting, coherent, mainly unilaminar, reticulate: with

conspicuous lacunae between zooids. Autozooids slongate-pyriform to cylindrical; zoecial aperture almost circular with a wide and shallow proximal sinus. Male gonozooids longer or shorter and more slender than autozooids, with a proportionally smaller zoecial aperture; they replace one autozooid in the basal sheet of the zoarium. Female gonozooids, frontally budded from areolae developed from the lateral interzoecial connections; curvate-conical, measuring one half or one third of the zoecial length; ovicell globose evenly and densely perforated. Ancestrula schizoporelloid, longer than wide; first zooid budded asymmetrically; early astogeny spiral.

The latin name *retiformis* means netlike and indicates the actual aspect of the zoaria of this species.

Types: The holotype MZUC 14688, a colony lacking the ancestrula but having instead, male and female gonozooids other than the autozooids. The paratypes MZUC 14689, include several ancestrulated zoaria. All these types encrusted subtidal talli of *Lessonia* sp. coming from near Antofagasta.

Remarks: This species like *C. (C) uberrima* sp. n. is closely allied to *C. (C) hyalina* in having a similar type of both early astogeny and female gonozooid origin. It differs, however, in forming male gonozooides in the basal zoarial sheet, in the more densely perforated ovicell and in not forming a clear-cut bilaminar or multilaminar zoarium as *C. (C) hyalina* does.

Distribution: Known only from the type locality: Antofagasta in northern Chile.

19. *Celleporella (Celleporella) uberrima* sp. n

Pl. XIX. fig. 4, A.

Diagnosis: Known zoaria encrusting *Serolis* isopods, discrete, multiserial, bilaminar to irregularly plurilaminar, hyaline to white. Autozooids elongated, cylindric, with a prominent suboral blunt umbo; zoecial aperture horseshoe-shaped, with a straight proximal rim, without proximal oral condiles. Female gonozooids, conical, shorter and lesser than ovicells, stemming from the interzoecial furrows, three times more abundant than autozzoids; ovicell irregularly spherical with two holes frontally faced, one or two more sometimes present apically. Male zooids somewhat shorter and slender than autozzoides with a similar aperture. Schizoporelloid ancestrula budding laterally and asymmetrically the first zooid; early astogeny spiral.

The feminine latin word *Uberrima* means very fertil, indicating here the extremely high number of feminine gonozooids and therefore larvae this species forms.

Types: The holotype MZUC 14690 is a young colony with ancestrula and gonozooids. Paratypes MZUC 14691, are a large number of zoaria growing on the underside of more than 30 large *Serolis* isopods collected subtidally in the western part of the Magellan Strait.

Remarks: This species seems allied to *C. (C) hyalina* due to the following characters: a. bi to multilamelar zoaria; b. schizoporelloid ancestrula; c. spiral astogeny. It differs however, in the sorter female gonozooids, the small number of ovicellar pores, the straight proximal border of the zoecial aperture and the primary origin of the male gonozooids in the basal colonial sheet. In *C (C) hyalina* instead, the male and female gonozooids issue as a second sheet over the primary one made of autozooids. *C. uberrima* is only known from *Serolis* isopods, where they grow covering most of their ventral surface. It is probable that this apparently epizoic bryozoan acts as a comensal obtaining substrate and alimentary particules when the isopod crawls and/or swims on soft bottoms. The isopod seems to obtain nothing but a second "carapace" and it is perhaps troubled by the excessive thickness of the exogenous calcareous deposit. Then, this rela-

tionship is not comparable to the one between *Zanclea* (Hydrozoa) and *Cellepora-ria* (Osman & Haugness, 1981), but apparently resembles the bryozoans growing on the polychaete *Laetmonice producta* from Antarctica (Moyano, 1972).

Distribution: Magellan Strait in the southernmost tip of South America.

DISCUSSION AND CONCLUSIONS

In sections B, C, and D of the Results a partial discussion of them is given. Nevertheless, it is worth to reconsider some aspects.

The Bryozoan fauna of Easter Island is partially known (Moyano, 1983) so it is highly probable that Hippothoan species other than *H. flagellum* might be found. The same statement can be made of the Juan Fernández Hippothoan Fauna. However, this bryozoan fauna in much better known as more than fourty species have been described (Moyano, 1983). The only Juan Fernández hippothoan species is *C. (C) muricata*. This was recorded in these islands by Marcus (1921) who described it as *Hippothoa hyalina*. The drawings in his report clearly show the typical frontal umbos and hollow tubes or spines decorating the frontal surface of ovicells. The population of this species seems to be relictual here because other known localities are Kerguelen and nearby archipelagos.

One of de original projects associated to this research was to find a probable phylogenetic tree of the family Hipothoidae. This proved to be difficult to work out owing to the paucity of informations on ancestrulae and early astogeny of many species of the Northern Hemisphere. Other remaining problem is the existence of a gizzard in some species of *Plesiothoa* for it is not known if this feature is present in species other than those investigated by Gordon & Hastings (1979).

Another point to be evaluated and discussed is the presence of a tatiform ancestrula in some hippothoan species. This ancestrula is actually present only is pacific or nearly so species. At present four species show this ancestrula; three inhabit the cold waters around the southernmost tip of South America, *e. g. C. (N) patagonica, C. (N.) chiloensis* and *C. (A.) yagana*. The remaining, *H. distans* inhabits more warm waters of the western Pacific, although its presence in the south eastern Pacific is highly probable. This plesiomorphic character seems to characterize apparently unrelated species as *C. (A.) yagana* and *H. distans*, so they have been included in different generic groupings as demonstrated in section C.

Once all the species are known as to their ancestrulae, digestive tracts and early astogenies, the phylogenetic approach suggested herein should become possible.

CONCLUSION

1. The Eastern Pacific Hippothoan Fauna is composed by at least eighteen recorded species, and another, *H. distans* is supposed to be present. They are part of the genera *Hippothoa* (three species), *Plesiothoa* (three species) and *Celleporella* (thirteen species).

2. *Atacama foramina* Morris, 1980, a miocene fossil from northern Chile, is considered closely allied to the recent *Plesiothoa* species. Therefore, *A. foramina* the single species of the genus *Atacama* Morris, 1980 is included in *Plesiothoa* and *Atacama* becomes a synonym of *Plesiothoa* Gordon & Hastings, 1979

3. Three species are described as new:

a. *Celleporella (Celleporella) retiformis* sp. n. of the *C.(C.) hyalina* complex coming from Antofagasta in northern Chile.

b. *Celleporella (Celleporella) uberrima* sp. n. also pertaining to the *C. (C.) hyalina* complex. It is only known to develop

on the underside of large littoral *Serolis* isopods from the Magellan Strait in the Chilean far south.

c. *Celleporella (Neothoa) vivianii sp. n.* a uniserial species structurally close to *C. (N.) patagonica* and *C. (N.) chiloensis*, coming from Central Chile.

4. The genus *Celleporella* is divided into four subgeneric groups:

a. Celleporella s. str.: unilaminar or bilaminar species with a schizoporelloid ancestrula giving off a latero-distal first zooid producing a spiral early astogeny.

b. *Antarctothoa* subgen. n. : unilaminar species having a schizoporelloid ancestrula budding two latero-distal symmetrical first zooids.

c. *Neothoa* subgen. n.: uniserial tatiform ancestrula-bearing species.

d. *Austrothoa* subgen n.: pluriserial tatiform ancestrula-bearing species.

5. In the Antarctic Ocean three common Hippothoan species are actually known. *C. (A.) bougainvillei* and *C. (A) antarctica are clearly related to the subantarctic C. (A.) bougainvillei* complex. The third *H. flagellum* is a cosmopolitan element.

6. Zoogeographically, the South Eastern Pacific Hippothoan Species form two discrete units. A northern group of eight endemic species and a southern one with also eight endemic or quasi-endemic forms. Although these discrete units do not overlap between 38° S to 40° S, they are connected by the cosmopolitan *C. (C.) hyalina* and *H. flagellum.*

7. The relict *C. (A.) muricata* characterizes the Juan Fernández Archipelago, indicating a closer affinity with the subantarctic Kerguelen Archipelago where this species is also present.

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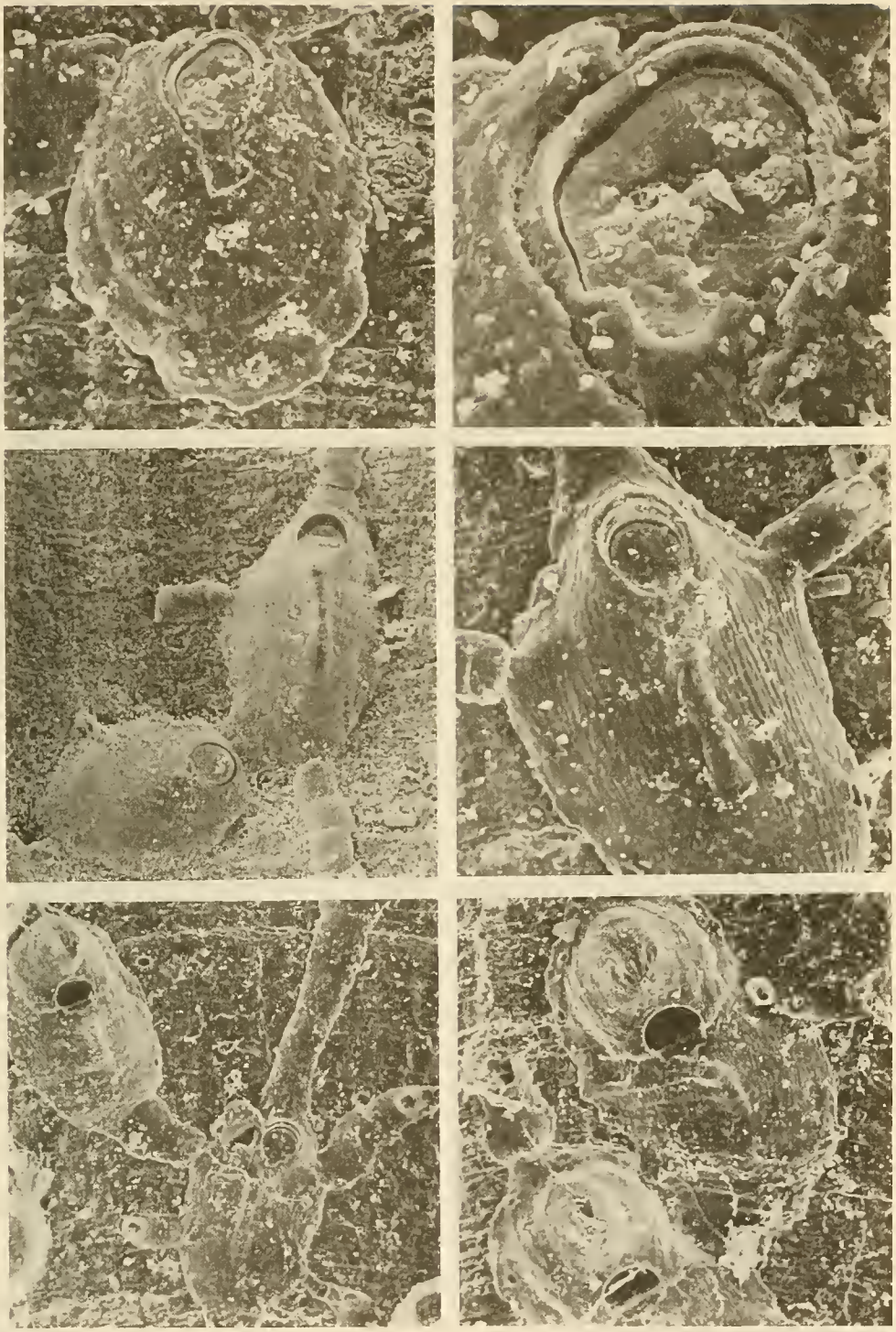
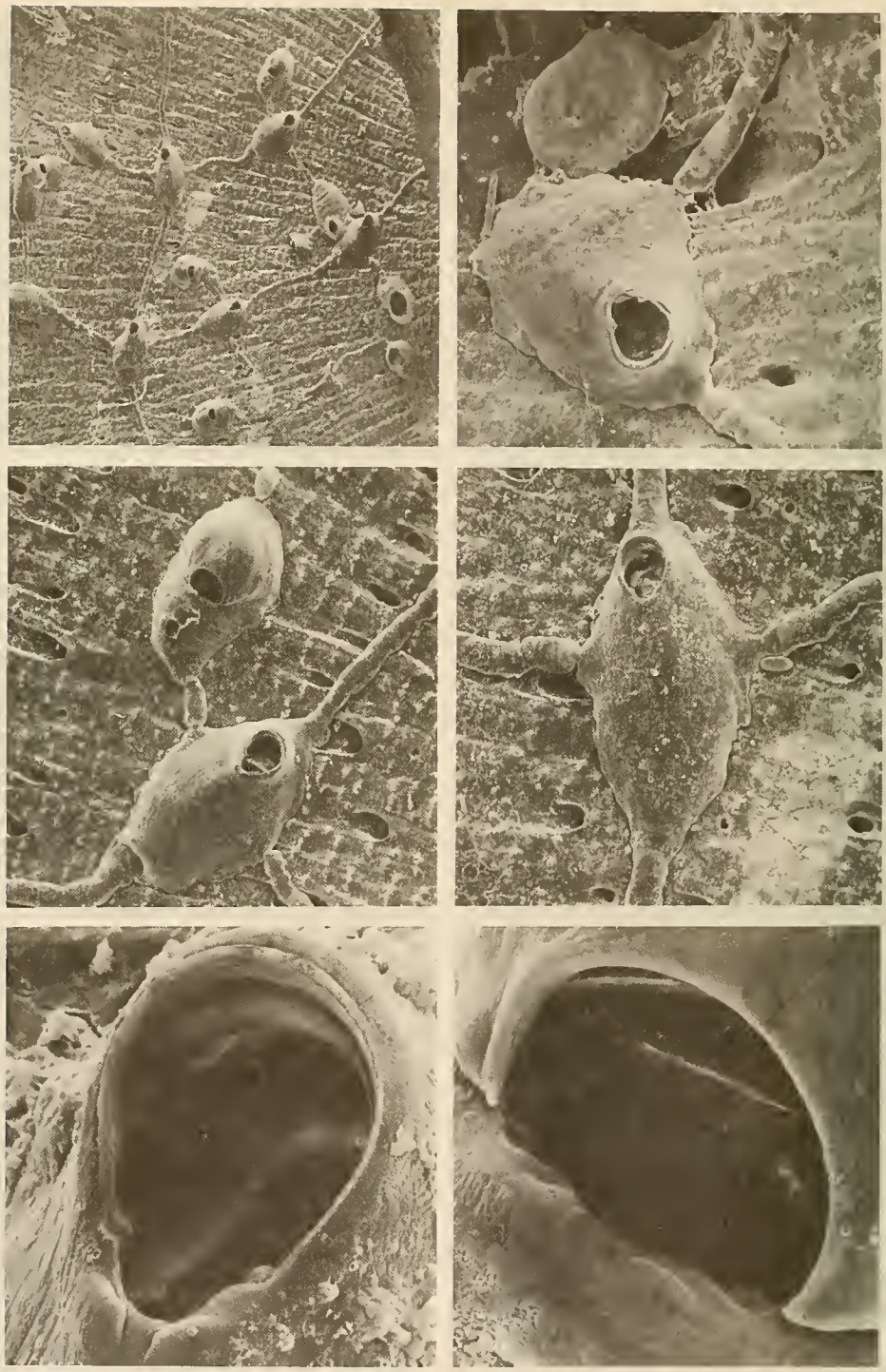
Plates I - IXX

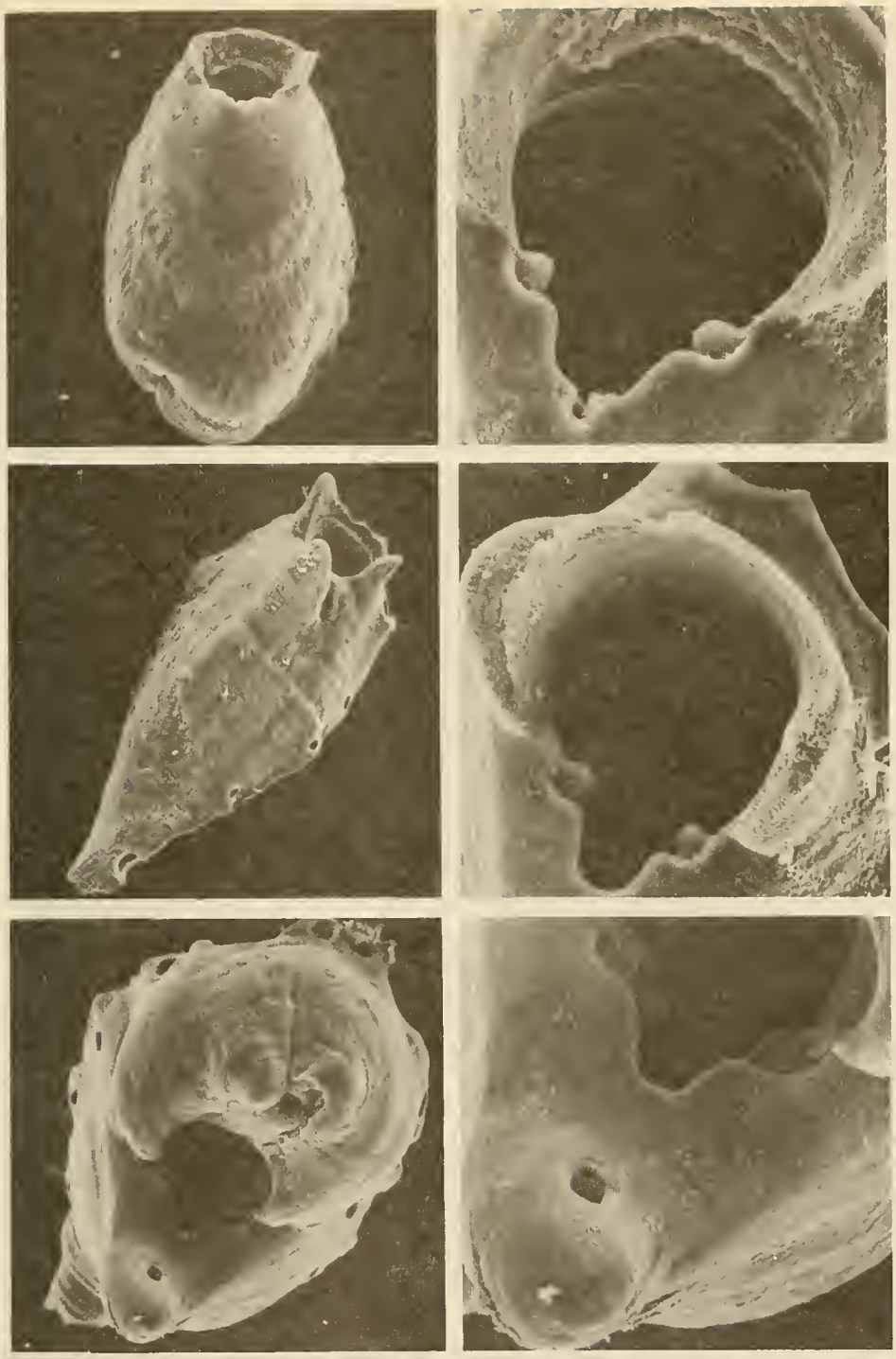
"All the figures should be reduced in 20% owing to the reduction of the original plates in the pressing process".



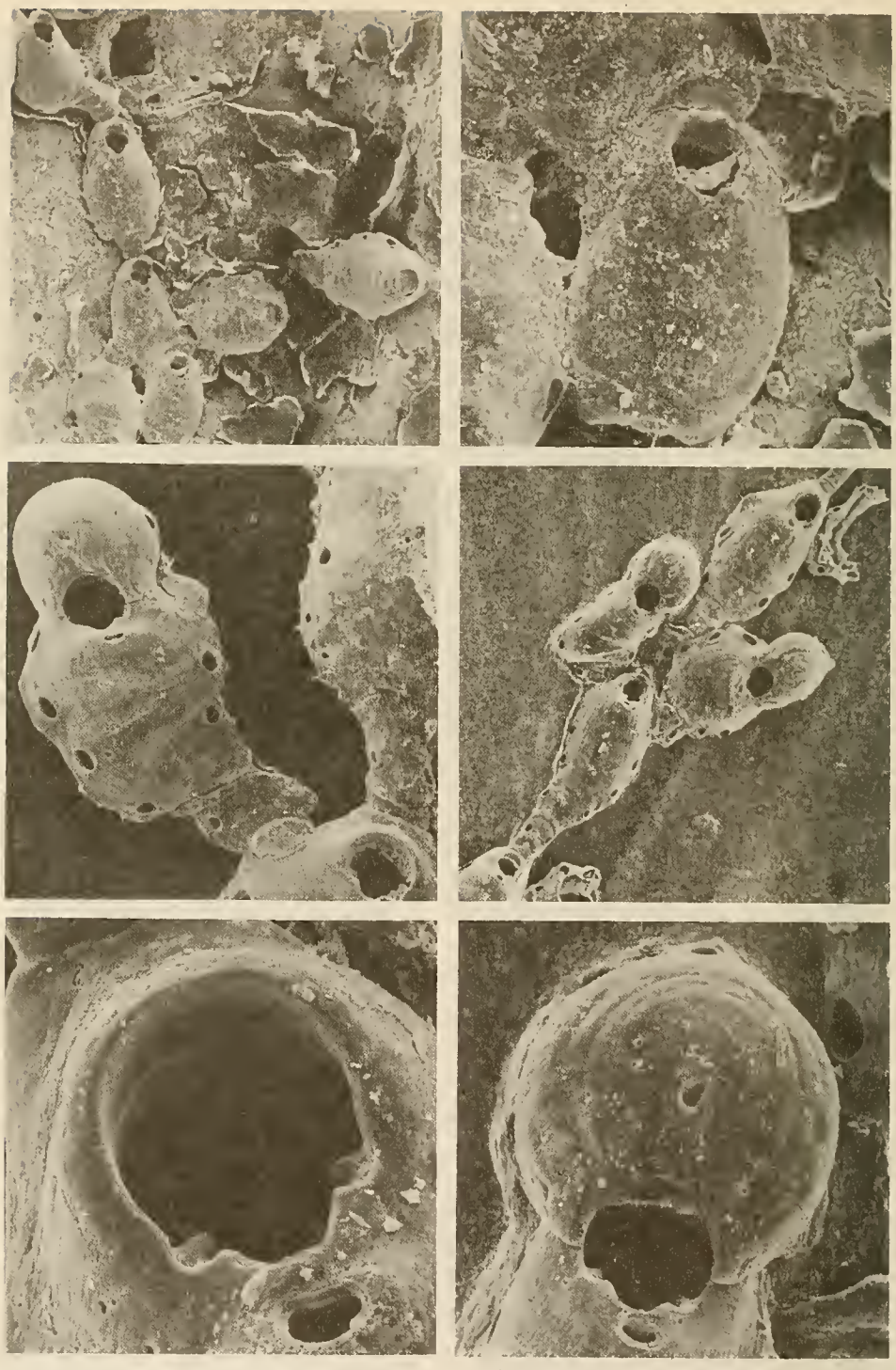
Pl. 1. *Hippothoa divaricata* Lamouroux.
TL. Ancestrula. x240. **TR.** ancestrular aperture with operculum. x800. **ML.** ancestrula and first keeled zooid. x150. **MR.** keeled autozooid with a right disto-lateral "male zooid". x200. **BL.** autozooid giving off one female and three "male" zooids. x110. **BR.** female zooid giving off another female zooid. x130.



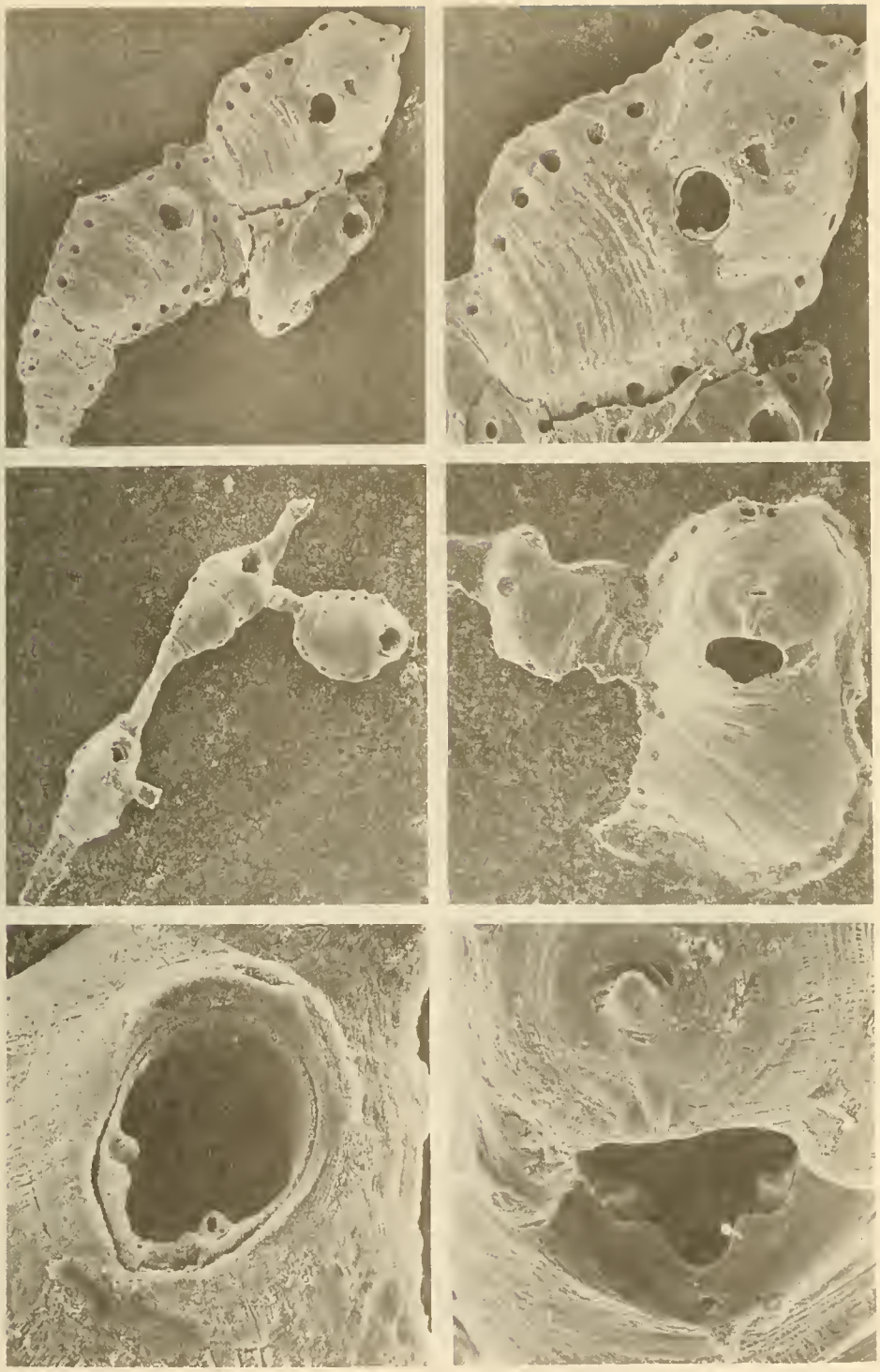
Pl. II. *Hippothoa flagellum* Manzoni.
TL. zoarium growing on a *Hornera* zoarial base. x26. **TR.** first zooid and its proximal kenozooidal disciform ancestrula. x200. **ML.** autozooid and gonozooid. x100. **MR.** autozooid and its cruciform lateral budding. x130. **BL.** autozooidal aperture. x800. **BR.** ovicellar aperture showing lateral condiles. x1000.



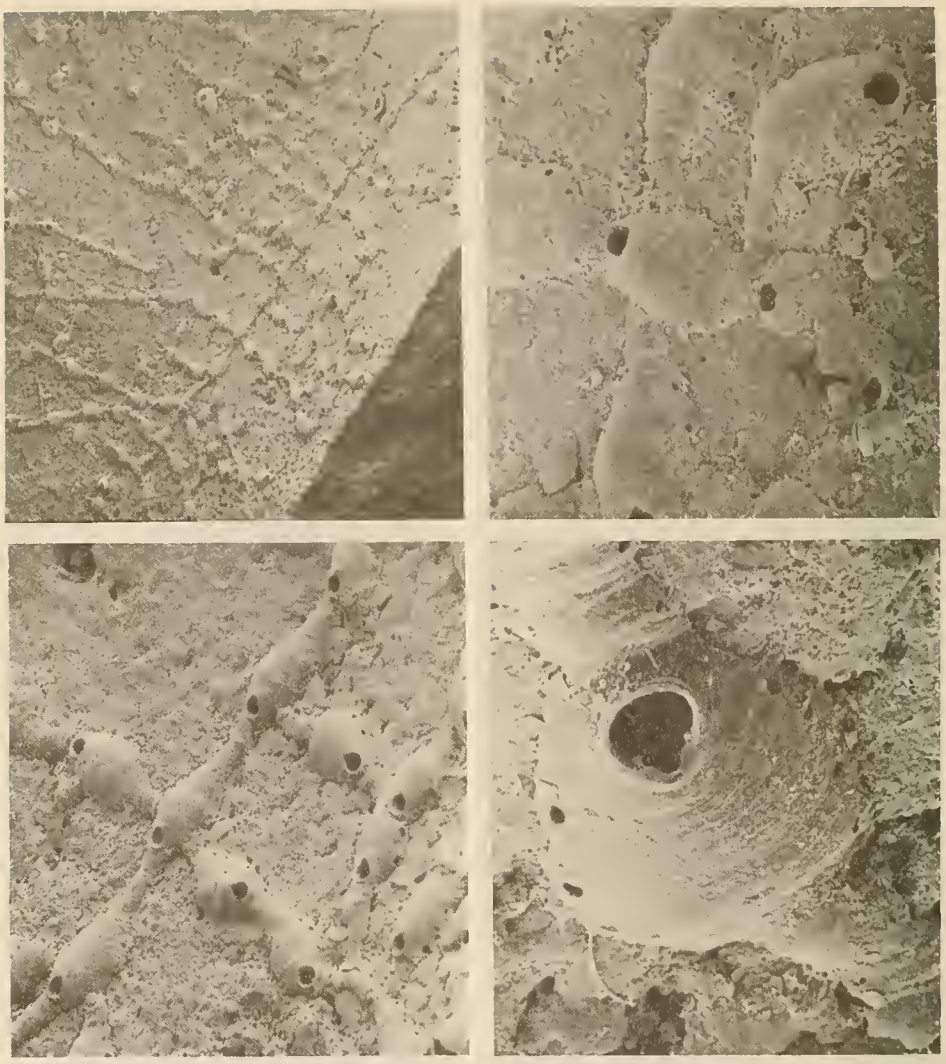
Pl. III. *Plesiothoa australis* Moyano & Gordon.
TL. ancestrula. x260. **TR.** ancestrular aperture. x960. **ML.** autozooid. x160. **MR.** autozooidal aperture. x680; **BL.** ovicell in distal view showing the two umbos. x280; **BR.** fronto-suboral pore of a female zooid. x680.



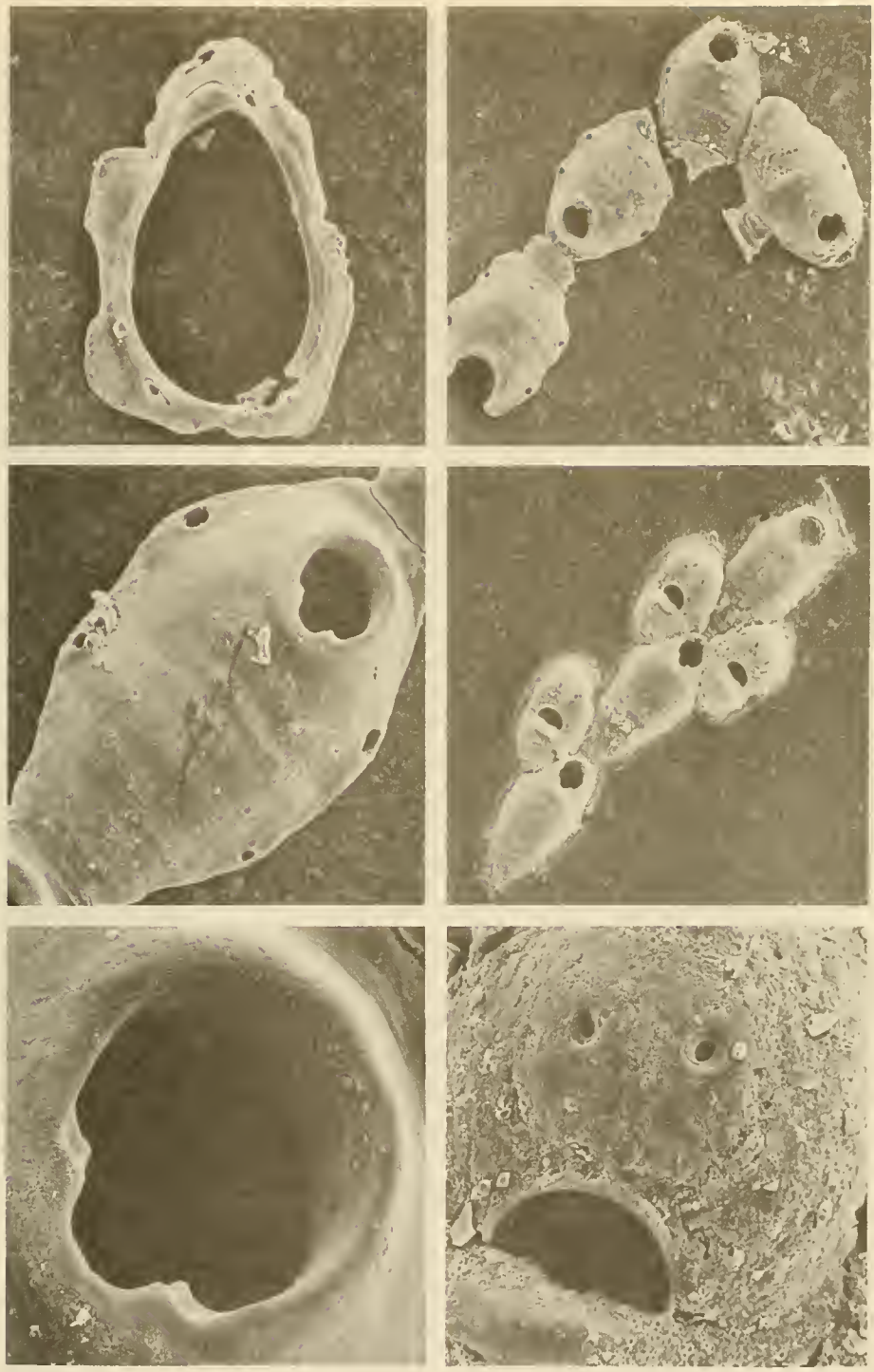
Pl. IV. *Plesiothoa coquimbana* Moyano & Gordon.
TL. young ancestrulate zoarium. x52. **TR.** same ancestrula of. **TL.** zoarium. x200. **ML.** female gonozooid. x120. **MR.** ovicellate zoarium including caudate zooids. x52. **BL.** autozoecial aperture exhibiting condiles and a large suboral fenestra. x520. **BR.** ovicell. x260.



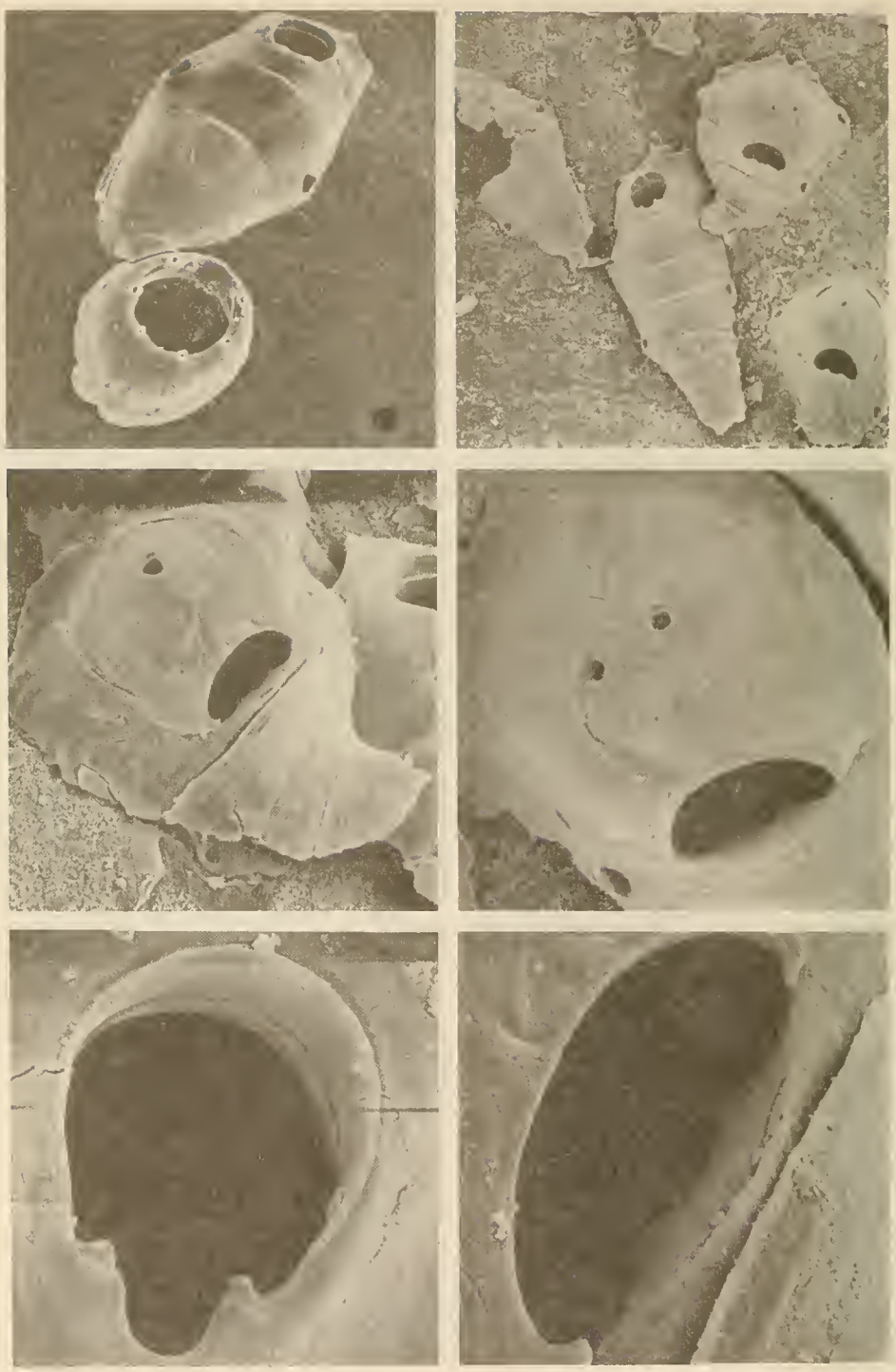
Pl. V. *Plesiothoa dorbignyana* (Viviani).
TL. compact and wide form including autozooids and gonozooids. x72. **TR.** female gonozooid of TL, showing the wide margin and the lateral pores. x144 **ML.** slender and caudate form including lateral budding and caudae. x48. **MR.** female gonozooid laterally budding a zoeciule or "male zooid". x120. **BL.** autozooidal aperture and condiles. x480. **BR.** female zooid aperture with condiles and suboral fenestra. x400.



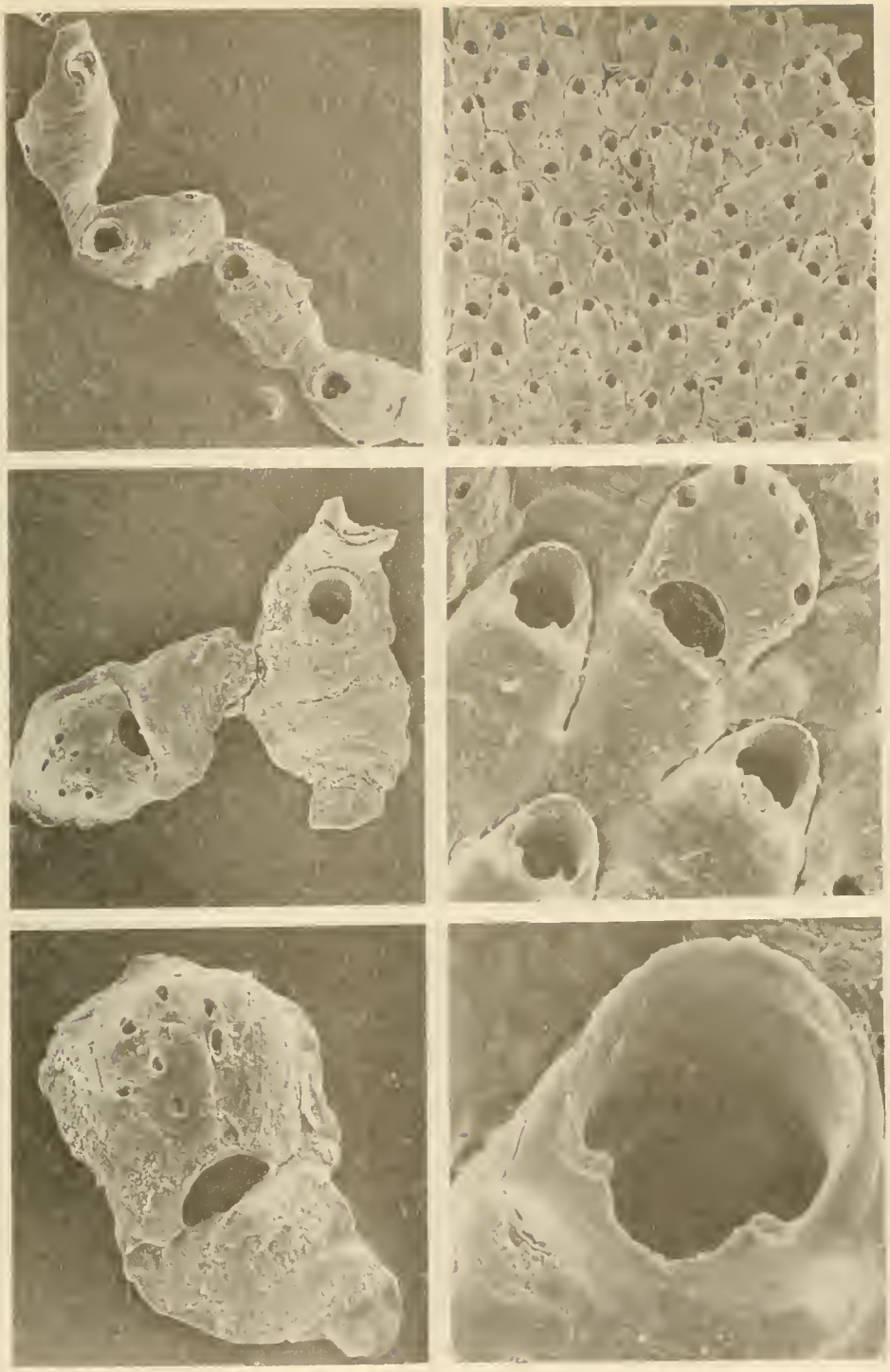
Pl. VI. *Plesiothoa aff. dorbignyana* (Viviani).
TL. zoarium encrusting a *Pholas* tube. x10. **TR.** ancestrula at centre right and the first zooid to the left The first zooid is giving off four lateral zoecial "branches" (the left proximal one is actually broken off). x80. **BL.** zoarium showing cruciform pattern of branching. x40. **BR.** autozooid. x80.



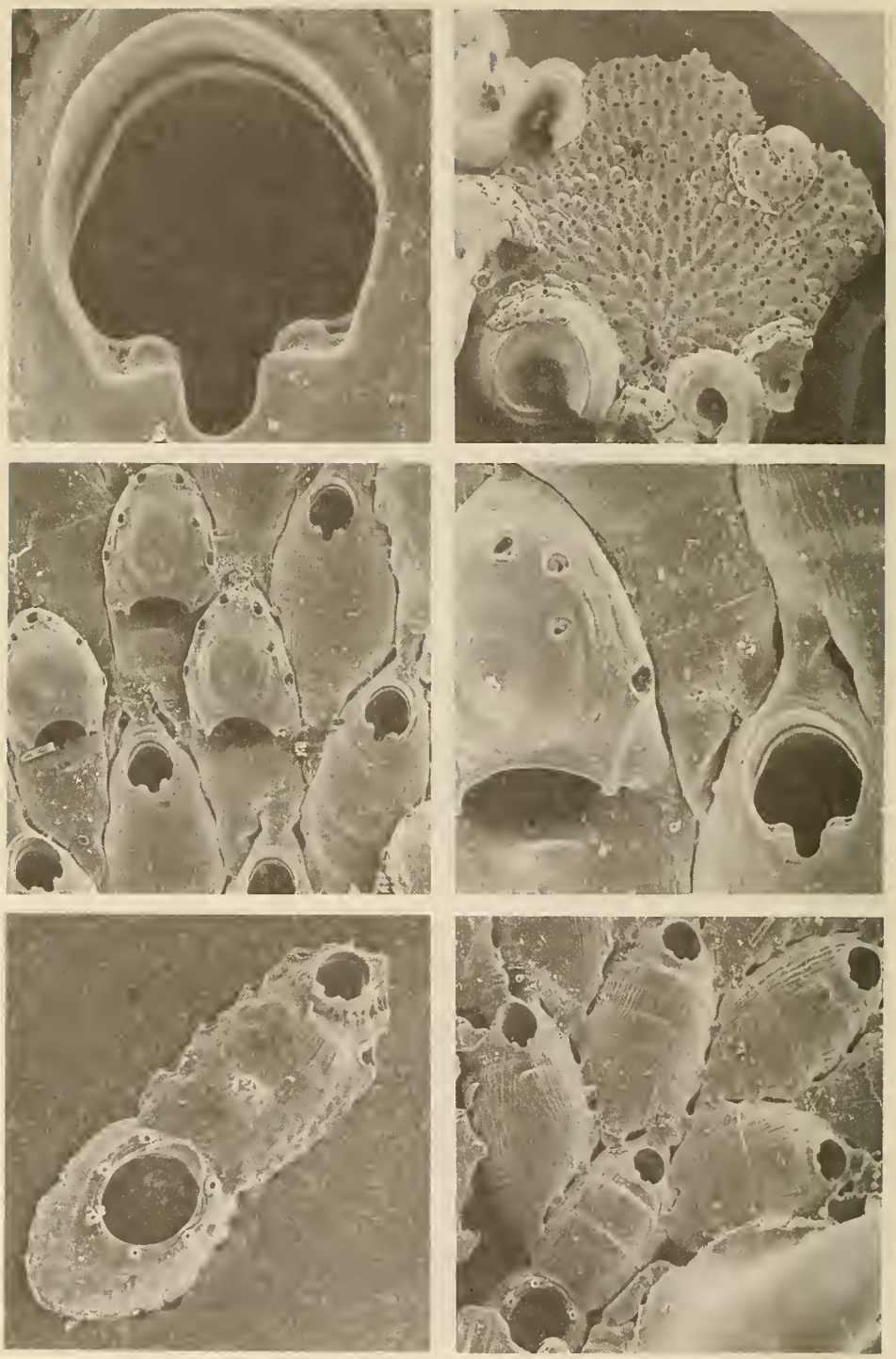
Pl. VII. *Cellcporella (N.) chilocnsis* Moyano.
TL. Tatiform ancestrula. x240. **TR.** young triradiate zoarium lacking ancestrula, x63. **ML.** autozooid. x180. **MR.** autozooidal series and lateral female zooids. x63. **BL.** autozooidal aperture and ledge-like condiles. x600. **BR.** ovicell with two frontal pores and a very shallow sinus in the aperture.



Pl. VIII. *Celleporella (N.) patagonica* (Busk).
TL. tatiform ancestrula and first latero-distal zooid. x140. **TR.** autozooid and lateral gonozooid. x80. **ML.** female gonozooid. x200. **MR.** ovicell showing two frontal pores. x300. **BL.** autozooidal aperture. x600. **BR.** ovicell aperture. x800.

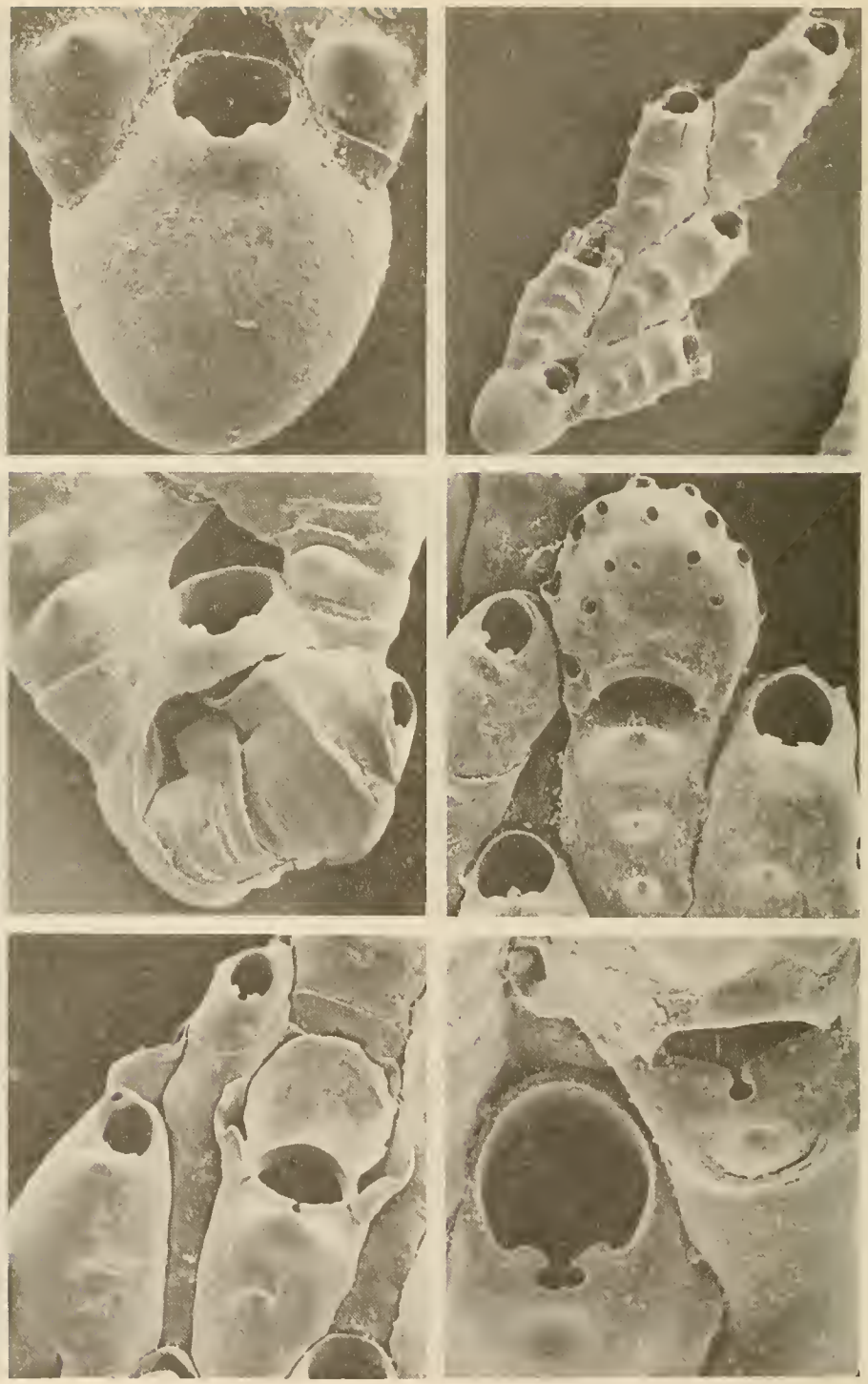


Pl. IX. *Celleporella (N.) vivianii* sp. n. (TL, ML, BL) and *Celleporella (C.) concava* Viviani (TR, MR, BR).
TL. autozooids forming an uniserial zoarium. x80. **TR.** mature zoarium. x26. **ML.** autozooid budding off a lateral female gonozooid. x130. **MR.** autozooids and female zooids. x130. **BL.** female zooid showing the perforated ovicell. x240. **BR.** autozooidal aperture, the ledge-like apertural condiles and the two fronto-lateral suboral blunt umbos. x450.

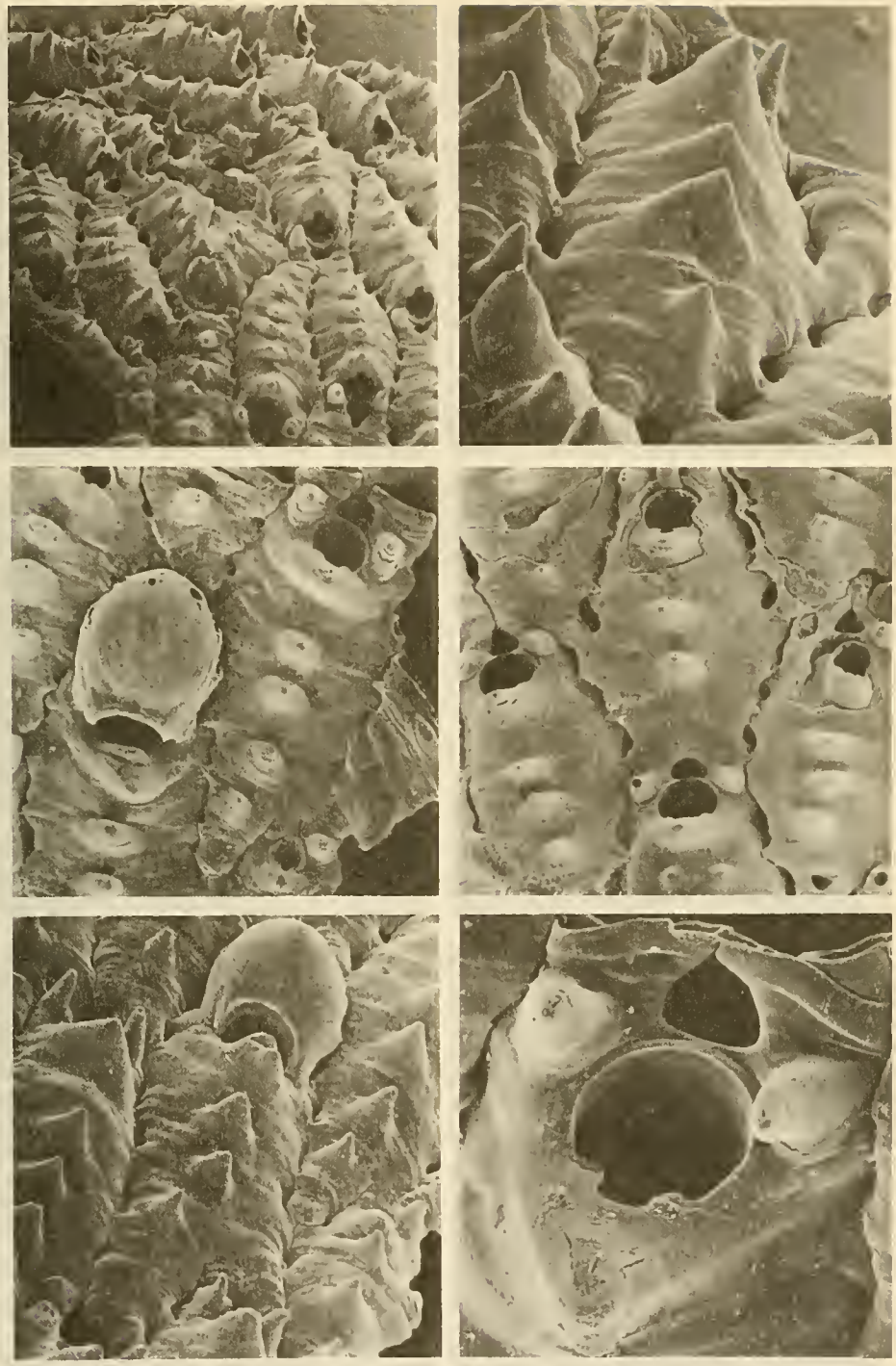


Pl. X. *Celleporella (A.) yagana* Moyano & Gordon.
TL. autozooidal aperture. x560. **TR.** complete zoarium partly encrusting serpulid tubes. x10. **ML.** autozooids and female gonozooids. x80. **MR.** autozooid and female apertures. x200. **BL.** tatiform ancestrula symmetrically budding off a single distal zooid. x123. **BR.** ancestrula and early astogeny. x72.

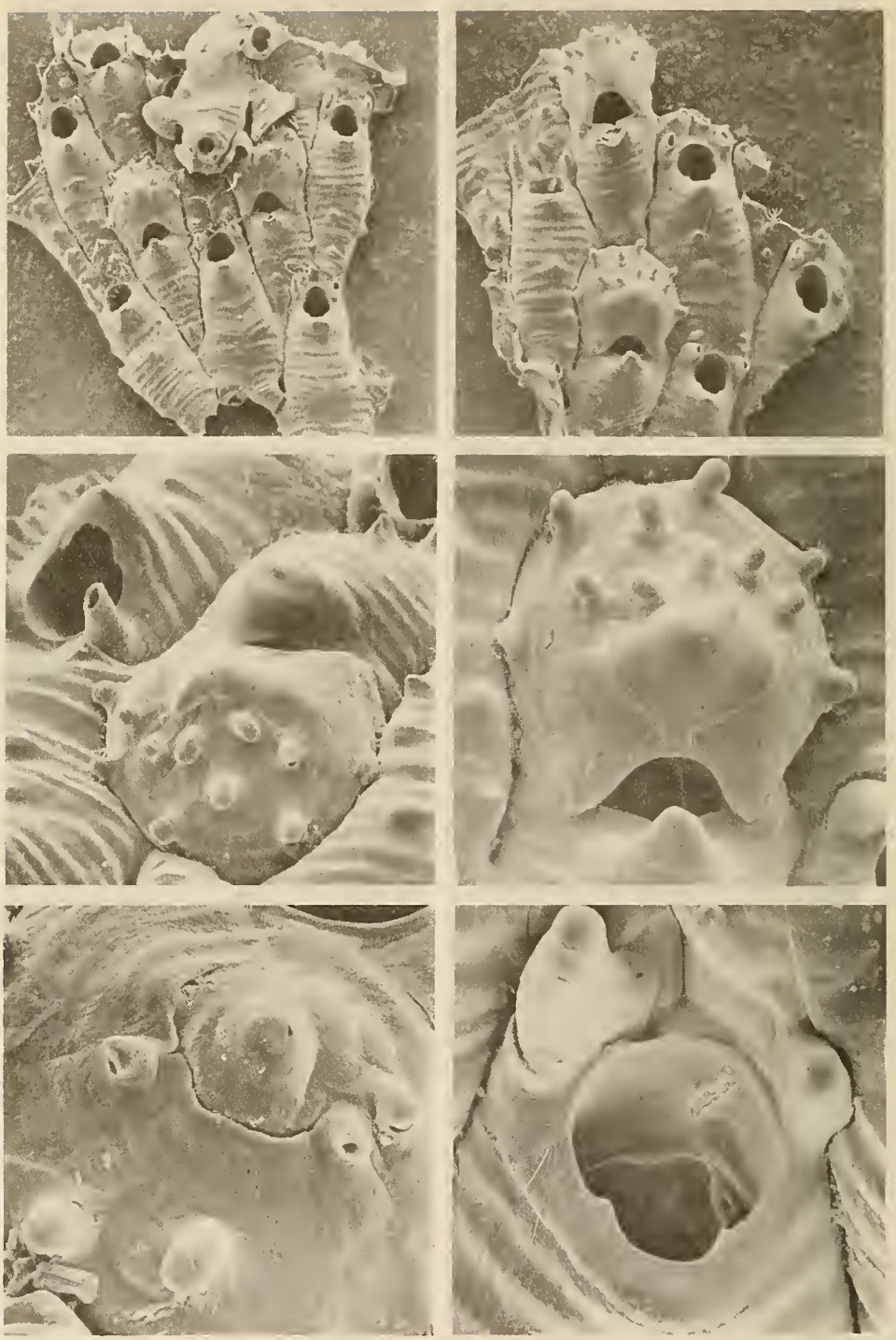
Pl. XI. *Celleporella (A.) antarctica* Moyano & Gordon.
TL. Ancestrulla. x170. **TR.** ancestrular aperture. x680. **ML.** young zoarium. x34. **MR.** Autozoecial aperture. x400. **BL.** full ovicelled zoarium. x36. **BR.** female zooid and ovicell. x200.



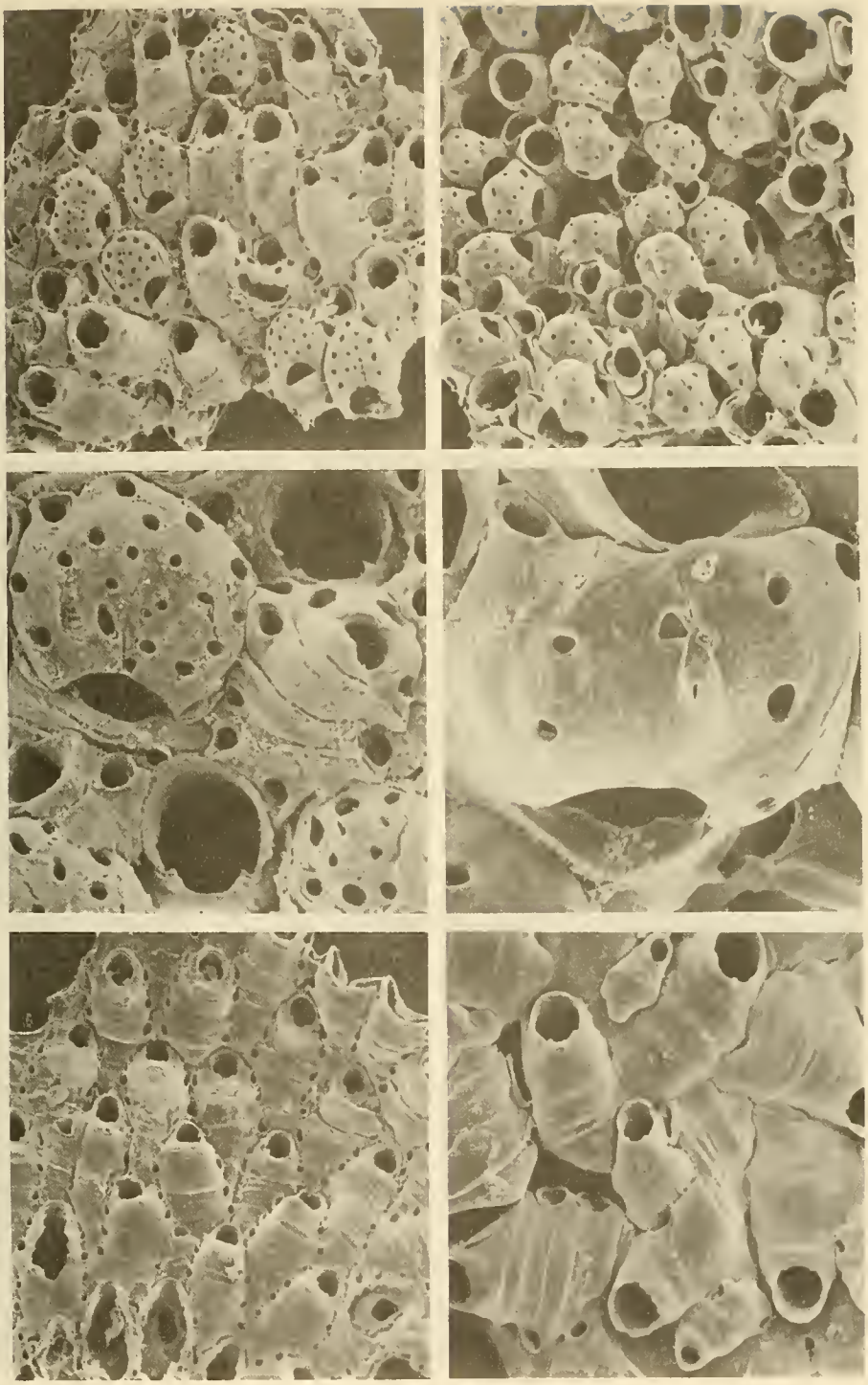
Pl. XII. *Celleporella (A.) bougainvillei* (d'Orbigny).
TL. Ancestrula. x180. **TR.** young zoarium. x48. **ML.** Injured ancestrula giving off a third fronto-lateral zooid. x150. **MR.** from left to right: male, female and autozooid. x96. **BL.** an ovicell showing its two calcareous layers. x100. **BR.** autozooid and female zooid apertures. x200.



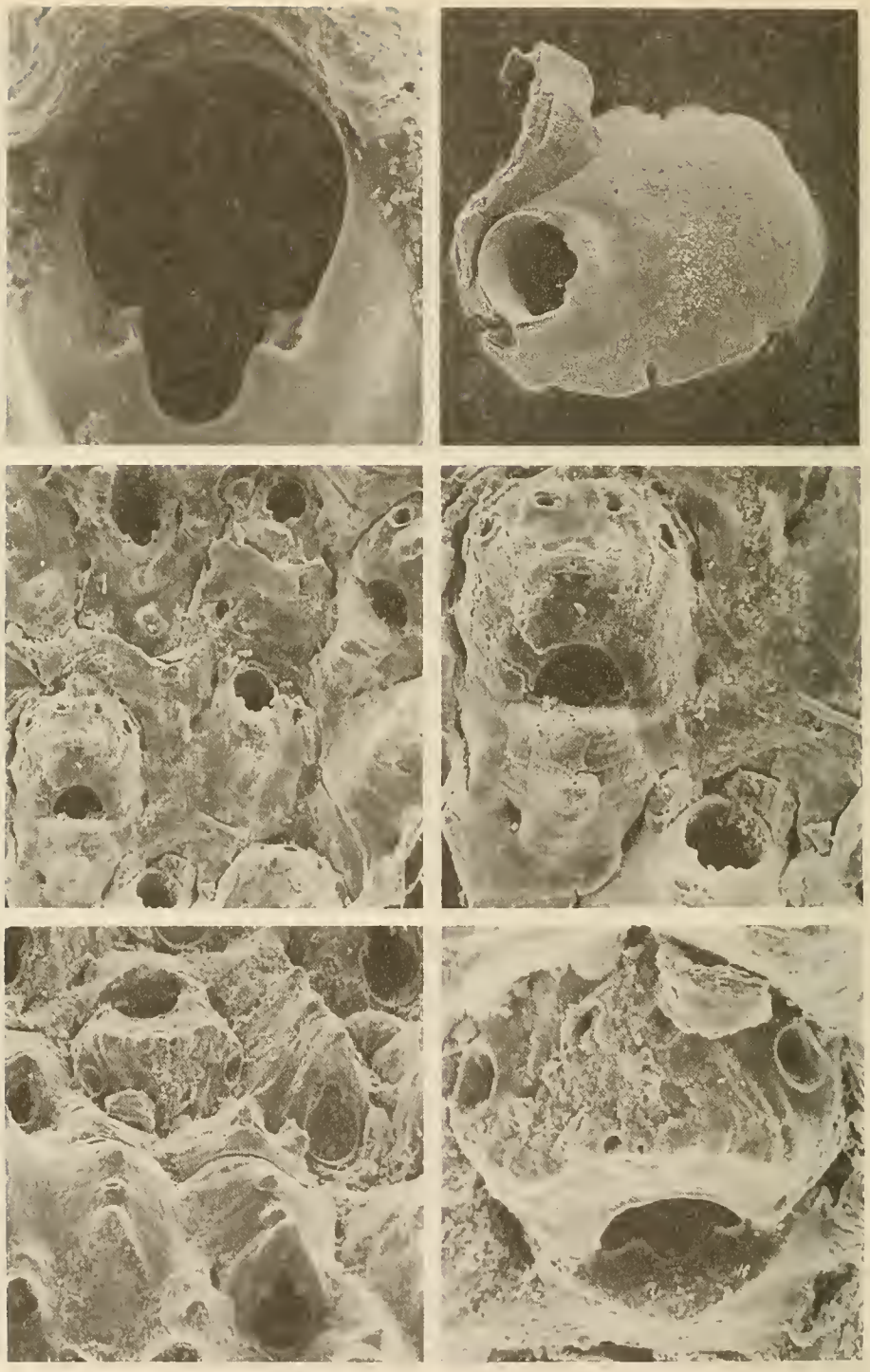
Pl. XIII. *Celleporella (A.) bougainvillei* (d'Orbigny) prickled form.
TL. zoarium in disto-lateral view. x40. **TR.** frontal and latero-oral umbos in proximal view. x170. **ML.** female, autozooid and male zooid. x80. **MR.** frontal view of autozooids and of interzoecial lacunae. x68. **BL.** female zooid and autozooid in proximal view. x80. **BR.** autozoecial aperture. x240.



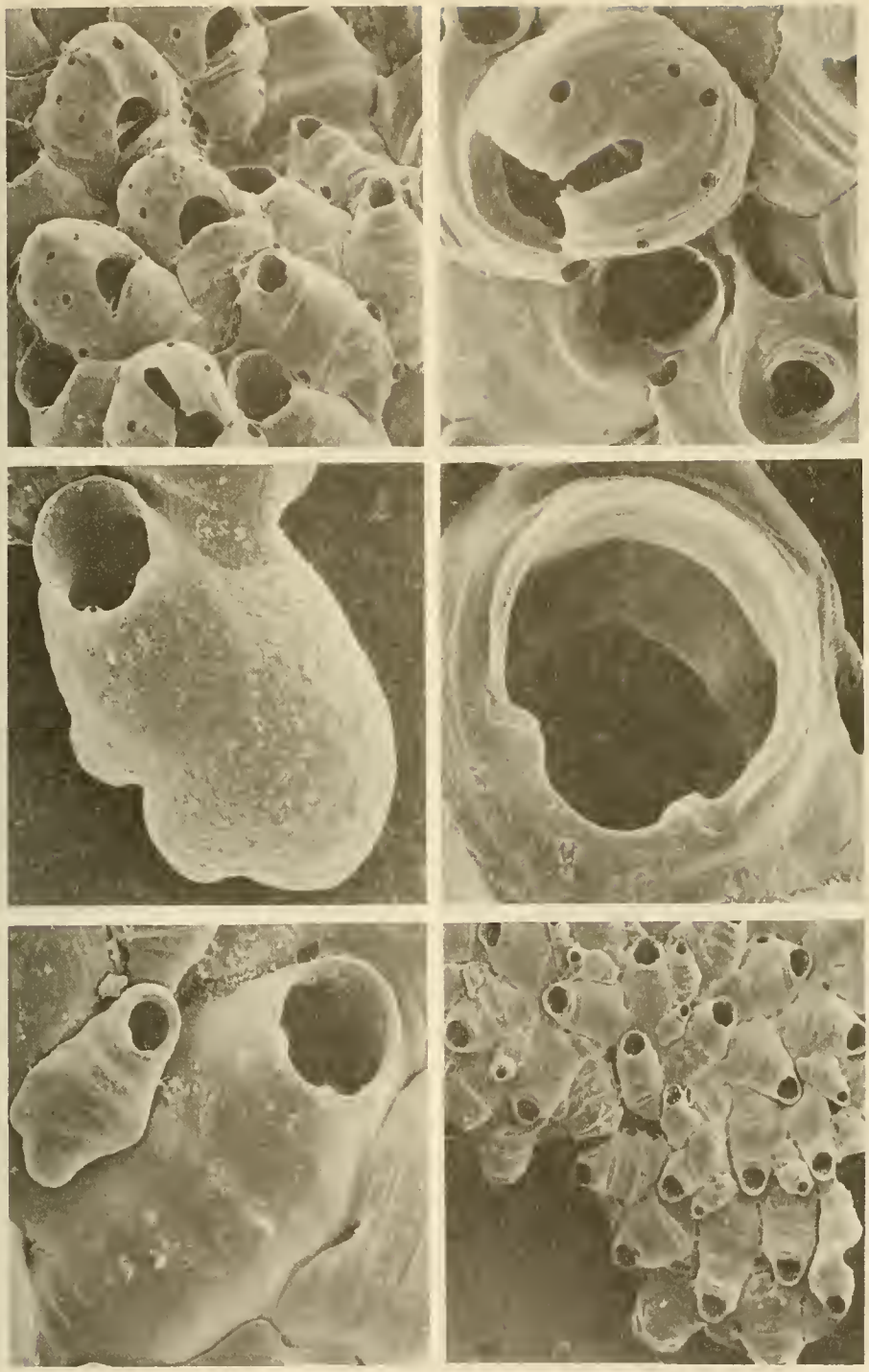
Pl. XIV. *Celleporella (A.) muricata* (Busk).
TL. zoarium exhibiting distorted zooids in the growing edge. x50. **TR.** zoarium with normal zooids. x60. **ML.** distal view of autozooid and female apertures. x165. **MR.** prikled ovicell. x195. **BL.** dorso-distal side of an ovicell showing the perforated ovicellar wharts. x340. **BR.** autozooidal aperture and latero-distal horns. x350.



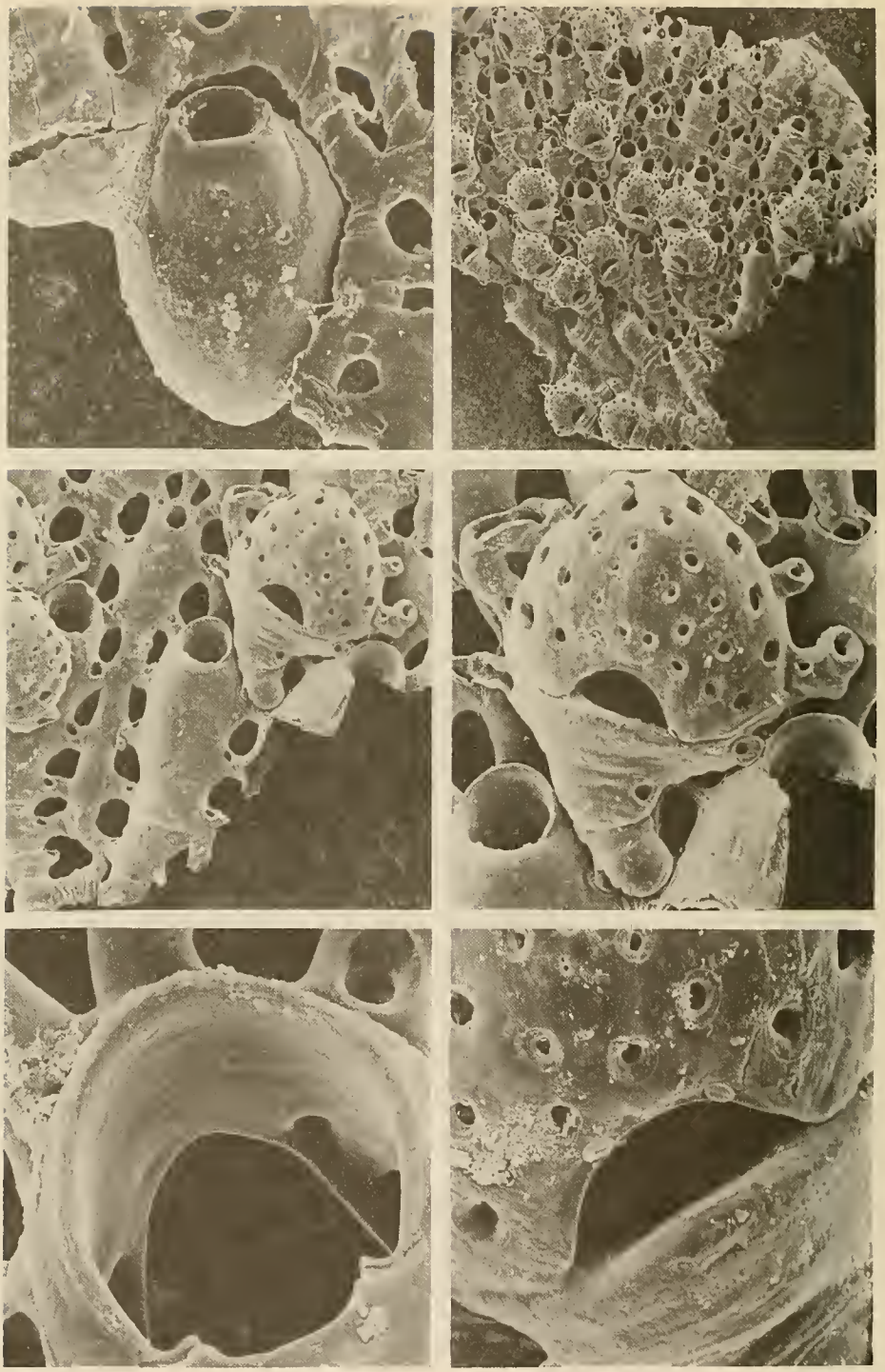
Pl. XVI. *Celleporella (C.) hyalina* (Linnaeus) from central and northern Chile (TL, ML, BL) and from Magellan Strait (TR, MR, BR).
TL. ovicellate zoarium. x40. **TR.** ovicellate central part of an aged zoarium. x48. **ML.** female, autozooid and male. x128. **MR.** dorso-posterior view of an ovicell. x240. **BL.** autozooids. x40. **BR.** ancestrula, autozooids and adventicious interzoecial males. x64.



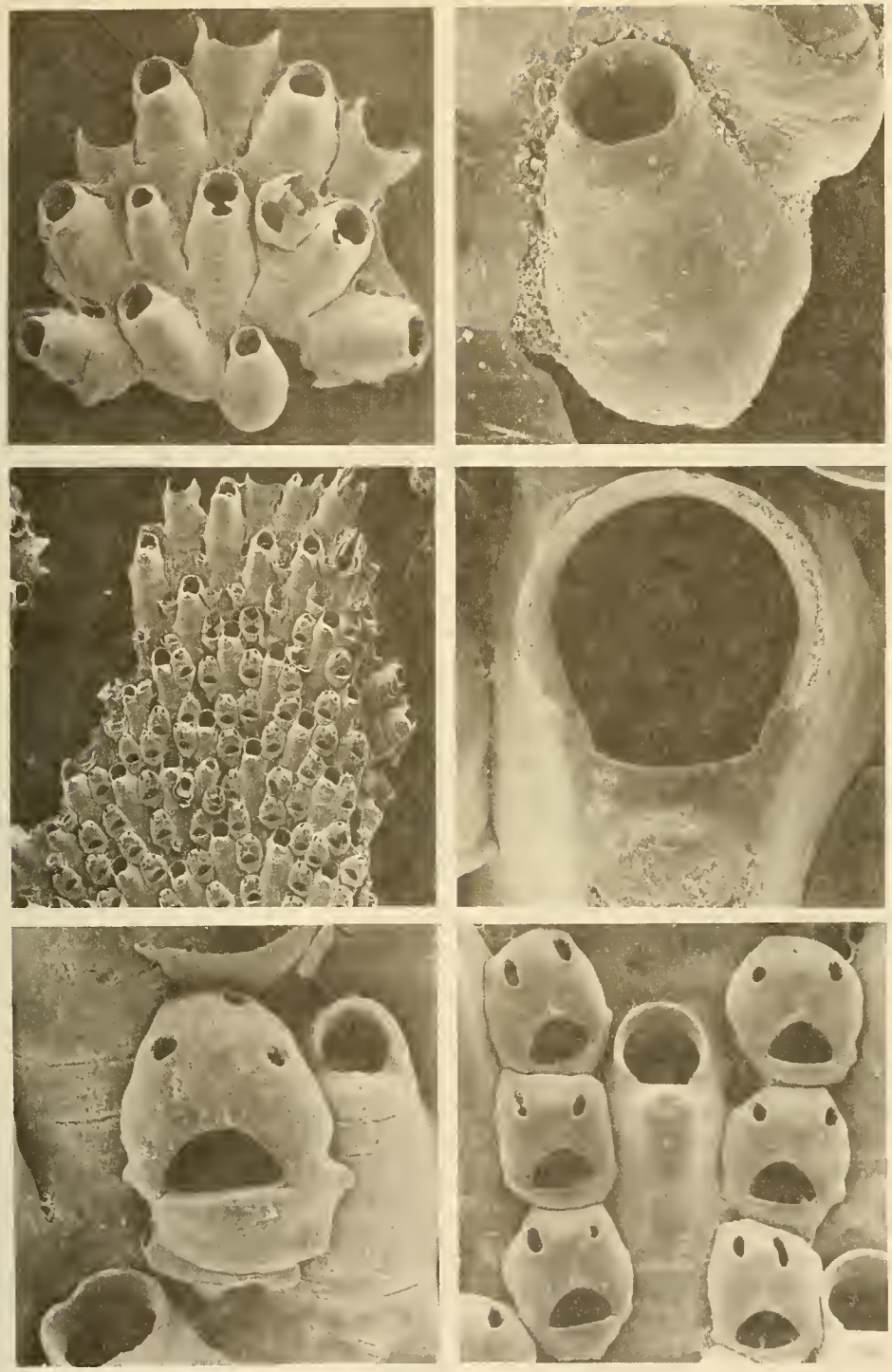
Pl. XV. *Celleporella (C.) chilina* (d'Orbigny).
TL. autozoecial aperture and ledge-like condiles. x700. **TR.** ancestrula latero-distally giving off the first zooid. x200. **ML.** very calcified auto an female zooids. x120. **MR.** Female zooid and autozooid. x220. **BL.** distal view of male, female and autozooid apertures. x140. **BR.** ovicell with large disto-lateral pores.



Pl. XVII. *Celleporella (C.) hyalina* (Linnaeus) from Magellan Strait.
TL. males, females and autozooids. x80. **TR.** zooidal apertures of female, autozooid and male. x160. **ML.** ancestrula. x220. **MR.** autozooidal aperture. x480. **BL.** male and autozooid from the zoarium centre. x160. **BR.** centre of a young zoarium showing ancestrula, autozooids, males and spiral astogeny. x32.



Pl. XVIII. *Celleporella (C.) retiformis* sp. n.
TL. ancestrula budding disto-laterally. x200. **TR.** retiform ovicellate zoarium. x32. **ML.** very slender basal male, autozooid and female zooid. x100. **MR.** female zooid and ovicell. x180. **BL.** autozoecial aperture having ledge-like condiles. x600. **BR.** ovicellar aperture. x400.



Pl. XIX. *Celleporella (C.) uberrima* sp. n.
TL. young colony showing ancestrula, autozooids, one male and one female zooids. x52. **TR.** ancestrula asymmetrically budding the first latero-distal zooid. x200. **ML.** distal segment of a mature zoarium. x20. **MR.** autozooidal aperture showing no proximal U-shaped or V-shaped sinus. x320. **BL.** female gonozooid between autozooid (left) and male zooid (right). x180. **BR.** female zooids flanking an autozooid. x100.