MAGELLAN-ANTARCTIC: ECOSYSTEMS THAT DRIFTED APART. *W.E. ARNTZ and C. RÍOS (eds.)*

Magellan Bryozoa: a review of the diversity and of the Subantarctic and Antarctic zoogeographical links*

H.I. MOYANO G.

Departamento de Zoología, Universidad de Concepción, Casilla 160-C, Concepción, Chile

SUMMARY: Based principally on previous work by the author, the Magellan Bryozoa are reviewed in terms of endemism, specific diversity, zoarial diversity and polymorphism. The Magellan, Atlantic, Pacific, Subantarctic and Antarctic zoogeographical relationships are reevaluated. New data related to the distribution of Magellanic and Antarctic species along the archipelagos of the Scotia Arc and new data on Bryozoa from the Magellan continental slope are added.

Key words: Bryozoa, diversity, polymorphism, endemism, zoogeography, Magellan area, Antarctica, southern Pacific Ocean.

RESUMEN: BRYOZOA MAGALLÁNICOS: REVISIÓN DE LA DIVERSIDAD Y DE LAS CONEXIONES ZOOGEOGRÁFICAS ANTÁRTICAS Y SUBANTÁRTICAS. – Se revisa la briozoofauna magallánica en términos de endemismo, diversidad específica, diversidad zoarial y de polimorfos. Se reevalúan las relaciones zoogeográficas transpacíficas, transatlánticas, subantárticas y antártico-magallánicas. A la revisión anterior basada en trabajos previos del autor se añaden nuevos datos referentes a la briozoofauna magallánica del talud y a la vicariancia entre especies antárticas y magallánicas. Se evalúa el papel del Arco de Escocia en el movimiento de especies desde y hacia la Antártida.

Palabras clave: Bryozoa, diversidad, polimorfismo, endemismo, zoogeografía, área magallánica, Antártida, Pacífico austral.

INTRODUCTION

Knowledge of the Chilean bryozoan fauna began in the Magellan Region, South America, during the first quarter of the 19th century (Lamouroux, 1825). It increased greatly at the end of that century and the beginning of the 20th century with the arrival of many European expeditions to the Southern Ocean, the "Challenger" expedition being the principal one. American and European expeditions to the Antarctic have been steadily completing that knowledge; detailed bibliographic accounts have been provided by Hastings (1943), Borg (1944), Moyano (1982, 1991) and Hayward (1995).

Zoogeographically the Magellan bryozoan fauna is closely related to that of the Falkland, Tristan da Cunha and Kerguelen archipelagos to the east; a little less to that of the Scotia Arc archipelago and the Antarctic Peninsula to the south and, less related but still sharing several common species, with that of New Zealand and Australia to the west and that of the Chilean coast influenced by the Humboldt cold current to the north. These zoogeographical links are of the vicariant type especially in relation to Antarctica but also sharing species that have Subantarctic or cold-temperate distributions. These types of links

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are respectively caused by the proximity of the southern tip of South America and western Antarctica during the Tertiary and the West Wind Drift circulation connecting the coasts of the austral lands in the Recent.

This work aims to briefly update what is known of the Magellan bryozoan fauna, and to reassess the zoogeographical connections, especially those linking the Magellan bryozoan fauna with that of the Antarctic Peninsula through the Scotia Arc archipelagos.

MATERIAL AND METHODS

This work has used previously known bryozoan information from the Antarctic and Subantarctic areas (Hastings, 1943; Borg, 1944; Moyano, 1982, 1991, 1995, 1996; Hayward, 1995) for evaluating the zoogeographical significance of the Scotia Arc archipelagos. Data have also been obtained from a) the preliminary taxonomic study of the bryozoan samples gathered by R/V "Victor Hensen" in the Magellan area in October-November 1994, b) the results of the Italian 1991 Magellano I expedition (Moyano, 1992, 1994a,b; Cáceres and Moyano, 1992, 1994) and c) the partial study of two very rich samples dredged on the continental slope near Cape Horn by R/V "Polarstern" in 1996 (Moyano, 1997).

RESULTS

Taxonomic diversity

The Magellan bryozoan fauna accounts for at least 200 species, only slightly less than the species richness at the Antarctic Peninsula and much more than that of the Chilean coast influenced by the cold Humboldt current. Taxonomic richness - including the cyclostome, ctenostome and cheilostome bryozoans- reaches 205 spp. (Table 1) and proves to be higher at the generic and familial levels than those of the Antarctic Peninsula and central and northern Chile. Important qualitative differences exist among those three bryozoan faunas: ctenostomes, almost absent from Antarctica, reach 7% in Magellan South America and 8% in central and northern Chile; and cyclostomes are proportionally more important and diverse in the Magellan area (Table 1).

Diversity (as E, see Table 1) of the Magellan bryozoan fauna, as a measure of the number of species per genus and the number of species per family, is intermediate among the values calculated for the

TABLE 1. – Diversity and endemism of the Magellan Bryozoa fauna in comparison with those of the Antarctic and central and northern Chile

General diversity** (Moyano,1996)*		Taxonomic richness Spp.	Gen	Fam.	E = H'/H' max 100*** DSG	DGF .	DSF
Antarctic Peninsula	Ch, Cy, Ct	225	102	44	91.60	94.30	88.94
Magellan Region	Ch, Cy, Ct	205	106	55	94.26	94.50	91.16
Central-Northern Chile	Ch, Cy, Ct	127	79	35	96.04	92.65	91.70
Ordinal diversity**** (Moyano, 1995)		Spp.	CT (%)	CY (%)	CH (%)		
Antarctic Peninsula		203	2 (0.98)	30 (14.78)	171 (84.24)		
Magellan Region		196	14 (7.14)	43 (21.94)	139 (70.92)		
Central-Northern Chile		106	8 (7.55)	10 (9.43)	88 (83.02)		
Endemism (Moyano, 1995)		Spp.	Non-endemic (%)	Endemic (%)			
Antarctic Peninsula		203	33 (18.29)	170 (83.75)			
Magellan Region		196	89 (45.41)	107 (54.59)			
Central-Northern Chile		106	66 (62.26)	40 (37.73)			

Ch = Cheilostome bryozoans; Cy = Cyclostome bryozoans; Ct = Ctenostome bryozoans;
DSG = Species/genus diversity ; DGF = Genera/family diversity; DSF = Species/family diversity.
* Data not fully worked for ordinal diversity and endemism, therefore for this account previous data by Moyano (1995) have been included in the Table; ** General diversity refers to the entire bryozoan fauna without distinction between the species belonging to three recent orders; *** For theory and calculations of H' and E (evenness) see Cox (1967) and Shannon and Weaver (1963); **** Ordinal diversity or order diversity refers to the species richness of each of the recent orders of the phylum Bryozoa.

TABLE 2. – Zoarial and zooidal diversity of the Magellan bryozoans in comparison with those of the Antarctic and central-northern Chile. Fz = Zoarial forms.

Zoarial diversity (Moyano, 1995)	N (spp.)	Fz	H'	H'max.	E (H'/H'max. 100)
Antarctic Peninsula	203	10	2.5512	3.3219	76.80
Magellan Region	196	10	1.8361	3.3219	55.27
Central-Northern Chile	106	6	1.1272	2.5849	43.61
Polymorphs (Cheilostomatida) (Moyano, 1995)	Spp.	None (%)	One (%)	Two(%)	Three (%)
Antarctic Peninsula	171	38 (22.22)	77 (45.03)	34 (19.88)	22 (12.86)
Magellan Region	138	36 (26.09)	66 (47.83)	31 (22.46)	5 (3.62)
Central-Northern Chile	87	36 (41.38)	43 (49.42)	5 (5.75)	3 (3.45)

bryozoan faunas of the Antarctic and central-northern Chile, and is higher when it is calculated for the number of genera per family. The ca. 50% of endemism of the Magellan bryozoans intermediates between those of the Antarctic (>80%) and the north and central coast of Chile (<40%).

Zoarial forms and polymorphs

Diversity in zoarial forms of the Magellan bryozoan fauna (10 different types) is similar to that of Antarctica (Table 2) and largely surpasses that of central-northern Chile. The shape diversity, considered as the proportional representation of each zoarial form in the total number of species and measured as evenness, decreases following the geographical gradient from Antarctica to Magellan region and central-northern Chile. Thus, in the Antarctic bryozoan fauna all zoarial forms tend to be represented by a similar number of species whereas in the Magellan and central-northern Chile bryozoan faunas a few zoarial forms tend to predominate: e. g. in the latter more than 50% of species are encrusting.

The most specialized polymorphs - avicularia and vibracularia - are missing in a fourth of the Magellan cheilostomes and a little less in the Antarctic forms, which contrasts with the higher proportion of bryozoan species lacking polymorphs in central-northern Chile (Table 2).

Considering all types of polymorphs, the percentage of species having only one ranges from 45% to 49%. That of those with two polymorphs per species is higher in the Magellan bryozoan fauna but less amongst bryozoans from central-northern Chile. Those species having three different polymorphs stand out in the Antarctic bryozoan fauna with more than 12%. This distribution might indicate that Antarctic waters are inhabited by more K-selected taxa, and that r-selected ones are more numerous in central northern Chile. In other words specialization in "exotic castes" of zooids is higher among Antarctic bryozoan species and much lower among those of central-northern Chile.

Bryozoogeographical links

Transpacific links

Although distances between the eastern and western coasts of the South Pacific are huge, many common marine organisms inhabit them, viz. the king crab *Lithodes murrayi* Henderson, 1888, the anguilliform fish *Genypterus blacodes* (Schneider, 1801), the laminarial algae *Macrocystis pyrifera* (Linnaeus) C. Agardh, 1820 and *Durvillea antarctica* (Chamisso in Choris) Hariot, 1892 among many others. The same pattern is observed among bryozoans with not less than 30 species distributed both in Magellan South America and the Australian-New Zealand realm (Table 3). Most of these species are strictly austral Pacific excepting those with a much wider distribution such as *Microporella ciliata*, *Beania magellanica* and *Chaperia acanthina* (see Moyano, 1996).

Atlantic-Indian links

Subantarctic waters flowing eastward and northward from east of Tierra del Fuego explain the existence of the Magellan fauna along the Patagonian continental shelf as far as the latitude of the mouth of the Rio de La Plata (Busk, 1884; López-Gappa and Lichtschein, 1988). The probable northernmost incursion of Subantarctic waters in the southwestern

TABLE 3. – Common bryozoan species - including cosmopolite forms - linking the Magellan area with the southwestern Pacific. Data from Gordon (1984, 1986, 1989) and Moyano (1991).

Order **Cheilostomida**	
1.	*Aetea australis* (Jullien, 1888)
2.	*Beania magellanica* (Busk, 1852)
3.	*Buffonellodes rimosa* (Jullien, 1888)
4.	*Camptoplites asymmetricus* Hastings, 1943
5.	*Cellaria tenuirostris* (Busk, 1852)
6.	*Chaperia acanthina* (Lamouroux, 1825)
7.	*Chorizopora brongniarti* (Audouin, 1826)
8.	*Crepidacantha crinispina* Levinsen, 1909
9.	*Escharella spinosissima* (Hincks, 1881)
10.	*Foveolaria elliptica* Busk, 1884
11.	*Galeopsis pentagonus* (d'Orbigny, 1847)
12.	*Hemismittoidea hexaspinosa* (Uttley and Bullivant, 1972)
13.	*Hippomenella vellicata* (Hutton, 1873)
14.	*Microporella ciliata* (Pallas, 1766)
15.	*Odontoporella adpressa* (Busk, 1854)
16.	*Opaeophora lepida* (Hincks, 1881)
17.	*Osthimosia bicornis* (Busk, 1881)
18.	*Osthimosia eatonensis* (Busk, 1881)
19.	*Phonicosia circinata* (MacGillivray, 1869)
20.	*Schizosmittina cinctipora* (Hincks, 1883)
21.	*Scruparia ambigua* (d'Orbigny, 1841)
22.	*Tricellaria aculeata* (d'Orbigny, 1847)
23.	*Villicharixa strigosa* (Uttley, 1951)
Order **Cyclostomida**	
24.	*Bicrisia biciliata* (MacGillivray, 1868)
25.	*Bicrisia edwardsiana* (d'Orbigny, 1839)
26.	*Disporella fimbriata* Busk, 1875
27.	*Fasciculipora ramosa* d'Orbigny, 1839
28.	*Nevianipora pulcherrima* (Kirkpatrick, 1890)
Order **Ctenostomida**	
29.	*Bowerbankia imbricata* (Adams, 1800)
30.	*Alcyonidium mytili* auctt.

Atlantic Ocean should explain the presence of Subantarctic (Magellan) species around Tristán da Cunha and Gough (Hastings, 1943; Moyano, 1982). Following Subantarctic waters eastward into the Indian Ocean between 45°S and 55°S three archipelagos are found: Prince Edward, Crozet and Kerguelen. Their bryozoan faunas show a mixture of Magellan and Antarctic species (Hastings, 1943; d'Hondt and Rédier, 1977; d'Hondt, 1979) with a slight prevalence of Magellan ones sensu Moyano (1982).

Antarctic-Magellan links

Antarctic-Magellan bryozoogeographical connections are qualitatively and quantitatively different from the trans-Pacific ones. On the one hand there exists an important number of vicariant species (Table 4), and on the other there are common species distributed along the archipelagos of the Scotia Arc (Table 5).

The fifteen species pairs of Table 4 do not actually represent the true richness of vicariant forms because to one Magellan species of a given genus might correspond several Antarctic ones of the same genus or vice-versa. So, whereas to *Parafigularia magellanica* corresponds the Antarctic *P. discors*, to the Pagatonian Tertiary fossil *Adelascopora divaricata* correspond *A. jeqolqa* Moyano, 1989 and *A. secunda* from the Antarctic, and to the Magellan *Orthoporidra petiolata* reciprocate the three Antarctic forms of the genus: *O. brachyrhyncha* Moyano, 1975, *O. compacta* Waters, 1904 and *O. stenorhyncha*. This suggests several vicariant events between South America and Antarctica or amongst previously detached lands now forming part of the whole Antarctic Continent.

Species in Table 5 may be considered common to Magellan South America and western Antarctica. According to the directions of arrows most species (marked +) seem to be moving from north to south, from Patagonia to the Antarctic Peninsula, ten species seem to go north from Antarctica (marked -) and three

TABLE 4. – Magellan and Antarctic vicariant bryozoan species.

	MAGELLAN	ANTARCTIC
1.	*Adelascopora divaricata* (Canu, 1904)	*A. secunda* Hayward and Thorpe, 1888
2.	*Arachnopusia monoceros* (Busk, 1854)	*A. decipiens* Hayward and Thorpe, 1888
3.	*Austroflustra australis* López-Gappa, 1982	*A. vulgaris* (Kluge, 1914)
4.	*Cellarinella dubia* Waters, 1904	*C. foveolata* Waters, 1904
5.	*Chondriovellum angustilobatum* (Moyano, 1974)	*Ch. adeliense* (Livingstone, 1928)
6.	*Exochella longirostris* Jullien, 1888	*E. avicularis* Hayward, 1991
7.	*Fenestrulina horrida* Moyano, 1985	*F. rugula* Hayward and Ryland, 1990
8.	*Hippadenella margaritifera* (Quoy and Gaimard, 1824)	*H. inerma* (Calvet, 1909)
9.	*Klugella buski* Hastings, 1943	*K. echinata* (Kluge, 1914)
10.	*Micropora notialis* Hayward and Ryland, 1993	*M. brevissima* Waters, 1904
11.	*Orthoporidra petiolata* (Waters, 1905)	*O. stenorhyncha* Moyano, 1985
12.	*Paracellaria cellarioides* Hayward and Thorpe, 1989	*P. calveti* (d'Hondt, 1984)
13.	*Parafigularia magellanica* (Calvet, 1904)	*P. discors* (Hayward and Taylor, 1984)
14.	*Romancheina labiosa* (Busk, 1854)	*R. asymmetrica* Moyano, 1975
15.	*Turritigera stellata* Busk, 1884	*T. cribrata* Hayward, 1993

TABLE 5. – Scotia Arc archipelagos as a linking way for Magellan and Antarctic bryozoan faunas.

	SPECIES	MAGELLAN						ANTARCTIC					
		TF	Pa	Ma	BB	KG	R	GS	OS	SS	PA	MR	R
1.	*Aimulosia australis* Jullien, 1888	x	x	x	x	-	k	x	x	x	-	-	+
2.	*Amastigia gaussi* (Kluge, 1914)	-	x	-	-	-	o	x	x	x	x	x	-
3.	*Amphiblestrum georgensis* Hay. and Thor., 1989	-	x	-	-	-	ok	x	-	-	-	-	+-
4.	*Andreella uncifera* (Busk, 1884)	x	x	x	x	x	k	-	x	-	-	-	+
5.	*Arachnopusia inchoata* Hay. and Thor., 1988	-	x	-	-	-	o	x	x	x	-	-	-
6.	*Aspidostoma giganteum* (Busk, 1854)	x	x	x	x	-	k	-	-	x	-	-	+
7.	*Beania inermis* (Busk, 1852)	x	x	x	-	-	k	-	-	x	-	-	+
8.	*Bugula longissima* Busk, 1884	-	-	-	-	x	o	-	-	x	x	x	-
9.	*Caberea darwini* Busk, 1884	x	x	x	x	x	k	x	x	x	x	-	+
10.	*Camptoplites bicornis* (Busk, 1884)	-	x	-	-	x	o	x	x	x	x	x	-
11.	*C. asymmetricus* Hastings, 1943	-	x	-	-	-	k	x	-	-	-	-	+
12.	*Carbasea ovoidea* (Busk, 1852)	x	x	x	x	x	k	-	-	-	x	-	+
13.	*Cellaria clavata* (Busk, 1884)	x	x	x	x	-	k	x	-	-	-	-	+
14.	*C. malvinensis* (Busk, 1852)	x	x	x	x	x	k	x	-	-	-	-	+
15.	*Celleporella allia* Hayward, 1993	-	x	x	x	-	k	x	x	-	-	-	+
16.	*C. dictyota* Hayward, 1993	-	-	x	x	-	k	-	x	-	-	-	+
17.	*C. discreta* (Busk, 1854)	x	x	x	x	x	k	x	-	-	-	-	+
18	*Chaperiopsis galeata* (Busk, 1854)	x	x	x	x	-	k	x	-	x	-	-	+
19.	*Chaperiopsis patulosa* (Waters, 1804)	x	-	-	-	x	o	-	-	-	x	x	-
20.	*Cornucopina ovalis* Hastings, 1943	-	x	-	-	-	k	x	-	-	-	-	+
21.	*Electra longispina* (Calvet, 1904)	x	-	-	-	-	ok	x	-	-	-	-	+-
22.	*Ellisina antarctica* Hastings, 1945	x	x	x	x	x	ok	x	x	x	x	x	+-
23.	*Himantozoum obtusum* Hastings, 1943	-	-	x	-	-	o	x	x	x	x	x	-
24.	*Inversiula nutrix* Jullien, 1888	x	x	x	x	-	k	x	x	x	-	-	+
25.	*Lacerna eatoni* (Busk, 1876)	x	x	x	x	x	k	x	x	x	-	-	+
26.	*L. hosteensis* Jullien, 1888	x	x	x	x	-	k	x	x	x	-	-	+
27.	*Menipea patagonica* Busk, 1852	x	x	x	x	x	k	x	-	-	-	-	+
28.	*Micropora notialis* Hayward and Ryland, 1993	x	x	x	x	-	k	x	x	x	-	-	+
29.	*Paracellaria cellarioides* Hay. and Thor., 1989	-	x	-	-	x	o	x	-	x	-	-	-
30.	*Stomhypsellosaria watersi* Hay. and Thor., 1989	-	x	-	-	-	o	-	-	x	x	x	-
31.	*Talivittaticella frigida* (Waters, 1904)	-	-	x	-	-	o	-	-	-	x	-	-
32.	*Tricellaria aculeata* (d'Orbigny, 1847)	x	x	x	x	x	k	x	-	-	-	-	+
33.	*Valdemunitella lata* (Kluge, 1914)	-	x	-	-	-	o	x	x	x	x	x	-

TF = Tierra del Fuego; Pa = Patagonia; MA = Falkland; BB = Burdwood Bank;
KG = Kerguelen; GS = South Georgia; OS = South Orkney; SS = South Shetland;
PA = Antarctic Peninsula; MR = Ross Sea; R = probable migration ways.
k = To Antarctica; o = To Magellan area.

species are equally distributed on both sides of the Drake Passage (marked + -). According to Table 5 the real path for migrating species is no doubt the chain of archipelagos stretching between the northernmost tip of the Antarctic Peninsula and the southernmost tip of South America. The actual physical discontinuity along this way, more than the distances between its components, seems to be the Antarctic Convergence passing to the north of South Georgia. Nevertheless it appears that zoaria or larvae of species in Table 5 might endure the thermic change of being in shallow waters to the north or south of the Convergence.

Magellan bathyal and abyssal bryozoan faunas

Little or nothing is so far known on the Magellan bathyal and abyssal bryozoan fauna. On the western Atlantic side, the continental shelf is huge - measuring ca 1000 km wide in front of the Falkland Islands - so, most of the collecting records have been obtained in waters of less than 200 m depth. On the Pacific side, the continental shelf is much narrower - less than 100 km - but the continuous bad weather conditions prevent much collecting in outer Chilean Magellan archipelagos. Thus, most expedition activities and collecting records were done in interior waters and not on the continental slope or abyssal plain of that area.

A recent collecting trip by the German research vessel "Polarstern" in 1996 gathered an unusual bryozoan collection from the Magellan continental slope in the Cape Horn area. Two samples containing more than 40 species were obtained at 430 m and 780 m depth. One-third of these species are new to science (Moyano, 1997). The collection is dominated by the biomass of flustrine species belonging to several genera and families. The discovery of a living species of *Adelascopora*, genus considered so far as a Tertiary South American fossil, but at present with two Antarctic species is worth mentioning.
DISCUSSION

Bryozoan diversity in the Magellan zoogeographical Province, with a little over 200 species recorded so far, is similar to that of the Antarctic Peninsula and almost twice the number of species in the Peruvian-Chilean Province. This fact is probably related to the length of coast-line and to the width of the inhabitable submarine associated shelf. Schopf (1978) had already predicted 200 bryozoan species for the Tierra del Fuego and adjacent areas including the Falkland islands. This prediction was based on the available coast as a good indicator of diversity, and on postulates of the island biogeography theory (MacArthur and Wilson, 1967). The large dissected coastline of southwestern South America caused by glaciers during the last million years consists of an enormous number of intricate archipelagos, channels and fjords. To this should be added the broad Atlantic Patagonian shelf which completes the picture of a huge submarine area that explains why the bryozoan fauna is so rich.

The Polychaeta Errantia distribution and species richness along the Chilean coast from Arica to the Magellan region show a somewhat similar pattern to that exhibited by bryozoans. Considering the 184 species indicated by Wesenberg-Lund (1962), it is possible to see an increase of the number of species from north to south: Iquique 30 species, Valparaíso 46 species, Ancud area 62 species, and Magellan region 90 species. The same analysis using the data on distribution and species richness of 167 species of Mollusca Pelecypoda (Soot-Ryen, 1959) shows 81 species from Arica to Valparaíso, 54 species from Valparaíso to Valdivia, 65 species from Valdivia to Golfo Corcovado, and 95 species in the Magellan region. This case is different from that of Polychaeta Errantia because there is a high number of species both in the far north and in the far south, but with higher values in the Magellan region. This trend is supported when considering the total species number of Pelecypoda from Valdivia to the north (90 species) and to the south (120 species). In general terms, the species richness along the Chilean coast increases from north to south as shown by bryozoans, pelecypods and polychaetes; this is probably related to the layout of marine coastal areas as discussed above. It is also probable that such a distributional pattern is evident in other invertebrate groups, however, such analyses are far from the scope of the present study.

The zoogeographical identity of the Magellan region has been widely accepted by many authors (see Briggs, 1974) and confirmed by the results of the Lund University Chile Expedition (Brattström and Johanssen, 1983). This identity is ratified by its 55% of endemic bryozoan species.

Subantarctic ecosystems, widely connected both latitudinally and longitudinally, differ greatly from that of the Antarctic - almost isolated by the Antarctic Convergence and great marine depths. So, the Magellan region is zoogeographically linked with the circum-austral Subantarctic realm through the West Wind Drift (Hedgpeth, 1969). Along this circum-austral path diverse organisms such as larvae or adults can drift attached to drift-wood, buoys, ships and animals. In this respect it is known that *Nothofagus* logs coming from South America have reached Macquarie, Marion, South Georgia, South Shetland and South Sandwich islands (Barber *et al.*, 1959; van Zinderen Bakker, 1971; Mathews, 1931; Smith, 1984; Longton, 1977; respectively; *fide* Burckle and Pokras, 1991).

Another explanation would be to assume a closer proximity of the austral coasts due to a different distribution of lands and seas during the Tertiary (Zinsmeister, 1979). The discovery of South American herbivorous mammals as fossils in Seymour Island, Antarctic Peninsula (Marenssi *et al.*, 1994) suggests that this part of the Antarctic was linked with or much closer to South America and therefore its coasts and faunas of the shelf were also closer. It is also well known that before the Antarctic-South American separation, Australia and Antarctica, as parts of Gondwana, had been drifting apart (Grant-Mackie, 1979; Durham, 1979), and it is possible therefore that the Antarctic shelf might have functioned as a bridging area between South America and the Australian-New Zealand realm. This statement can be exemplified by the rare and archaic *Villicharixa strigosa*, among many other bryozoan species inhabiting the inner Magellan sea and New Zealand (Moyano, 1982; Gordon, 1989).

Antarctic-Magellan links are as noteworthy or more so than those of the amphi-Pacific ones. They might have been produced between the southern tip of South America, the Scotia Arc archipelago, western Antarctica and eastern Antarctica. This would explain the existence of not only pairs of vicariant species but groups of congeneric species, such as those of the genera *Cellarinella*, *Smittina*, *Cellaria*, *Melicerita*, *Camptoplites*, *Notoplites* and *Arachnopusia*. Some bryozoan species such as *Camptoplites bicornis* probably colonized the Magellan region through the intermission of deep waters because species of this genus are both cold stenothermic and eurybathic (Rogick, 1965), thus their presence north of the Antarctic convergence is always in cold deep waters (Hastings, 1943; Gordon, 1989). Another example is the genus *Cellarinella* which has more than fifteen Antarctic species, but only one, *C. dubia,* stretches from Golfo de Penas (46°S in the eastern south Pacific) to the Atlantic Patagonian shelf. The ancestors of this species, inhabiting Sub-antarctic waters on the shelf, probably reached Patagonian waters following the Scotia Arc path.

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