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

Taxonomical and biogeographical notes on the sponges of the Straits of Magellan*

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SUMMARY: The sponge material from the Straits of Magellan collected by the research vessels "Cariboo" in 1991 and "Victor Hensen" in 1994, and by a shallow water diving team, were studied. Most of the investigated bottoms were soft or detritic and true rocky shores were seldom surveyed. However, alternative hard substrata are the holdfasts of dead laminarians, very abundant in the Straits, which represent a sort of microenvironment suitable for settling of sponges and other benthic organisms. Out of a total of more than 150 specimens, 44 demosponge species were identified. The resulting taxonomic pattern suggests a very heterogeneous sponge assemblage, partly related to the variety of the surveyed stations. Sponge communities are characterized by a patchy distribution, a high specific diversity and a low biomass. Most of the recorded species are of austral origin and distribution, confirming the Subantarctic character of the demosponge fauna of the Magellan Straits and its close affinity (14 species in common) with the fauna of the Antarctic continent. Twenty species identified in this study had never been recorded before from the Straits.

Key words: Antarctic, demosponges, taxonomy, ecology, biogeography, Straits of Magellan, Southern Ocean.

RESUMEN: NOTAS TAXONÓMICAS Y BIOGEOGRÁFICAS SOBRE LAS ESPONJAS DEL ESTRECHO DE MAGALLANES. – El material objeto de este estudio se recogió durante las campañas del N/O "Cariboo" en 1991 y del "Victor Hensen" en 1994 en la zona del Estrecho de Magallanes. En el segundo periodo un grupo de buzos tomó muestras también en la zona litoral. La mayor parte de los muestreos se realizaron en fondos blandos y detríticos, los verdaderos fondos duros son raros. Estos fondos están remplazados por rizoides de laminarias muertas, muy abundantes en la zona del estrecho, que constituyen una especie de micro-ambiente, apto para la instalación de esponjas y otros organismos bentónicos. De un total de más de 150 ejemplares examinados se identificaron 44 especies de demospongias. El cuadro taxonómico sugiere una comunidad heterogénea de esponjas, debida, en parte, a la variedad de las estaciones muestreadas. La comunidad se caracteriza por una distribución agregada, por una diversidad específica elevada y por una biomasa reducida. La mayor parte de las especies encontradas son de origen y distribución austral. Se confirma asi el carácter sub-antártico de la fauna de demospongias del Estrecho de Magallanes y su estrecha afinidad (14 especies en común) con la fauna antártica continental. De las especies identificadas en este estudio 20 no habían sido, hasta ahora, encontradas en el Estrecho de Magallanes.

Palabras clave: Antártida, demospongias, taxonomía, ecología, biogeografía, Estrecho de Magallanes, Océano Austral.

INTRODUCTION

The basic information on the taxonomy of the Magellan demosponges comes from the reports of the "Alert" expedition (Ridley, 1881), of the "Challenger" (Ridley and Dendy, 1886; 1887), from the study of the Plate collection (Thiele, 1905) and from a series of Antarctic and Subantarctic expeditions listed by Desqueyroux (1972). More recent data may be found in two reviews of some Poecilosclerida families from South America (Hajdu and Desqueyroux-Faundez, 1994) and the south-east Pacific (Desqueyroux-Faundez and Van Soest, 1996). However, since the demosponge fauna of the

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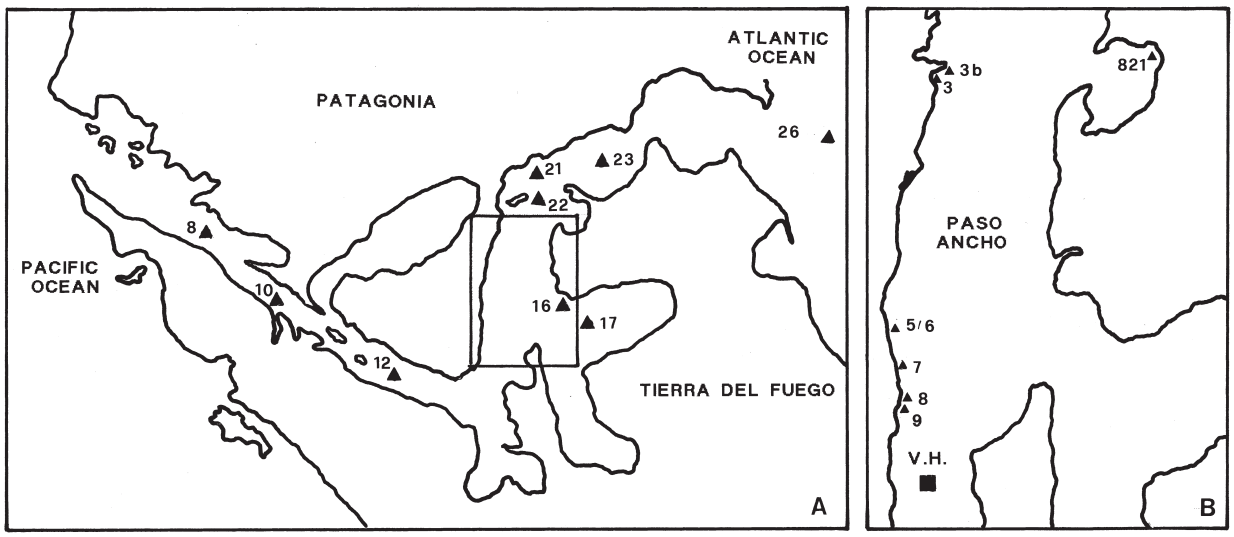

FIG. 1. – Locations of benthos sampling sites: A) "Cariboo" Campaign, 1991; B) Joint Chilean-German-Italian Campaign, 1994, "Victor Hensen" (V.H.) and diving team.

area is far from being well known, this study aims to extend its present knowledge exploiting also sampling techniques, such as diving, never used before in the Strait.

The study was performed within the PNRA (Italian National Antarctic Research Programme) in cooperation, as far as the second cruise is concerned, with the AWI of Bremerhaven and the Universidad de Magallanes of Punta Arenas.

MATERIALS AND METHODS

Part of the sponge material we studied was collected in April 1991, during the Italian cruise of the R.V. "Cariboo" and part in October 1994, during the Joint Chilean-German-Italian Campaign, both from the R.V. "Victor Hensen" and by a diving team.

The sampling devices used by the "Cariboo" were the Charcot-Picard and triangle dredges and the Van Veen grab (size: 0.2 m^2 corresponding to a volume of 60 l), whereas on "Victor Hensen" we used mainly a 1.5m Agassiz trawl for collecting benthos. Divers operated in several shallow-water stations along the northern coast of the Strait from Cabo Porpesse to Puerto del Hambre (Fig. 1 B). Only qualitative data were recorded. Sponges were found at Bahía Laredo (St. 3), Cabo Porpesse (St. 3b), Rio Colorado (St. 5/6), Bahía Rinconada (St. 7), Bahía Mansa (St. 8), Puerto del Hambre (St. 9). An effort has been made to maintain the uniformity of station numbers with those reported by Arntz and Gorny (1996) in the report of the Joint Chilean-German-Italian Campaign.

The "Cariboo" Italian cruise of the autumn 1991 sampled a series of stations ranging from 30 to 830 meter depth from the Atlantic to the Pacific side of the Strait. Sponges were found at the eight stations reported in Figure 1 A. A few sponge specimens (two species of Calcarea and the demosponge *Halichondria panicea)* were collected from floating rhizoids of *Durvillea antarctica*.

In 1994 R.V. "Victor Hensen" was not allowed to repeat the survey in the same positions sampled three years before, but sponges were found in the extensive trawls performed at Bahía Voces from 60 to 550 meter depth, at Bahía Gente Grande in less than 15 m, and off Punta Arenas (Fig. 1 A-B).

The collected material was fixed in a neutralized formol solution (4 % in sea-water) and preserved in 70 % ethanol. Spicule preparations were made by dissolving small fragments of the sponge in 65 % nitric acid, both in test - tubes and directly on slides, rinsing with water, dehydrating with 90 % ethanol and mounting with Eukitt resin. Tangential and transversal sections cut by hand from medium-dry specimens were mounted with the same resin to study the skeletal architecture.

RESULTS

A total of 44 demosponge species were identified from the about 150 specimens collected. Six of them were identified only at genus level, whereas at least 3 species are probably new for science and will be described in a further paper (Table 1).

Families	Species		"Cariboo" - February/March 1991								Divers - Joint Magellan Campaign 1994						Victor Hensen" - Joint Magellan Campaign 1994								
		Numbers of the stations	8	10	12	16	17	21	22	26	3	3b	5/6	7	8	9	821	862	863	864	870	875	881	888
		Depth in meters	800	730	150	110	160	80	35	30	2-4	12	4	4	6	8	10	136	527	550	338	240	60	100
Clionidae	*1. Cliona azzaroliae* Sarà					•			•															
	2. Cliona sp.							•																
	3. Cliona chilensis Thiele																						•	
Suberitidae	4. *Pseudosuberites digitatus* Thiele																•							
	5. Pseudosuberites hyalinus (Ridley & Dendy)					•																		
	6. Pseudosuberites sulcatus Thiele						•																	
	7. Suberites ruber Thiele																•							
	8. Vosmaeria reticulosa Thiele					•										•								
Polymastiidae	*9. Polymastia invaginata* Kirkpatrick																					•		•
	10. Trichostemma sp.			•																				
Axinellidae	*11. Axinella crinita* Thiele				•	•																	•	•
	12. Axinella egregia (Ridley)					•																		
	13. Plicatellopsis flabellata Burton					•																		
Raspailiidae	*14. Eurypon* sp.				•																			
Halichondriidae	*15. Halichondria* cf. *panicea* Pallas				•										•									
	16. Halichondria sp.													•		•								
Hymeniacidonidae	*17. Hymeniacidon fernandezi* Thiele					•			•															
Mycalidae	*18. Mycale magellanica* (Ridley)										•		•	•	•	•	•							
	19. Mycale sp.		•																					
Desmacididae	*20. Isodictya delicata* Thiele								•															
Biemnidae	*21. Biemna chilensis* Thiele																					•		
Myxillidae	*22. Ectyomyxilla tenuissima* (Thiele)					•																		
	23. Iophon chilense Desqueyroux - Van Soest		•																					
	24. Iophon proximum (Ridley)							•												•				•
	25. Iophon tubiforme Desqueyroux - Van Soest										•	•	•			•								
Tedaniidae	*26. Tedania armata* Sarà																		•				•	
	27. Tedania mucosa Thiele					•		•	•	•													•	•
Hymedesmiidae	*28. Hymedesmia* sp.					•																		
	29. Stylopus longurius antarcticus (Hentschel)											•				•								
Anchinoidae	*30. Pronax* sp.							•																
Clathriidae	*31. Axociella nidificata* (Kirkpatrick)																							•
	32. Clathria discreta Thiele															•								
	33. Clathria koltuni Hooper		•																					
	34. Clathria papillosa Thiele														•									•
	35. Clathria saraspinifera Hooper							•																
	36. Echinoclathria contexta Sarà										•													
	37. Pseudanchinoe toxifera (Topsent)															•	•							
Haliclonidae	*38. Gellius carduus* Ridley & Dendy																							•
	39. Gellius flagellifer Ridley & Dendy					•																		
	40. Haliclona topsenti (Thiele)					•																		
	41. Reniera sp.																		•		•			
Callyspongiidae	*42. Callyspongia fortis* (Ridley)																	•						
	43. Callyspongia fusifera (Thiele)															•								
Dysideidae	*44. Dysidea* sp.					•																		

The 44 demosponge species belong to 18 families and 29 genera. The most numerous families are Clathriidae with 7 species, Suberitidae with 6, Myxillidae and Haliclonidae with 4.

The number of species per station varied between 1 and 13, with a mean value of 3.3. Station 16 of the "Cariboo" cruise, located at the entrance of Bahía Inutil at 110 m depth (Fig. 1), shows the highest number of recorded species (13). Eight species were recorded from the rocky shore of Puerto del Hambre, both from the intertidal and infralittoral zones, and finally 7 species were recorded from station 888 of Bahía Voces, at 100 m depth.

The characteristics of the bottoms where samples were taken are remarkably different (Table 2). At the shallow water stations -sampled by divers- the *Macrocystis* holdfasts and the boulders which they are attached to are the commonest hard substrate suitable for sponge settling. Detritic bottoms of biogenic origin dominate at the deep water stations, but they differ remarkably in the sediment texture, abundance and size of pebbles, presence of mud, sand or gravel. True rocky shores are rare in the investigated localities, having been found only at Bahía Manza and Puerto del Hambre.

According to the underwater observations and to the record numbers, at least four species are to be considered common in the Strait. Two of them: *Mycale magellanica* (6 records) and *Iophon tubiforme* (4 records) are common in the coastal environment, whereas *Tedania mucosa* (6 records) and *Axinella crinita* (4 records) are frequent on the detritic bottoms between 30 and 150 meter depth.

TABLE 2. – Bottom characteristics and depth of the sampling stations.

"Cariboo" February/March 1991	Divers - Joint Magellan Campaign 1994	"Victor Hensen" - Joint Magellan Campaign 1994
St. 8 - 800 m volcanic rocks and coarse sand	St. 1 - Bahía Laredo, 2-4 m Macrocystis rhizoids, shells	St. 821 - 9 m coastal detritic, mud
St. 10 - 730 m mud with scattered pebbles	St. 3 - Cabo Porpesse, 12 m Macrocystis rhizoids on boulders	St. 862 - 136 m pebbles
St. 12 - 150 m pebbles	St. 5 - Rio Colorado, 3-4 m Macrocystis rhizoids on boulders	St. 863 - 527 m biogenic detritus (shells), rare pebbles
St. 16 - 110 m pebbles, sand and mud	St. 6 - Bahìa Rinconada, 3-4 m Macrocystis rhizoids on boulders and scattered rocks	St. 864 - 550 m biogenic detritus (shells), rare pebbles
St. 17 - 160 m fine gravel mixed with sand and mud	St. 7 - Bahìa Manza, 6 m rocky shore	St. 870 - 338 m biogenic detritus (shells), rare pebbles
St. 21 - 80 m biogenic detritus (shells), no mud	St. 8 - Puerto del Hambre, 8 m rocky shore, boulders in the intertidal	St. 875 - 240 m biogenic detritus (shells), rare pebbles
St. 22 - 35 m coastal detritic - coarse sand		St. 881 - 60 m biogenic detritus (shells, barnacles), pebbles and mud
St. 26 - 30 m rock?		St. 888 - 100 m biogenic detritus (shells, barnacles), pebbles and mud

Mycale magellanica (Ridley, 1881) which in the last revision of South American *Mycal*e, was considered as a dustbin species (Hajdu and Desqueyroux-Faundez, 1994), appears on the contrary to be neatly defined according to numerous characters and perfectly matching the old descriptions (Topsent, 1913). *Iophon tubiforme* is a species described in 1996 by Desqueyroux-Faundez and Van Soest from Seno Otway and other localities and is an endemic of southern Chile (45° S - 53° S). *Tedania mucosa* is a Thiele (1905) species which includes at present as synonyms three other *Tedania* species described by the same author (i.e. *excavata, pectinicola* and *fuegiensis),* and is distributed along both South American coasts south of 32°. Finally *Axinella crinita* is also a Thiele species (known from Calbuco to Chiloé, Falkland and circumantarctic islands). For the first time we have recorded oxeas from this species, a spicule type never noted in the previous records but rather common within the genus *Axinella.*

Species distribution according to depth is substantially in agreement with data reported in the literature. However, a group of ten shallow-water species which were only found in less than 12 m depth, sharing the relatively uniform coastal environment, may be defined (Table 3). Three other species: *Vosmaeria reticulosa, Clathria papillosa* and a dubious *Halichondria panicea* extend their depth range from the shore to more than 100 m depth.

TABLE 3. – Shallow-water demosponge species from the Magellan Straits.

Numbers of the stations Depth in meters	1 2-4	3 12	5 4	6 4	7 6	8 8	821 10
1. *Callyspongia fusifera* (Thiele)						•	
2. *Clathria discreta* Thiele						•	
3. *Clathria papillosa* Thiele					•		
4. *Echinoclathria contexta* Sarà	•						
5. *Halichondria* cf. *panicea* Pallas					•		
6. *Halichondria* sp.				•		•	
7. *Iophon tubiforme* Desqueyroux - Van Soest	•	•	•			•	
8. *Mycale magellanica* (Ridley)	•		•	•	•	•	•
9. *Pseudanchinoe toxifera* (Topsent)						•	•
10. *Pseudosuberites digitatus* Thiele							•
11. *Stylopus longurius antarcticus* (Hentschel)		•				•	
12. *Suberites ruber* Thiele							•
13. *Vosmaeria reticulosa* Thiele						•	

As to biogeographical results, two out of the three species new to science belong to genera (*Eurypon* and *Trichostemma*) which are not known for the Magellan Province. The third one belongs to the genus *Hymedesmia* which has a worldwide distribution. However the closest species to the new one, *Hymedesmia gaussiana* Hentschel, is an Antarctic species. Four species are new for the Magellan Province: 3 of them *(Axociella nidificata, Stylopus longurius antarcticus, Stylotellopsis antarcticus* are known from the continental Antarctic; the third one, *Gellius flagellifer*, is a "Challenger" species, recorded from Kerguelen Islands, New Zealand and several northern localities up to Ireland. A total of 20 species may be considered new for the Magellan Strait.

DISCUSSION

A wide range of ecological situations were found in the surveyed zones. Pebbles and small rocks, due to the intense water movement, are very unstable in all the shallow water stations investigated, so the only available substrate for sponges are the rare boulders and the laminarian holdfasts. However, since algae exert a sort of antibiotic action against epibiotic organisms, the dead tufts of rhizoids are more intensively colonized than the living ones. These dead entangled tufts - which are quite common and appear also long lasting - represent a particular micro-environment suitable for both sessile and free living benthic organisms.

At the offshore stations the size of sponge specimens is generally small and their habit encrusting. They settle on dead shells of pectinids and other bivalve molluscs, on various debris and pebbles. When the size of the supporting substrate assures a minimal stability (Rützler, 1965), also small erect forms such as *Axinella crinita* may be found. The fact that these specimens rarely attain the normal size of the species (Desqueyroux, 1972) was already noted by Sarà (1991) in the preliminary results of the "Cariboo" campaign. Relating the reduced sponge growth to the scant stability of the substrate, due to bottom currents and other disturbances, Sarà suggested that the occurrence of small Axinellids may be considered a marker of the ecological conditions, especially of the current speed.

Most of the recorded species are present at a very low number of stations. This scattered and diversified distribution pattern may be partly related to the variety of the sampling stations. However, from such a diversified taxonomic pattern, the existence, in the strait, of a very heterogeneous sponge assembly resulting from an intrinsic diversity of the sponge communities may be inferred.

The updated number of demosponge species recorded from the Magellan Province (whose limits are South of 39° S on the Pacific coast and South of Rio de la Plata on the Atlantic) is 149. Desqueyroux-Faundez and Moyano (1987) report from the coast of Chile at least 96 demosponge species whose biogeographic affinities are the following: 4 species are cosmopolitan; 14 show a wide distribution range; 5 are of boreal origin; 56 are of austral origin; 15 are endemics; 19 species are present also in the Antarctic. 32 other species have been recorded in the territory of Argentina on the Atlantic side of Tierra del Fuego (Sarà, 1978; Cuartas, 1994) but should be present also on the coast of Chile. Such is the case of *Tedania armata* Sarà, 1978, recorded from the Strait. Taking away from our list of 44 recorded species from the Magellan Strait the 6 taxa identified at genus level, a biogeographic pattem of the remaining 36 species may be delined. The largest group is made up of the 14 species which are common to the Antarctic. Four species: *Echinoclathria contexta, Pseudosuberites digitatus, Suberites ruber* and *Tedania armata*, may be considered as endemics of South American coasts of Chile and islands, according to Desqueyroux-Faundez and Moyano (1987). Another 20 species, already known for the Magellan Province, but never recorded from the Magellan Strait, contribute to increase considerably the knowledge of its fauna. These data suggest that the Strait area truly belongs to the cold-temperate region of the Chilean South American coast (33° S to 56° S), for which (Desqueyroux-Faundez, 1994), using a method of Parsimony Analysis of Endemism, recognized a genuine historical relationship. The same author considered Falkland Islands and Antarctica as sister groups of that fauna.

Obviously the sponge fauna of the Magellan area is quite poor if compared to that of Antarctica. Even if the latter has been intensively studied in the past (see Sarà *et al.*, 1992 for a complete review), probably the real biodiversity of the continent has just been scraped. However, promising results have recently been obtained by the automatic photographic survey of benthic communities (Barthel *et al.*, 1991; Barthel and Gutt, 1992). Such a consistent information on deep water sponge assemblages is expected to increase the scant knowledge of sponge distribution

and ecology both in the Antarctic and Magellan areas.

Other recent papers on South American demosponges (Hajdu and Desqueyroux, 1994; Desqueyroux-Faundez and Van Soest, 1996, 1997) confirm the existence of a Magellan region on both sides of South-America and of two areas of endemism (a northern and a southern one) along the Chilean coast, this notwithstanding the existence of a few species with a wide distribution range along the Pacific coast, such as *Cliona chilensis* (California-Chiloé) and *Suberites ruber* (27° - 53° S). Clear relationships with Antarctica are shown by the genera *Iophon, Tedania* and *Myxilla*, with morphological traits shared with Antarctic species, indicating fairly recent interchange and subsequent speciation (Desqueyroux-Faundez and Van Soest, 1996). According to these authors the thick icecap that covered southern Chile and the Antarctic, possibly destroying the littoral fauna to considerable depth, may justify the subsequent invasions of these areas from the north. The existence of a faunal exchange between Antarctica and South America via the Scotia Arc, proposed by Knox and Lowry (1977) and supported by Sarà *et al*. (1992) with data on demosponges, seems once more confirmed.

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