

## 8.2 Macrobenthic biodiversity and community structure in austral Chilean channels and fjords

Erika Mutschke

Instituto de la Patagonia. Universidad de Magallanes  
E-mail: erika.mutschke@umag.cl

The fjords and channels of Chile form a complex geological and oceanographic system comprised of an estimated 84,000 km of coastline, much of which is glacial in origin. Ecologically and biogeographically, the distribution and abundance of macrobenthic organisms along the length of the South Pacific slope is discontinuous (Viviani, 1979; Brattström & Johanssen, 1983; Camus, 2001). Consequently, differences can be seen in some aspects of biodiversity and community structure of the natural systems in central and northern Chile and at high latitudes (Antarctica). The first relevant study of this complex, extensive region was the Challenger expedition in 1872-1876 (Sladen, 1889). The Lund University expedition in 1948-1949 provided the first published results for the Campos de Hielo Norte and the Strait of Magellan (e.g., Leloup, 1956; Madsen, 1956; Menzies, 1962). A more recent cruise undertaken by the R/V Hero took place in 1972. This should be contrasted with the information available for Chilean glacial channel and fjord regions in the Northern Hemisphere (Kendall *et al.*, 2003; Wlodarska-Kowalczyk & Pearson, 2004).

More recently, extensive efforts have been made to sample the benthic macro-communities in the Magallanes region (Arntz & Ríos, 1999). The CIMAR Program sampled biotic and abiotic components of the systems associated with the fjords and channels from the Campos de Hielo Sur to Cape Horn.

The channel and fjord area between Golfo de Penas and the Strait of Magellan (central zone) is highly influenced by glaciers and high sedimentation rates, which strongly affect the macrofaunal distribution and abundance values. To date, 131 macro-invertebrate species have been identified from the study area (Table I). Of these, Echinodermata was the most diverse (47 species),

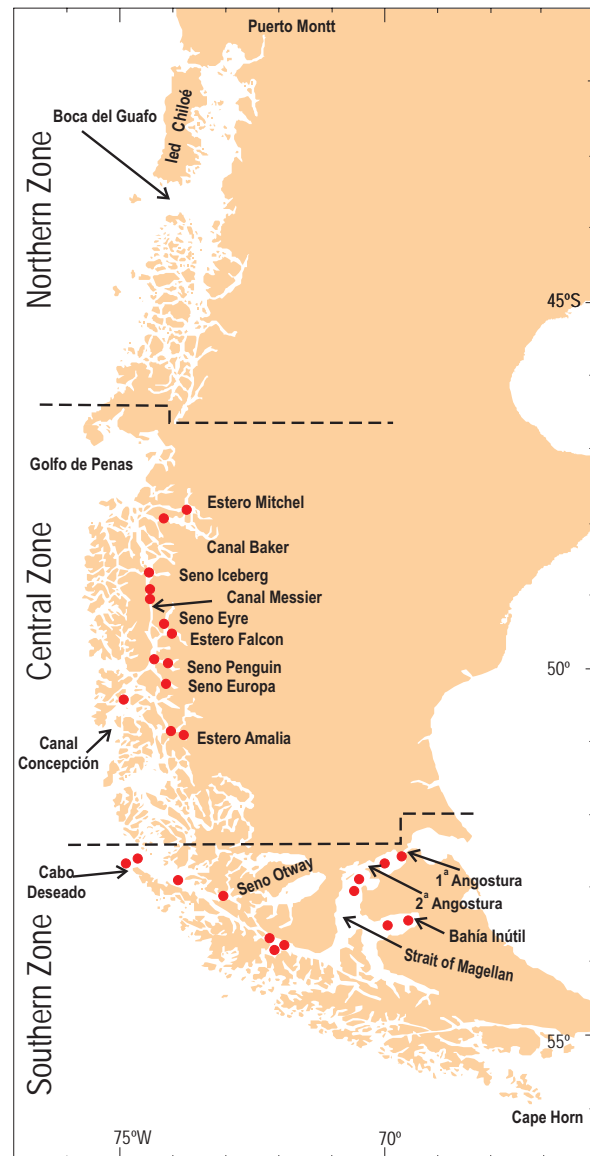


Figure 1: Sampled area, visited during the CIMAR 2 and 3 Fjords cruises for the study of the macrobenthic communities in the region of Chilean austral fjords and channels with glacial origins.

with the Asteroidea (25 species) and the Ophiuroidea (13 species) representing the majority of the sampled taxa.

Polychaetes were the second best represented group, with 46 species. Montiel *et al.* (2004) analyzed the composition of sub-littoral polychaetes in the Campos de Hielo Sur. Species in this group have austral and high-latitude distributions. At least 40 species were sampled, only four of which had been recorded previously. Moreover, 11 species were recorded for the first time in this area and new species were added to the literature, such as *Harmothoe campoglacialis* (Hilbig & Montiel, 2000).

Decapod crustaceans collected from littoral to deep-sea regions (0-1,218 m) were the most poorly represented of the groups sampled. There were a total of 13 species, including the Brachyura (4 species), Anomura (5), Caridea (3), and Palinura (1). The most abundant species were *Austropandalus grayi*, *Libidoclaea smithi*, *Eurypodius latreillei*, *Pagurus comptus*, *Munida subrugosa*, and *Campylonotus semistriatus* (Mutschke & Gorny, 1999). Overall, the number of species decreased from the exposed, coastal Pacific regions to those located within the fjords. The Brachyura were widely distributed throughout the channels, fjords, and adjacent coastal areas. Other decapods were collected from more restricted areas. The Caridea were limited to channels, whereas the Anomura were only collected from fjords. *Libidoclaea smithi* and *Munida subrugosa* were the most frequently collected species from the fjords, but other anomuran species were also occasionally caught in the oceanic channels.

Decapod taxa were collected from different bathymetric ranges. Brachyura were collected from < 200 m depths, Caridea from between 75 and 438 m, and the palinuran *Stereomastis suhmi* from between 75 and 392 m. Some evidence indicates that species such as *Libidoclaea smithi*, *Munida subrugosa*, and *Campylonotus semistriatus* prefer bottom environments composed of limes and clays (Retamal, 1974; Wehrmann & Lardies, 1996).

The species richness of decapod crustaceans in the Campos de Hielo Sur is relatively low compared to the 46 species known from Chiloé to Cape Horn (Gorny, 1999). Nonetheless, it can be assumed that, if there is a retreat in the ice fields

resulting in increased shallow waters, these species could colonize the interior fjords (Mutschke & Gorny, 1999).

Amphipods were scarce—in number of individuals and species represented by these—near the glaciers. The predominant families were Oedicerotidae and Phoxocephalidae (Mutschke *et al.*, 1997) in terms of abundance and biomass. Of the 174 species identified for the Magallanes region (36 families and 104 genera, according to De Broyer & Rauschert (1999), only 68 species were previously recorded from the Campos de Hielo Sur. A great potential for undiscovered biodiversity exists, as 15 to 20 % of the total number of species collected could not be identified from the literature. Several families (e.g., Cyproideidae, Eusiridae, Gammaridae, Liljborgiidae, Lysianassidae, Phoxocephalidae, Podoceridae, Stenothoidae) were represented by potentially new species. Amphipod diversity from the Magallanes region is poorly understood and new taxa, such as *Victorhensenoides arntzi* Rauschert, 1996, continue to be discovered. Sustained sampling has also extended the distribution range for several species. For example, *V. arntzi*, of the family Cyproideidae, had not been previously recorded for Chile and Antarctica. Similarly, the genus *Scaphodactylus*, of the family Stenothoidae, whose geographic distribution was thought to be restricted to the Southern Ocean, was recorded for the first time in the eastern South Pacific in Campos de Hielo Sur (De Broyer & Rauschert, 1999). The sub-littoral macrobenthic fauna found in the southern zone (Strait of Magellan to Cape Horn) has been described in greater detail for the Strait of Magellan and adjacent channels (Brey & Gerdes, 1999; Gerdes & Montiel, 1999; Gutt *et al.*, 1999; Mutschke & Gorny, 1999; Thatje & Mutschke, 1999; Montiel *et al.*, 2001; Ríos *et al.*, 2003a). The north-south diversity gradient in this area is more homogenous than that of the Antarctic region, with a transition that is gradual rather than abrupt (Arntz, 1999). The epifaunal communities in the Strait of Magellan represent a patchy distribution determined primarily by variability in the mesoscale environmental conditions and not by macroscale regional differences.

In some cases, notable differences were found between the structures of shallow and deep-water epibenthic communities. Gutt *et al.* (1999) suggested that, in the Strait of Magellan and Canal Beagle, two types of communities can be

Table I. List of marine invertebrate species found in the study area off the Campos de Hielo Sur and Strait of Magellan, including the number of individuals caught at each station with a modified Agassiz trawl. Colonial organisms are indicated with p (presence); H = Campos de Hielo Sur; E = Strait of Magellan.

Species / Station number	H5	H8	H13	H14	H15	H19	H22	H25	H27	H32	H33s	H35s	H39	H40	E1	E2	E3	E4	E5	E6	E56	E8	E9	E10	E12	E14	E15	E16	
<b>Anthozoa</b>																													
<i>Thouarella variabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Primoella</i> sp																													
<b>Polychaeta</b>																													
<i>Terebellidae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
<i>Polynoidea</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	1	0	0	0	0	0	0	0	1	
<i>Ophelidae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
<i>Ampharetidae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
<i>Sabellidae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	1	0	0	0	0	0	0	0	0	0	0	
<i>Sabellariidae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
<i>Lumbrineridae</i> INDET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eunereis patagonica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	2	0	0	0	0	0	0	0	0	0	0	
<i>Platynereis</i> sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
<i>Onuphis pseudoiridescens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	
<i>Chaetopterus</i> sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	
<i>Maldane sarsi</i>	0	1	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Melinna cristata</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nephtys paradoxa</i>	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cirratulus</i> sp	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eunice pennata</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Aphrodita magellanica</i>	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Abyssoninoe abyssorum</i>	0	0	0	0	1	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Lumbrineres cingulata</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ninoe leptognatha</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Asychis</i> sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nephtys</i> sp	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Gymnoreris hartmannschoederæ</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nicon maculata</i>	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Neanthes cf. abyssorum</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Neanthes kerguelensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Travisia kerguelensis</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Anailides</i> sp	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Harmothoe cf. xanthena</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Harmothoe campoglaialis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Hololepida</i> sp	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Polydora laevis</i>	0	0	0	0	0	1	34	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Hypsicomus phaeotaenia</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Leanira quatrifagesi</i>	0	0	0	0	6	3	0	1	2	0	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Neoleanira magellanica</i>	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Laonice</i> sp	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Sternopsis scutata</i>	0	0	0	0	13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Artacama valparaisensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eteone sculpta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	

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Species / Station number	H5	H8	H13	H14	H15	H19	H22	H25	H27	H32	H33s	H35s	H39	H40	E1	E2	E3	E4	E5	E6	E55	E56	E8	E9	E10	E12	E14	E15	E16		
<i>Sthenolepis magellanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
<i>Nothria</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<i>Lanice</i> cf. <i>flabellum</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nicolea chilensis</i>	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Pista cristata</i>	0	0	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Terebellides bisetosus</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Terebellides</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<b>Decapoda</b>																															
<i>Eurypodius latreillei</i>	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	2	2	0	0	0	0	0	1	0	2	4	0	
<i>Haliscarcinus planatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Steromastis suhmi</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Pagurus comptus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
<i>Campylonotus semistriatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	8	0	0	0	0	
<i>Libidoclelea smithi</i>	0	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
<i>Munida subrugosa</i>	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
<i>Pelitarion spinosulum</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
<b>Isopoda</b>																															
<i>Acanthoserois schythei</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	6	40	0	
<i>Cirrolana chilensis</i>	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Aega</i> sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Thoracica</b>																															
<i>Austromegabalanus psittacus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	p	p	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Polyplacophora</b>																															
<i>Stenoseurus exaratus</i>	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Callochiton puniceus</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	
<b>Gastropoda</b>																															
<i>Crepidula dilatata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Trochita pileolus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
<i>Trochita pileus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Adelomelom ancilla</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
<i>Berthella platei</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	
<i>Trophon geversianus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	
<i>Pareuthria plumbea</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	
<i>Photinula caerulea</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	
<b>Bivalvia</b>																															
<i>Aulacomya ater</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	
<i>Lucinoma lamellata</i>	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Emucula grayi</i>	1	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Acosta patagonica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Camptonectus (P.) subhyalinus</i>	0	0	0	0	0	0	0	0	191	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Limopsis marionensis</i>	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Limopsis</i> sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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Species / Station number	H5	H8	H13	H14	H15	H19	H22	H25	H27	H32	H33s	H35s	H39	H40	E1	E2	E3	E4	E5	E6	E55	E56	E8	E9	E10	E12	E14	E15	E16	
<i>Cyclocardia velutina</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	14	0	0	0	0	
<i>Tindaria virens</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nucula</i> sp.	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Chlamys patagonica</i>	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	
<i>Yoldia</i> cf. <i>woodwardi</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Yoldia eightsi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Scaphopoda</b>																														
<i>Dentalium majorinum</i>	0	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	12	0	10	0	0	0	0	1	
<i>Dentalium</i> cf. <i>perceptum</i>	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Gymnolaemata</b>																														
<i>Reteporella magellensis</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nevianipora milneana</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Hornera</i> sp.	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Microporella hyadesi</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Rhabdopleura normani</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Adeonella</i> sp.	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	
<i>Orthoporida petiolata</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Aspidostoma giganteum</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Catadystoma pygmaeum</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carbacea ovoidea</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	p	p	p	p	p	p	p	p	p	p	p	p	p	p	
<i>Hippodimella adpressa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	
<i>Cellaria malvinensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Heteporella chilensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Smittina februni</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ogivalia elegans</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Arachnopusia monoceros</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Fasciulipora meandrina</i>	0	0	0	0	0	0	0	0	0	0	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Articulata</b>																														
<i>Terebratella dorsata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	1	0	0	3	0	0	0	0	0	0	0	0	0	
<i>Magellania venosa</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	31	0	5	0	142	0	0	0	0	0	0	0	0	0	0	
<b>Asteroida</b>																														
<i>Otenodiscus procurator</i>	0	0	0	0	50	0	0	1	0	0	0	0	0	0	0	0	0	0	2	12	29	10	0	0	6	0	0	22		
<i>Asterina fimbriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cheiraster (Luidia) planeta</i>	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
<i>Solaster regularis</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
<i>Poraniopsis mira</i>	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Lophaster stellans</i>	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<i>Doraster qawashqari</i>	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cosmasterias lurida</i>	0	0	0	0	0	0	0	0	0	0	16	0	0	0	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Henricia obesa</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	
<i>Henricia studeri</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<i>Labidaster radicosus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1

Table I. (Continuation). List of marine invertebrate species found in the study area off the Campos de Hielo Sur and Strait of Magellan, including the number of individuals caught at each station with a modified Agassiz trawl. Colonial organisms are indicated with p (presence); H = Campos de Hielo Sur; E = Strait of Magellan.

Species / Station number	H5	H8	H13	H14	H15	H19	H22	H25	H27	H32	H33s	H35s	H39	H40	E1	E2	E3	E4	E5	E6	E55	E56	E8	E9	E10	E12	E14	E15	E16				
<i>Calyptaster tenuissimus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0			
<i>Odontaster penicillatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
<i>Odontaster meridionalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0			
<i>Ceramaster patagonicus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0			
<i>Hippasteria sp</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0			
<i>Porania antarctica magellanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0	0	0	3	0		
<i>Anasterias antarctica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
<i>Anasterias sp</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0		
<i>Ganeria falklandica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
<i>Bathylaster loripes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	1	0	0	4	0		
<i>Poraniopsis echinaster</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
<i>Cyathra verrucosa</i>	0	0	0	0	18	0	0	0	0	0	0	0	0	0	2	0	1	10	0	0	0	0	0	0	0	4	0	0	0	0	0		
<b>Echinoidea</b>																																	
<i>Triplyaster philippii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	2	0		
<i>Arbacia dufresnei</i>	0	1	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		
<i>Pseudechinus magellanicus</i>	0	0	0	0	0	2	0	0	0	8	4	24	0	0	6	1	0	11	20	0	0	0	0	0	5	9	0	0	0	0	0		
<i>Austrocidaris loroli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0		
<i>Brisaster moseleyi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0		
<b>Ophiuroidea</b>																																	
<i>Ophiura INDET</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
<i>Ophiacantha cf. pentactis</i>	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
<i>Ophiactis sp</i>	0	0	0	0	0	0	0	0	0	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophiocten amittinum</i>	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophiacantha vivipara</i>	0	0	0	0	0	2	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophiuroglypha lymani</i>	13	0	7	0	0	0	3	0	0	0	0	8	0	0	0	0	0	0	0	0	55	0	0	0	4	65	0	0	0	0	0		
<i>Gorgonocephalus chilensis</i>	0	0	0	0	0	3	0	0	0	27	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophiomyxa vivipara</i>	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophiactis asperula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	1	1	0	
<i>Astrotolema agassizii</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Homalophiura inornata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ophioscolex nutrix</i>	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Homalophiura sp</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Holothuroidea</b>																																	
<i>Hemioderma spectabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Psolus patagonicus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	79	0	0	0	0	0	0	0	
<i>Pseudocnus leoninus dubiosus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Holothuroidea sp 1</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Holothuroidea sp 2</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	12	0	2	0	0	0	0
<i>Holothuroidea sp 3</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	7	0	0	0	0	0	0	0	0

distinguished in association with shallow water versus deeper-water environments. Gutt *et al.* (1999) characterized these communities as differing in abundance, number of taxa, diversity, and species composition. Decapod crustaceans characterized some shallow-water communities, whereas other communities were dominated by sessile filter feeders such as Porifera (sponges), Cnidaria (Anthozoa), or Bryozoa. A third community associated with the stations at the south of the eastern mouth of the Canal Beagle resembled the shallower stations in terms of dominant organisms. Echinodermata (asteroids, ophiuroids) dominated ecologically the deeper communities. In general, no noticeable differences in terms of composition and abundance were detected between the Strait of Magellan and the narrower Canal Beagle. With the exception of the Echinodermata, no significant faunal differences were observed to be associated with either the Pacific or the Atlantic (*e.g.*, Gutt *et al.*, 1999).

The distribution and abundance of the Asteroidea differed from those of other Pacific-Atlantic distributed invertebrates. Although this group is widely distributed in the Strait of Magellan, Atlantic and Pacific specificity was observed. According to the similarity analysis, in terms of species composition, the recurrent species in the Atlantic zone, which were largely responsible for this differentiation, were *Cycethra verrucosa*, *Ganeria falklandica*, and *Cosmasterias lurida*. In the Pacific zone, the dominant species were *Ctenodiscus procurator* and *Bathybiaster loripes*, reaching eastward to the Paso Ancho sector (Mutschke & Ríos, 2006).

Gerdes & Montiel (1999) used results from the Estrecho de Magallanes, Canal Beagle, and continental shelf to determine that the average abundance values of invertebrates varied from 1,591 ind·m<sup>-2</sup> at Paso Ancho (Strait of Magellan) to 3,643 ind·m<sup>-2</sup> in Canal Beagle and as many as 3,983 ind·m<sup>-2</sup> on the continental shelf to the south of Canal Beagle. The biomass values in these respective areas were 96.8, 301.6, and 119.0 g·m<sup>-2</sup>, and the organic carbon values were 4.8, 11.4, and 4.6 g·m<sup>-2</sup>. In spite of the differences in the benthic faunal compositions from the tip of South America and Antarctica, these authors did not find any significant differences in density. Brey & Gerdes (1999), however, reported higher production and productivity of the benthic community in the Magallanes region than in the Weddell Sea,

possibly as a response to the former area's greater trophic availability and higher temperatures. Thatje & Mutschke (1999) also found that abundance (2,318 ind·m<sup>-2</sup>), biomass (3.2 gC·m<sup>-2</sup>), and primary production (0.62 gC·m<sup>-2</sup>) values in the Magallanes region were lower than those estimated for the Weddell Sea. Since the average values of number and biomass for the Campos de Hielo Sur were significantly less than those determined for the Strait of Magellan, Thatje & Mutschke (1999) suggested that the Magallanes region is transitional in nature.

Ríos *et al.* (2003a) indicated that the biodiversity of the sub-littoral zone in the eastern sector of the Strait of Magellan is dominated, in terms of abundance, by a few macrobenthic species and that diversity values are high. The values show a clear tendency to fluctuate over time, with the averages differing significantly amongst themselves. Diversity not only varied on a spatial scale within the Strait of Magellan but also on a temporal scale, strongly supporting the need for further sampling and the continuation of long-term diversity estimates.

Biodiversity in the Strait of Magellan was substantially higher in association with the algae *Macrocystis pyrifera*. The *M. pyrifera* holdfasts sheltered up to 150 macro invertebrate and vertebrate species. Some of these species displayed seasonal settlement processes (Ríos *et al.*, 2003b) and evidence suggests that different developmental stages of the community are found in different sectors of the strait, possibly associated with the effects of the Pacific and Atlantic, as revealed by differences in dominance, abundance, and diversity between the two oceans. Taxonomic richness was best represented by the Polychaeta, Echinodermata, and Crustacea. The significantly lower species richness reported for Canal Beagle, as compared with the algal communities ("huirales") of the Strait of Magellan and the Northern Hemisphere can be explained by historic and biogeographical causes (Santelices, 1980; Ojeda & Santelices, 1984).

Quantitative and qualitative data have indicated that the average abundance of the macrobenthos reaches a maximum (3,972 ind·m<sup>-2</sup>) on the continental slope but is less than the abundance recorded at the sampling stations located in the Campos de Hielo Sur (625 ind·m<sup>-2</sup>). Multidimensional scaling (MDS) was used to

compare the sampling sites in the Campos de Hielo Sur and the Strait of Magellan. The sites were divided into two groups of stations: one related to the channels and fjords and the other to the strait. The division, determined by the invertebrate species present or absent in both sectors, seems to be a consequence of the substrate type (limes and clays for the fjords, sand for the channels), but could also be associated with the effect of the disturbances caused by the high rate of sedimentation in the Campos de Hielo Sur. The Strait of Magellan, on the other hand, is probably a more diverse habitat and apparently less disturbed by the direct action of the glaciers and, consequently, more abundant and rich in species.

Our results reveal the lack of studies on seasonal and long-term fluctuations in the sub-Antarctic and Antarctic ecosystems as well as the need for studies on their relationships with the environmental parameters. Such research would permit more explicative analyses of the patterns and trends presented in the macrobenthic communities associated with the southern Chilean fjord and channel complex.

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