

THE MAGELLAN-ANTARCTIC CONNECTION: LINKS AND FRONTIERS AT HIGH SOUTHERN LATITUDES.
 W.E. ARNTZ, G.A. LOVRICH and S. THATJE (eds.)

Species richness and faunistic affinities of the Gammaridea and Corophiidea (Amphipoda) from shallow waters of southern Tierra del Fuego, Argentina: preliminary results*

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SUMMARY: Species richness and faunistic affinities of gammaridean and corophiidean amphipods from southern Tierra del Fuego were studied. The material was collected with dredges and grabs at 7 locations (15 sampling stations) in a range of 5 to 35 m depth. A total of 61 species belonging to 20 families and 43 genera were identified. The genera *Cephalophoxoides*, *Ceradocopsis* and *Photis* are reported for the first time from the Magellan region and 3 species belonging to *Atylus*, *Ischyrocerus* and *Photis* appear to be new to science. Most of the species collected belong to Phoxocephalidae, whereas most individuals were contained in the Stenothoidae and Lysianassidae s.l. The analysis of the faunistic affinities showed that 16 species (39%) are endemic to the Magellan region, 9 species (22%) extend to the south, 5 species (12.2%) to the north and 5 other species (12.2%) to both the north and south. In addition, 6 species extend beyond the Magellan region as far as Oceania.

Keywords: Magellan region, Beagle Channel, Amphipoda, diversity, distribution.

RESUMEN: – RIQUEZA DE ESPECIES Y AFINIDADES FAUNÍSTICAS DE GAMMARIDEA Y COROPHIIDEA (AMPHIPODA) DE AGUAS SOMERAS DEL SUR DE TIERRA DEL FUEGO, ARGENTINA: RESULTADOS PRELIMINARES. – Se estudió la diversidad y las afinidades faunísticas de los anfipodos gammarideos y corophiideos del sur de Tierra del Fuego. El material fue recolectado utilizando rastras y dragas en 7 sitios (15 estaciones de muestreo) a un rango de profundidad entre 5 y 35 metros. Un total de 61 especies pertenecientes a 20 familias y 43 géneros fueron identificadas. Los géneros *Cephalophoxoides*, *Ceradocopsis* y *Photis* son citados por primera vez para la región magallánica, y 3 especies de los géneros *Atylus*, *Ischyrocerus* y *Photis* parecen ser nuevas para la ciencia. Phoxocephalidae resultó la familia con mayor número de especies, mientras que Stenothoidae y Lysianassidae s.l. fueron las más abundantes. El análisis de las afinidades faunísticas reveló que 16 especies (39%) son endémicas de la región magallánica, 9 especies (22%) se extienden hacia el sur, 5 especies (12,2%) hacia el norte y otras 5 (12,2%) están presentes en el norte y en el sur. Además, 6 especies se extienden más allá de la región magallánica alcanzando Oceanía.

Palabras clave: región magallánica, Canal Beagle, Amphipoda, diversidad, distribución.

INTRODUCTION

The gammaridean and corophiidean amphipods (Crustacea, Peracarida, Amphipoda) represent a

widely diversified group of invertebrates in benthic communities from the Magellan region. Based on extensive collections along the Chilean coasts and data from the literature, a total of 206 species were listed by De Broyer and Rauschert (1999). In contrast, the amphipod fauna from the Argentine sector

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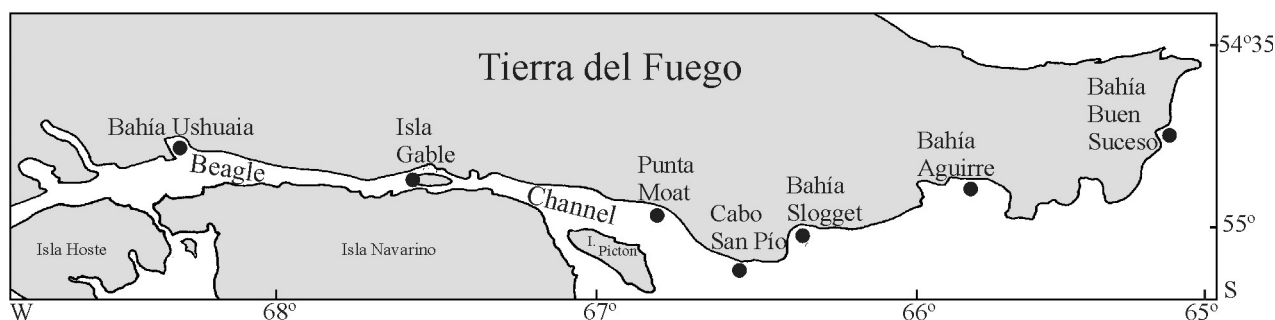


FIG. 1. – Sampling locations in southern Tierra del Fuego.

of the Magellan region still remains scarcely studied. Unfortunately, the main contributions for the area by Schellenberg (1931) and Barnard (1932) have overlooked important details in their descriptions of species, and most of them need revision and redescription. Recently, several species have been described from the provinces of Santa Cruz and Chubut, but the knowledge on the group is sparse in Tierra del Fuego, where only a few studies carried out by Alonso (1987a,b, 1989) and Alonso de Pina (1993a, 1997a) provided the description of 2 new species and the addition of 3 new records of distribution. The low number of species presently known from the Argentine waters of the Magellan region is probably due to the lack of extensive field surveys conducted in this area.

The present work provides the first results on the species richness and faunistic affinities of the Gammaridea and Corophiidea collected in southern Tierra del Fuego. The sampling area is not only of great biogeographic interest due to its proximity to the Subantarctic islands and the Antarctic, but also represents a transitional region between the Atlantic and Pacific oceans.

MATERIAL AND METHODS

Seven locations (comprising a total of 15 sampling stations) were established along the Beagle Channel and its eastern mouth, at the southern coast of Tierra del Fuego, Argentina (Fig. 1, Table 1). All stations were selected within a relatively homogeneous bathymetric range (5 to 35 m) in order to avoid depth-related effects. A total of 6 samples were obtained with a dredge of 45 x 50 cm mouth and 2 mm mesh. The dredge was pulled for 7 minutes at Isla Gable, Punta Moat, Cabo San Pío, Bahía Slogget, Bahía Aguirre and Bahía Buen Suceso (Fig. 1). In addition, the contents of grab samples (Snapper and Van Veen, 0.07 m²) taken at 9 sampling stations in Bahía Ushuaia were received from colleagues and considered altogether for this study (Table 2).

The material was fixed in 10% formalin. Amphipods were sorted from the sediment under a stereoscopic microscope, preserved in 70% ethanol, and identified to the lowest taxonomic level. The taxonomic classification of the amphipods follows Barnard and Karaman (1991) and Myers and Lowry (2003).

TABLE 1. – Sampling locations

Locations	Date	Latitude	Longitude	Depth (m)	Sampler
Bahía Ushuaia					
Península Ushuaia	27/10/96	54° 51' S	68° 19' W	5-10	Van Veen Grab
Bahía Golondrina	12/2/97	54° 50' S	68° 20' W	5	Snapper Grab
Bahía Golondrina	12/2/97	54° 50' S	68° 19' W	5	Snapper Grab
Bahía Golondrina	12/2/97	54° 50' S	68° 14' W	5	Snapper Grab
Bahía Golondrina	10/2/97	54° 49' S	68° 14' W	12	Snapper Grab
Bahía Golondrina	10/2/97	54° 50' S	68° 16' W	30	Snapper Grab
Bahía Golondrina	10/2/97	54° 49' S	68° 17' W	30	Snapper Grab
Isla Lucas	10/12/97	54° 50' S	68° 19' W	17	Snapper Grab
Pozo Angel	12/2/97	54° 52' S	68° 15' W	23	Snapper Grab
Isla Gable	11/5/01	54° 54' S	67° 21' W	15-20	Dredge
Punta Moat	2/9/01	55° 02' S	66° 42' W	15-25	Dredge
Cabo San Pío	29/9/02	55° 03' S	66° 37' W	30-35	Dredge
Bahía Slogget	2/9/01	55° 00' S	66° 21' W	15-27	Dredge
Bahía Aguirre	2/2/00	54° 54' S	65° 57' W	30-35	Dredge
Bahía Buen Suceso	8/2/01	54° 47' S	65° 14' W	12	Dredge

The number of species and specimens were determined for each locality.

For the analysis of the faunistic affinities, the following areas were considered:

a) Magellan region: comprising the Malvinas (Falkland) Islands, the Argentine coast south of Península Valdés and the Chilean coast south of Isla Chiloé; the southern limit is Cape Horn (Boschi, 2000).

b) "North of the Magellan region": embracing the coasts north of Península Valdés (Atlantic Ocean) and Isla Chiloé (Pacific Ocean), including the Brazilian, Uruguayan, Peruvian and northern Argentinean and Chilean waters.

c) "South of the Magellan region": includes the Scotia Arc islands (South Georgia, South Sandwich Islands, South Orkney Islands and South Shetland Islands), the Subantarctic islands (Kerguelen, Crozet, Campbell, Macquarie, Auckland, Prince Edward and Marion Islands) and the Antarctic.

Data for these areas were obtained from Schellenberg (1931), K. H. Barnard (1932), Lowry and Bullock (1976), González (1991), De Broyer and Jazdzewski (1993), Wakabara and Serejo (1998) and De Broyer and Rauschert (1999). In the analysis of faunistic affinities, the new species and those reported as "sp." or "cf." were not considered.

RESULTS

Species richness of amphipods

A total of 3,928 specimens were examined during this study and 41 species were identified (Table 2); another 20 species (reported as "sp." or "cf." in Table 2) were recognised as different taxa. In total, 61 species belonging to 43 genera and 20 families were reported (Table 2). The present study provides the first records of the genera *Cephalophoxoides*, *Ceradocopsis* and *Photis* from the Magellan region and of 18 species from the Beagle Channel. Moreover, 3 species belonging to *Atylus*, *Ischyrocerus* and *Photis* appear to be new to science (Table 2).

Among the twenty families recognised, Phoxocephalidae had the highest number of species (7). Ten families had 3 to 6 species, and nine families only 1-2 species (Table 2). A high number of genera also had a low number of species: 34 genera were only represented by 1 species each; three genera (*Atyloella*, *Atylus* and *Iphimedia*) by 2 species each; and four genera (*Liljeborgia*, *Probolisca*,

Pseudiphimediella and *Seba*) by 3 species each. *Gammaropsis* and *Gondogeneia* had 4 and 5 species each respectively (Table 2).

Stenothoidae and Photidae were the families that accounted for the highest number of specimens (887 and 797 respectively), followed by Lysianassidae s.l. (575) and Eusiridae s.l. (458). The remaining 16 families were consistently less abundant (Table 2). Among the Stenothoidae, *Probolisca nasutigenes* was the most abundant species (545 specimens), followed by *P. ovata* (189 specimens) and *P. elliptica* (153 specimens). Among the Photidae, *Gammaropsis deseadensis* was the most abundant species (485 specimens). All other species were represented by fewer than 300 specimens, including 41 species that were represented by fewer than 35 specimens each (Table 2).

Tryphosites chevreuxi was the most frequent species, being present at all locations, whereas *Phoxorgia sinuata* was found at 6 out of 7 locations (Table 2). The highest number of species (29) was found in the sample from Bahía Slogget, followed by those from Punta Moat (28 species) and Bahía Ushuaia (26 species), whereas the highest abundance (1,211 specimens) was found at Cabo San Pfo (Table 2).

Faunistic affinities

For the 41 amphipod taxa identified at species level in this study, 16 species (39%) are known only from the Magellan region (Table 3) and the ranges of 24 species extend beyond this region: 9 (22%) to the south, 5 (12.2%) to the north, and 5 (12.2%) to both the north and the south (Fig. 2). Another 6 species extend beyond the Magellan region, reaching Oceania: 2 of them (*Bircenna fulva* and *Seba typica*) are known only from this allopatric distribution; *Jassa alonsoae* is also present in South Georgia and the Subantarctic islands; *Eusirus antarcticus* is also present in the Scotia Arc islands, Subantarctic islands and Antarctica; *Probolisca ovata* is also distributed north of the Magellan region; and *Eusiroides monoculoides* is found in the Magellan region, Subantarctic islands, South Africa, and Oceania (Lowry and Bullock, 1976; De Broyer and Jazdzewski, 1993; De Broyer and Rauschert, 1999).

For the 14 species extending south of the Magellan region, 5 (*Fuegiphoxus fuegiensis*, *Liljeborgia octodentata*, *Pariphimedia normani*, *Phoxorgia sinuata* and *Seba subantarctica*) reach only the Scotia Arc islands, 6 (*Amphilochus marionis*, *Gammarop-*

TABLE 2. – List of species of Gammaridea and Corophiidea collected in southern Tierra del Fuego. Total number of species and specimens for each location; •: new records for the Magellan region; X: new records for the Beagle Channel. Locations = BU: Bahía Ushuaia, IG: Isla Gable, PM: Punta Moat, CP: Cabo San Pío, BS: Bahía Slogget, BA: Bahía Aguirre, BB: Bahía Buen Suceso. Distribution = M: Magellan region, S: south of the Magellan region, N: north of the Magellan region, O: other localities.

Species	Locations							Distribution
	BU	IG	PM	CP	BS	BA	BB	
Ampeliscidae								
<i>Ampelisca</i> sp.						29		
Amphilocheidae								
<i>Amphilocheus marionis</i> Stebbing, 1888			3	27				MS
Aoridae								
X <i>Lembos argentinensis</i> Alonso de Pina, 1992	2	5	8	1	11			M
Corophiidae								
<i>Corophium</i> sp.	2							
X <i>Haplocheira barbimana robusta</i> K.H. Barnard, 1932	9	7	96	66	6			M
Dexaminidae								
<i>Atylus (Atylus)</i> sp. n.						3	9	M
<i>Atylus (Atylus)</i> cf. <i>villosus</i> Bate, 1862		50		5	25	1		
X <i>Paradexamine nana</i> Stebbing, 1914			2					M
Eophliantidae								
X <i>Bircenna fulva</i> Chilton, 1884			1					MO
Eusiridae s. l.								
X <i>Atyloella dentata</i> K.H. Barnard, 1932		6		35	2			M
<i>Atyloella magellanica</i> (Stebbing, 1888)	1	54	61	98	48			MNS
X <i>Eusiroides monoculoides</i> (Haswell, 1879)	1	1	3	3	1			MSO
<i>Eusirus antarcticus</i> Thomson, 1880		10		1				MSO
<i>Paramoera</i> cf. <i>fissicauda</i> (Dana, 1852)			39		94			
Gammarellidae								
<i>Austroregia regis</i> (Stebbing, 1914)	3							M
<i>Gondogeneia</i> cf. <i>antarctica</i> (Chevreux, 1906)			5					
<i>Gondogeneia gracilicauda</i> (Schellenberg, 1931)			1					M
<i>Gondogeneia</i> cf. <i>macrodon</i> (Schellenberg, 1931)							1	
X <i>Gondogeneia patagonica</i> Alonso, 1986			3		1			M
<i>Gondogeneia</i> cf. <i>thurstoni</i> Alonso, 1989					20	50	42	
Gammaridae s. l.								
• <i>Ceradocopsis</i> sp.			1					
<i>Maera</i> sp.				77				
Iphimediidae								
X <i>Iphimedia magellanica</i> Watling and Holman, 1980			10		1			M
<i>Iphimedia multidentata</i> (Schellenberg, 1931)	1		10	2				M
<i>Pariphimedia normani</i> (Cunningham, 1871)			5		2			MS
<i>Pseudiphimediella glabra</i> (Schellenberg, 1931)	1							M
X <i>Pseudiphimediella nodosa</i> (Dana, 1852)				4	1			M
<i>Pseudiphimediella</i> sp.	1							
Ischyroceridae								
<i>Ischyrocerus</i> sp. n.			24		26			M
<i>Jassa alonsoae</i> Conlan, 1990					21			MSO
<i>Notopoma</i> sp.				4				
<i>Ventojassa georgiana</i> (Schellenberg, 1931)			64	4	85			MS
Liljeborgiidae								
<i>Liljeborgia</i> cf. <i>macrodon</i> Schellenberg, 1931	2	24			3			
<i>Liljeborgia octodentata</i> Schellenberg, 1931	1	2	6	2	2			MS
<i>Liljeborgia</i> sp.		1						
Lysianassidae s. l.								
X <i>Erikus dahl</i> Lowry and Stoddart, 1987	56		118	21	71			M
<i>Tryphosella schellenbergi</i> (Schellenberg, 1931)	9	5			19			MN
<i>Tryphosites chevreuxi</i> Stebbing, 1914	89	78	16	17	27	32	6	MN
X <i>Uristes serratus</i> Schellenberg, 1931	10							M
<i>Stomacontion</i> sp.				1				
Oedicerotidae								
<i>Oediceroides cf. macrodactylus</i> Schellenberg, 1931	12							
Photidae								
X <i>Gammaropsis (Gammaropsis) deseadensis</i> Alonso, 1981		42	43	399	1			M
<i>Gammaropsis (Gammaropsis) longitarsus</i> (Schellenberg, 1931)					16			MS
<i>Gammaropsis (Paranaenia) dentifera</i> (Haswell, 1879)		37	78	143	28			MS
<i>Gammaropsis</i> sp.					4			
• <i>Photis (Photis)</i> sp. n.			2			2	2	M
Phoxocephalopsidae								
X <i>Phoxocephalopsis zimmeri</i> Schellenberg, 1931						6	5	MN
Phoxocephalidae								
• <i>Cephalophoxoides</i> sp.	1						1	
<i>Fuegiphoxus fuegiensis</i> (Schellenberg, 1931)	4	1		3				MNS
<i>Heterophoxus videns</i> K. H. Barnard, 1930	2							MNS

TABLE 2 (Cont.). – List of species of Gammaridea and Corophiidea collected in southern Tierra del Fuego. Total number of species and specimens for each location; •: new records for the Magellan Region. X: New records for the Beagle Channel. Locations = BU: Bahía Ushuaia, IG: Isla Gable, PM: Punta Moat, CP: Cabo San Pío, BS: Bahía Slogget, BA: Bahía Aguirre, BB: Bahía Buen Suceso. Distribution = M: Magellan Region, S: south of the Magellan Region, N: north of the Magellan Region, O: other localities.

Species	Locations							Distribution
	BU	IG	PM	CP	BS	BA	BB	
<i>Microphoxus cornutus</i> (Schellenberg, 1931)	57							MN
X <i>Parafoxiphalus longicarpus</i> Alonso de Pina, 2001	45					32		M
X <i>Phoxorgia sinuata</i> (K. H. Barnard, 1932)	20	19	9	20	14		2	MNS
<i>Proharpinia stephensi</i> (Schellenberg, 1931)	6						1	M
Sebidae								
<i>Seba saundersii</i> Stebbing, 1875	16							MS
<i>Seba subantarctica</i> Schellenberg, 1931	1							MS
X <i>Seba typica</i> (Chilton, 1884)					1			MO
Stenothoidae								
<i>Probolisca elliptica</i> (Schellenberg, 1931)		97	3	50	3			MS
X <i>Probolisca nasutigenes</i> (Stebbing, 1888)		342	13	177	13			MNS
<i>Probolisca ovata</i> (Stebbing, 1888)	2		4	50	133			MNSO
Urothoidae								
X <i>Urothoe falcata</i> Schellenberg, 1931			3	1		27	21	MN
Total number of species	26	18	28	25	29	9	10	
Total number of specimens	354	781	631	1211	679	182	90	

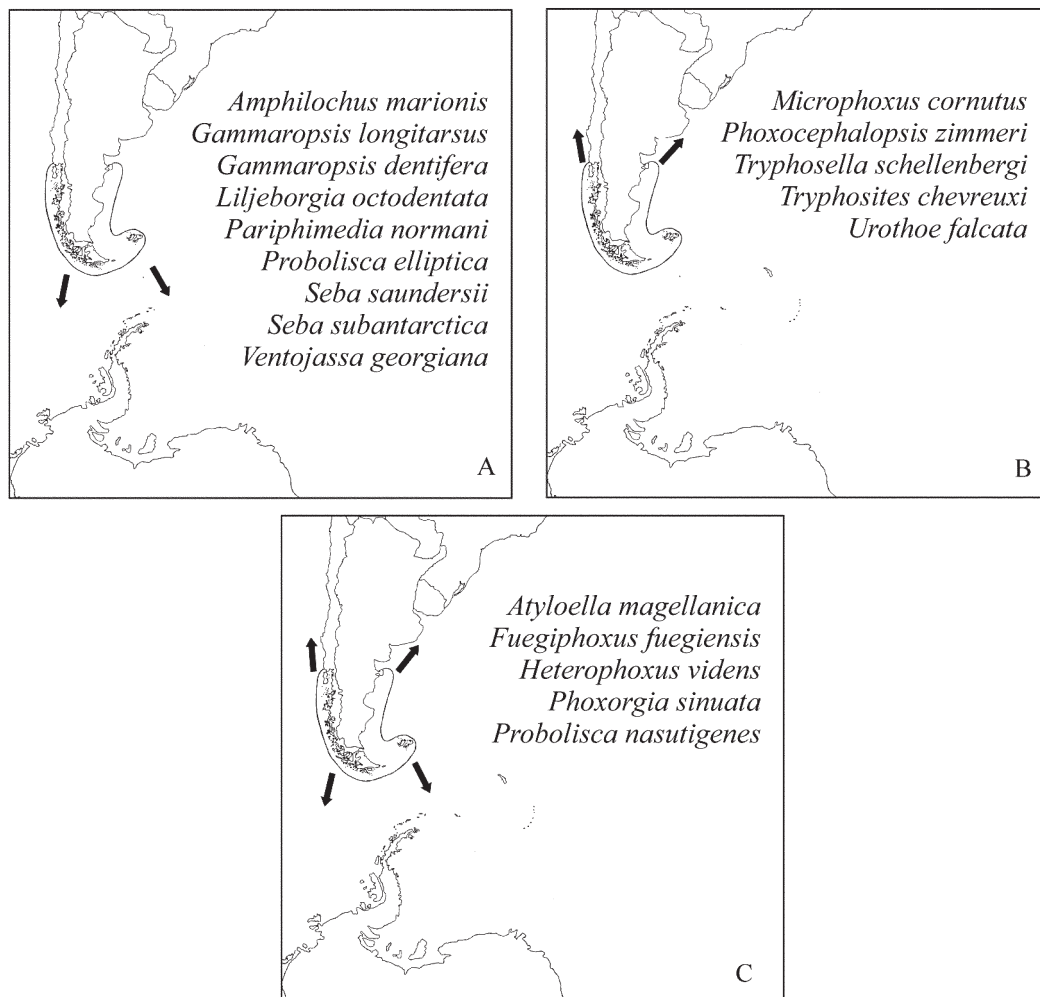


FIG. 2. – Distribution of species from southern Tierra del Fuego. A: Magellan species distributed towards the south; B: Magellan species distributed towards the north; C: Magellan species distributed towards both the north and the south.

TABLE 3. – Distribution of the species collected during the present study in southern Tierra del Fuego known hitherto only from the Magellan region. PO, Pacific Ocean; SM, Straits of Magellan; AO, Atlantic Ocean.

Species	PO	SM	AO
<i>Atyloella dentata</i>			X
<i>Austroregia regis</i>	X	X	X
<i>Erikus dahl</i>	X		
<i>Gammaropsis (Gammaropsis) deseadensis</i>			X
<i>Gondogeneia gracilicauda</i>			X
<i>Gondogeneia patagonica</i>			X
<i>Haplocheira barbimana robusta</i>			X
<i>Iphimedia magellanica</i>			X
<i>Iphimedia multidentata</i>	X	X	X
<i>Lembos argentinensis</i>			X
<i>Paradexamine nana</i>		X	X
<i>Parafoxiphalus longicarpus</i>			X
<i>Proharpinia stephensi</i>		X	X
<i>Pseudiphimiella glabra</i>	X	X	X
<i>Pseudiphimiella nodosa</i>		X	
<i>Uristes serratus</i>		X	X

sis dentifera, *G. longitarsus*, *Probolisca elliptica*, *P. nasutigenes* and *Seba saundersii*) extend to the Subantarctic islands and 3 (*Atyloella magellanica*, *Heterophoxus videns* and *Ventojassa georgiana*) reach the Antarctic continent.

Table 3 shows the geographic distribution of the 16 species collected during this study that were known exclusively from the Magellan region: 8 of them are also present in the Atlantic Ocean, 1 in the Straits of Magellan and 1 in the Pacific Ocean, 3 in the Straits of Magellan and the Atlantic Ocean, and 3 in the Straits of Magellan and also in the Atlantic and Pacific oceans. None of the species was endemic to the Beagle Channel.

DISCUSSION

The present study provides new information on the species richness of the shallow-water amphipod fauna from southern Tierra del Fuego, giving the first records of 3 genera from the Magellan region and reporting 18 species for the first time from the Beagle Channel. In addition, 3 probable new species are reported.

De Broyer and Rauschert (1999) listed 206 gammaridean and corophiidean species from the Magellan region. The present contribution adds to this list: two species described by Alonso de Pina (1993b and 1997c) and 2 records reported by Alonso de Pina (1997b) that were omitted by De Broyer and Rauschert; 4 new species described from the area by Alonso de Pina (2000, 2001, 2003); and the records

from this study (2 species belonging to the genera *Ceradocopsis* and *Cephalophoxoides* and 3 apparently undescribed species). These additions increase the species number of the Magellan region to 219. Sixty-one out of these species (27.9%) were found in southern Tierra del Fuego during this study. The relatively low number of species in this area as compared to the entire Magellan region could be a consequence of the few samples examined and the narrow bathymetric range considered herein. In fact, although Stenothoidae is the most speciose family in the Magellan region (more than 36 species were listed by De Broyer and Rauschert, 1999), only 3 species were collected during this study. This low number is probably due to the deep-water habitat of most stenothoids and to the relatively large mesh size used. The higher number (7 species) of phoxocephalids found (the most speciose family in this study) seems to be related to their sand-burrowing habit and a different sampling method: most of the phoxocephalid species and specimens were collected from Bahía Ushuaia, where a grab was used as the sampling device.

Gammarellidae, Lysianassidae s.l. and Eusiridae s.l., which have high species diversity in the Magellan region, were also well represented in southern Tierra del Fuego. Six out of 8 iphimiid species reported for the whole Magellan region were collected in southern Tierra del Fuego during this study. This fact is probably related to the low sampling depth since iphimiids are predominantly shallow-waters inhabitants.

Although dredge samples are not strictly quantitative, they provide a large amount of material with a relatively low effort (Arntz *et al.*, 1999). For this reason, they are useful for taxonomic studies, but the number of specimens caught should be considered only a crude estimate of abundance. The total number of species collected in Bahía Aguirre (9) and Bahía Buen Suceso (10) was lower than at the remaining locations, probably due to the faster speed of the sampling vessel that resulted in an inappropriate performance of the dredge. Moreover, the high number of species and the low number of specimens found at Bahía Ushuaia seems to be related to the sampling method used: grabs frequently capture a lower number of specimens than dredges, but they can penetrate more deeply into the substrate, thus obtaining more infaunal species.

The occurrence of Magellanic species present also at localities north of the Magellan region is probably related to the Malvinas, Patagonic and

Humboldt currents, three water masses which run northward reaching Brazil and Buenos Aires (Bastida *et al.*, 1992; Piola and Rivas, 1997), and Peru and Ecuador respectively (Brattström and Johannsen, 1983). Similarly, the presence of Magellanic species in the Scotia Arc islands, Subantarctic islands and Oceania is favoured by the West Wind Drift/Antarctic Circumpolar Current, regarded as a means of dispersion of other groups of invertebrates (Fell, 1962; Dell, 1972; Helmuth *et al.*, 1994; Castilla and Guíñez, 2000).

This study provides preliminary results on the species richness of the shallow amphipod fauna living in southern Tierra del Fuego. Additional samples are needed to confirm the taxonomic status of the 20 amphipods reported as sp. or cf. in this study and to improve the knowledge on the diversity and faunistic affinities of this region. Further investigations are also required in the southwest Atlantic Ocean, in order to determine the current distribution of the amphipods present in the Magellan region.

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