

An account of the Mysidacea (Crustacea, Malacostraca) of the Southern Ocean

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Abstract: An inventory of Antarctic and Subantarctic mysid fauna is presented, together with a summary of the present state of knowledge of species and their taxonomic diversity, geographic and bathymetric distribution patterns. Fifty nine species of Mysidacea (Crustacea, Peracarida) are now known. Of these, 37 were reported for the Antarctic region and 31 for the Magellan region; six species occur further north in the Southern Ocean, but south of 40°S. 51% of the Antarctic Mysidacea are endemic, and the figure for the Magellan region is 48%. Most of the species live hyperbenthically, but some also occur bathy- or mesopelagically. *Mysidetes* has the most species in the Southern Ocean, and *Eucopeia australis* is the species with the widest bathymetric distribution (600–6000 m depth). It is concluded that an emergence of species onto the Antarctic shelf in the Neogene was quite unlikely, because none of the mysid species is a true deep-sea species, and most species occur on the shelf or at the shelf break. It is more probable that present day species colonized the Southern Ocean via shallower waters. The examples of the distribution of different genera suggest that the Mysidacea of the Southern Ocean probably had various geographical origins.

Received 23 July 1997, accepted 26 September 1997

Keywords: Antarctic, biogeography, endemism, Mysidacea, origin, taxonomy

Introduction

In the Southern Ocean, and especially the Antarctic, the diversity of crustacean decapods is very low, with only 15 species being known (Arntz & Gorny 1991, Klages *et al.* 1995, Gorny personal communication). However, the Peracarida are known to thrive in this environment, although quite why is uncertain.

The origin and evolution of most of the Antarctic peracarid taxa, is still unclear, and there is a continuing debate, as to whether most forms became extinct during the Tertiary climatic deterioration, or whether they survived in a variety of refugia (e.g. Crame 1992, 1997). Clarke & Crame (1992) have listed a number of ways in which benthic groups may have survived repeated glacial advances. Within benthic taxa, survival through the Cenozoic and radiation of certain elements was postulated for both the Amphipoda (Watling & Thurston 1989) and the Isopoda (Brandt 1991, 1992). However, how hyperbenthic or benthopelagic taxa behaved during these climatic changes is less certain. We only know from fossil records that the Eocene decapod fauna became extinct (Feldmann 1986, Feldmann & Tshudy 1989), the most recent record of fossil crabs being from the early Miocene (Förster *et al.* 1987) from Cape Melville, King George Island. The “*Natantia*”, which occurs in the Antarctic today cannot be derived from the Eocene or Miocene taxa (Arntz *et al.* 1997). There are no palaeontological data on the origin of the Mysidacea. The most recent knowledge of the evolution of the Antarctic and South American fauna in the course of geologic and palaeoclimatologic changes is

summarized in Crame (in press), possible routes and barriers for the evolution and origin of the Antarctic peracarid fauna in general are discussed in more detail in Brandt (in press).

In order to solve questions on the origin of the Mysidacea, and the Peracarida in general, an inventory of each peracarid taxon in the Antarctic must first be made. For some taxa data are already available: an account of Antarctic Amphipoda was published by De Broyer & Jazdzewski (1996), who reported 531 amphipod species for the Antarctic (with 821 species the most diverse peracarid taxon in the Southern Ocean), 53 species of Cumacea (Mühlenhardt-Siegel in press), 348 species of Antarctic Isopoda (Brandt 1991, 1992, Brandt in press) (412 isopod species if only the Antarctic and the southern tip of South America is considered), and 50 species of Tanaidacea (Sieg 1988). For the Mysidacea only Wittmann (1991) briefly referred to the Antarctic fauna by listing the numbers of species he found within the Weddell Sea mysid genera. Therefore an inventory of all available data on Antarctic Mysidacea will be presented here, together with information on the degree of endemism.

Materials and methods

A world list of Mysidacea (Mauchline & Murano 1977), served as a basis for the present contribution, together with the taxonomic revisions of Tattersall (1955) and Müller (1993). In addition there are more specific papers on the Antarctic and the Southern Ocean in general (Hoffmeyer 1993, Ledoyer 1989, 1990a, 1990b, Wittmann 1996), as well

as additional information on lifestyle, distribution, and depth ranges of the various species (Siegel & Harm 1996, Siegel & Mühlenhardt-Siegel 1988, Ward 1984, 1985).

Following the biogeographic definition of De Broyer & Jazdzewski (1996), which is in turn based on the definition of Hedgpeth (1969), the Southern Ocean is taken to be south of 40°S (Fig. 1). The Magellan region is continental (thus southward immigration is still possible for the shallow-living species), it belongs to the Subantarctic and comprises the area south of 40° latitude, including Tierra del Fuego, Burdwood Bank and the Falkland Islands. In the Indian Ocean, Kerguelen Island is included in the Subantarctic region. The Antarctic comprises all islands south of the Antarctic Convergence, including South Georgia and the Scotia Arc region.

The species' depth ranges were taken from published data. It should be noted that especially for the pelagic mysids, the depth range refers to the depth of deployment of the hauls, and therefore these values have to be treated with some caution. The deepest range may be substantially overestimated and contamination (if opening/closing nets have not been used) will underestimate the shallow range. In the past only a few studies (Siegel & Mühlenhardt-Siegel 1988) used an epibenthic sledge as an adequate sampling device for mysids. For most studies the Mysidacea might just be undersampled

in the Southern Ocean, due to the usage of inadequate gear, such as the Agassiz trawl or box corers, which do not cover the hyperbenthic fauna, because either the mesh size is too large or the animals are already swept off before the corer hits the ground. Multinets, however, do not sufficiently cover the hyperbenthic fauna and usually only yield a low number of mysids. Therefore an epi- and suprabenthic sledge (Brandt & Barthel 1995) will be used in the near future in order to collect well preserved mysid material from the Southern Ocean.

Results

Fifty nine species of Mysidacea (Crustacea, Peracarida) are reported from the Southern Ocean; approximately 780 species are known world-wide at present. In the Antarctic region 37 species are known, with 31 species in the Magellan region (Table I). Six species occur just south of 40°S. In the Antarctic 51% (19 species) of the Mysidacea are endemic, and out of these 19 species five occur as far north as South Georgia; one is endemic to South Georgia. In comparison, the degree of endemism for the Magellan region is 50%; the species overlap between the Magellan region and Antarctica is 19%.

Biogeography

Only *Dactylamblyops hodgsoni*, *Hansenomysis antarctica*, *Mysidetes posthon*, and the three species of *Antarctomysis* are circum-Antarctic (Table I) (Mauchline & Murano 1977, Mauchline 1980, Müller 1993, Siegel & Mühlenhardt-Siegel 1988). A graphical representation of all genera recorded from the Southern Ocean is presented in Fig. 2, which indicates the number of species per genus in the various regions, as well as the percentage of Southern Ocean species in relation to the total number worldwide. In addition this figure shows the overlap in species occurrence between the Antarctic and Subantarctic regions. *Mysidetes* is the most speciose Antarctic and Subantarctic genus with 12 species in the Southern Ocean. As only 15 species of this genus are known worldwide, 80% of the species of *Mysidetes* thus occur in the Southern Ocean. *Pseudomma* has ten species, *Boreomysis* six, *Neomysis* five, *Amblyopsoides*, *Antarctomysis*, *Hansenomysis*, and *Mysidopsis* three, *Amblyops* and *Neognathophausia* two, and all the other genera are represented by only a single species in the Southern Ocean. In general, only a minor number of the Southern Ocean species (7) are cosmopolitan (12%).

Pseudomma is the second most speciose genus in the Antarctic with 10 species, *Mysidetes*, *Pseudomma*, *Neomysis*, and *Mysidopsis* are more frequent in the Subantarctic.

Species of some other genera have a much wider distribution, ranging from Antarctica to subantarctic waters (e.g. *Mysidetes*), or even further to the north, like *Boreomysis* and *Neognathophausia*.

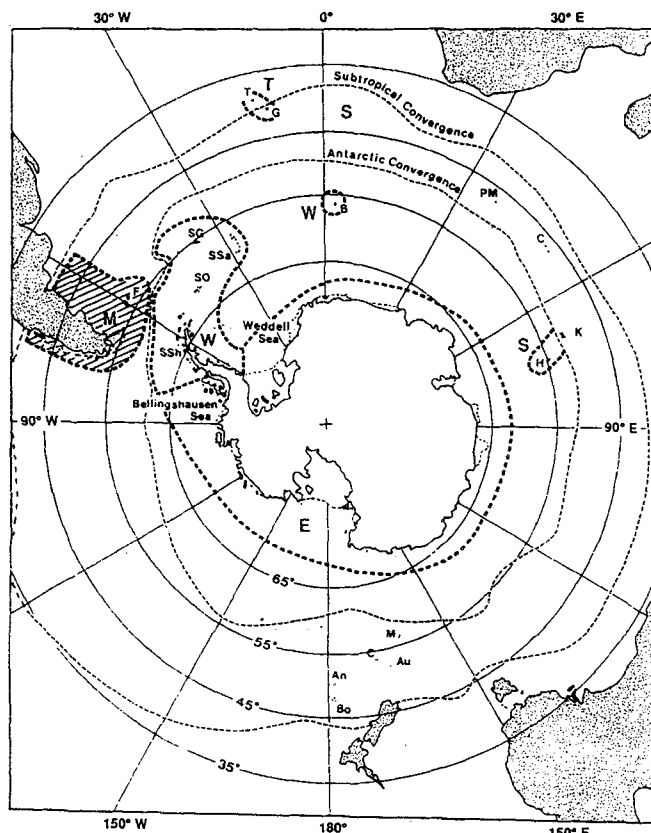


Fig. 1. Biogeographic zonation of the Southern Ocean (after De Broyer & Jazdzewski 1996).

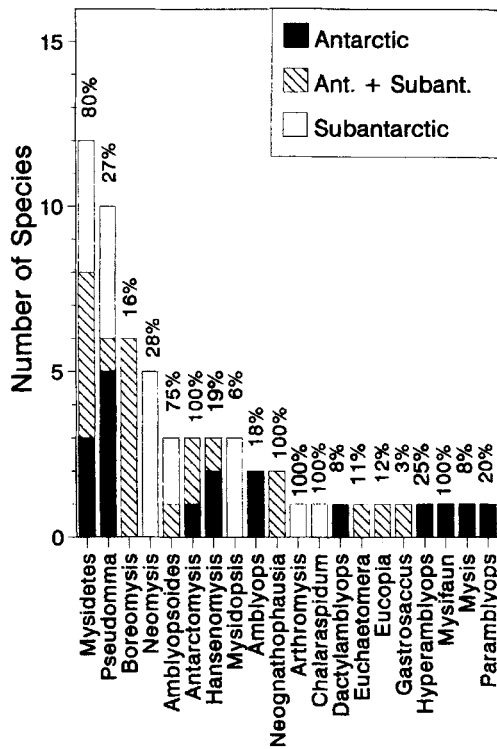


Fig. 2. Number of species of the Subantarctic and Antarctic genera of the Mysidacea and percentage of occurrence in the Southern Ocean.

Although most of the species live hyperbenthically, some occur bathy- or mesopelagically (Table I). Figure 3 shows the bathymetric distribution of 40 hyperbenthic mysid species. The highest number of species occur on the shelf, and there is a clear decrease in species number below 250 m (see depth of occurrence in Table I and Fig. 3).

While some species only occur over a narrow depth range, some show an extended degree of eurybathy (e.g. *Eucopeia australis*; *Neognathophausia gigas*; *N. ingens*) (Fig. 4). No

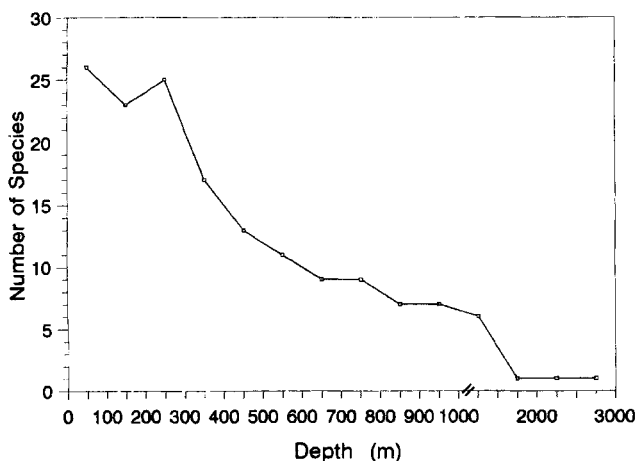


Fig. 3. Vertical distribution and number of species of Southern Ocean hyperbenthic Mysidacea occurring in depth horizons.

species can be classified as truly deep-sea, i.e. occurring only deeper than 1000 m. Some species also live bathypelagically, but sometimes rise into the mesopelagic zone.

The species with the widest bathymetric distribution is *Eucopeia australis*, which was reported from 600–6000 m depth. However, *Boreomysis brucei*, *B. inermis*, *Neognathophausia gigas* and *N. ingens*, are also known to occur down to more than 4000 m depth.

Discussion

Species of *Mysidetes* live hyperbenthically and typically below 500 m; however, some taxa are reported from beyond 1000 m (Mauchline & Murano 1977, Mauchline 1980). This genus occurs more frequently in the Antarctic Scotia Sea region and the Subantarctic Magellanic region (80%) than outside of the Southern Ocean (see Fig. 2). Therefore it is hypothesized that *Mysidetes* evolved in the Southern Ocean – probably in the Subantarctic region – and then progressively colonized more northern habitats along the east and west coast of America. There are only three further species of this genus, which are known from either the north-east Atlantic, the north-east Pacific, or South Australia. Another hypothetical ancestor of the present species of the genus colonized the Antarctic from the Subantarctic Atlantic or south-east Pacific, via the Scotia Arc, and then radiated in the Antarctic, like the Serolidae and Arcturidae (Brandt 1991) or the Iphimediidae (Watling & Thurston 1989).

Besides the endemic genera *Antarctomysis*, *Arthromysis*, *Chalaraspidium*, and *Mysifaun*, which evolved in the Southern Ocean, only *Amblyopsoides* occurs with 75% (3 out of 4 species) of its species south of the Antarctic Convergence; this indicates that this genus might also have experienced a radiation in an ‘‘Antarctic incubator’’. All of the other genera occur only with 28% or less species in the Antarctic, and are successful in more temperate waters.

The only genera with one to three species which are endemic to both Antarctic and Subantarctic waters are: *Antarctomysis* (three species), *Arthromysis*, *Chalaraspidium* and *Mysifaun* (one species each).

Only the primarily pelagic genera *Boreomysis* and *Neognathophausia* are cosmopolitan, but both are more frequent in the Pacific (21 species of *Boreomysis*) than in the Atlantic (16 species of *Boreomysis*) (Mauchline & Murano 1977). Most of the Antarctic *Boreomysis* and *Neognathophausia* species live bathypelagically, a common lifestyle for most forms of these genera. As indicated in Fig. 2, only 16% of the *Boreomysis* species live in the Southern Ocean. The other species of this cosmopolitan genus are widely distributed in the Atlantic and Pacific oceans (Mauchline 1980).

Some genera occur with only a few species in the Southern Ocean: e.g. the shallow water, hyperbenthic genera *Gastrosaccus* (3%, 1 out of 34) and *Mysidopsis* (6%, 3 out of 47), and the mainly bathypelagic genus *Dactylamblyops* (8%,

Table 1. Mysidiacea of the Antarctic, Subantarctic and Magellanic regions.

| Species | first described by | Latitude | Distribution | Depth (m) | Hyperbenthic | Pelagic | Antarctic | Ant. endemic | Magellanic | Kerguelen |
|----------------------------------|------------------------|------------|--------------------------------------|-----------|--------------|---------|-----------|--------------|------------|-----------|
| <i>Amblyops antarctica</i> | O. Tattersall 1955 | 57°S–78°S | Antarctic, S.Sh., Ross | 170–810 | + | | + | | | |
| <i>A. tattersalli</i> | Zimmer 1914 | 66°S–75°S | Ross | 500 | + | | + | | | |
| <i>Amblyopsoides crozeii</i> | G.O.Sars 1883 | 45°S, 45°N | Crozet, Kurile Island | | | + | | | | |
| <i>A. obtusa</i> | O. Tattersall 1955 | 51°S–53°S | Mag | | | + | | | + | |
| <i>A. haleyi</i> | Ledoyer 1990 | 7°S–74°S | Wed, Kerg | 585–1223 | + | | + | | | + |
| <i>Antarctomysis maxima</i> | Holt & Tattersall 1906 | 53°S–78°S | Antarctic, Falk, Wed, Bel, SG | 50–600 | + | | + | | | |
| <i>A. ohlini</i> | Hansen 1908 | 53°S–75°S | Antarctic, Ross, S G, Falk, Wed, Bel | 200–1000 | + | | + | | | |
| <i>A. profunda</i> | Ledoyer 1990 | 71°S–75°S | Wed | 771–1153 | + | | + | | | |
| <i>Arthromysis magellanica</i> | (Cunningham 1871) | 45°S–53°S | Mag, Pat | | + | | | | + | |
| <i>Boreomysis atlantica</i> | Nouvel 1942 | 38°N–54°S | wide distr. | | + | | | | + | |
| <i>B. bispinosa</i> | O. Tattersall 1955 | 35°S–50°S | SG, S. Africa | 700–1400 | + | | + | | | |
| <i>B. brucei</i> | W. Tattersall 1913 | 60°S–80°S | APen, SG, Wed, S.Ork., Ind.Sector | 750–4300 | + | | + | | | |
| <i>B. californica</i> | Ortmann 1894 | 59°N–60°S | wide distr. | 50–1500 | + | | + | | | |
| <i>B. inermis</i> | (W.- Suhm 1874) | 80°N–74°S | wide distr., Wed | 728–4500 | + | | + | | | |
| <i>B. rostrata</i> | Illig 1906 | 35°N–53°S | wide distr., SG | 300–1300 | + | | + | | | |
| <i>Chalaraspidium alatum</i> | (W.-Suhm 1876) | 40°N–49°S | | 50–1500 | | | | | + | |
| <i>Dactylamblyops hodgsoni</i> | Holt & Tattersall 1906 | 53°S–66°S | circumpolar | 275–3500 | + | | + | | | |
| <i>Euchaetomera zurstrasseni</i> | (Illig 1906) | 02°S–66°S | SG, Falk, S Africa, Bell, A. Pen | 200–500 | + | | + | | | |
| <i>Eucopia australis</i> | Dana 1852 | 62°N–70°S | wide distr. | 600–6000 | + | | + | | | |
| <i>Gastrosaccus sanctus</i> | (van Beneden 1861) | 53°N–53°S | SG, wide distr. | 200 | + | | + | | | |
| <i>Hansenomysis angusticauda</i> | O. Tattersall 1961 | 75°S | Ross, A. Pen, Wed | 160–810 | + | | + | | | |
| <i>H. antarctica</i> | Holt & Tattersall 1906 | 53°S–76°S | Antarctic, circumpolar | 100–400 | + | | + | | | |
| <i>H. falklandica</i> | O. Tattersall 1955 | 50°S–53°S | Falk | 200–1238 | + | | | | + | |
| <i>Hyperamblyops antarctica</i> | (Hansen 1913) | 53°S | 36° 21'W | 0–2000 | | + | | | | |
| <i>Mysidetes anomala</i> | O. Tattersall 1955 | 53°S | Mag | 0–300 | + | | | | + | |
| <i>M. antarctica</i> | O. Tattersall 1965 | 75°S | Ross | 100 | + | | + | | | |
| <i>M. brachylepis</i> | W. Tattersall 1923 | 50°S–80°S | Antarctic, Ross, Falk, SG | 130–525 | + | | + | | | |
| <i>M. crassa</i> | Hansen 1913 | 45°S–71°S | Falk, Pat, Wed | 40–412 | + | | + | | | |
| <i>M. dimorpha</i> | O. Tattersall 1955 | 53°S–65°S | SG, A. Pen | 18–295 | + | | + | | | |
| <i>M. hanseni</i> | Zimmer 1914 | 66°S | 89° 38' E | 200–250 | + | | + | | | |
| <i>M. intermedia</i> | O. Tattersall 1955 | 50°S–53°S | Mag, Falk | 94–170 | + | | + | | | + |
| <i>M. kerguelensis</i> | (Illig 1906) | 49°S–53°S | Kerg | 60–275 | + | | | | | |
| <i>M. macrops</i> | O. Tattersall 1955 | 50°S–53°S | Falk, SG | 88–400 | + | | + | | | |
| <i>M. microps</i> | O. Tattersall 1955 | 50°S–63°S | Antarctic, SG | 60–250 | + | | + | | | |
| <i>M. patagonica</i> | O. Tattersall 1955 | 50°S–53°S | Mag, Falk | 14–300 | + | | + | | | |
| <i>M. poshion</i> | Holt & Tattersall 1905 | 49°S–78°S | SG, circumpolar, Kerg | 50–800 | + | | + | | | + |
| <i>Mysidopsis acuta</i> | Hansen 1913 | 32°S–53°S | Chile, Falk, Mag | 250 | + | | + | | | + |
| <i>M. intii</i> | Holmquist 1957 | 41°S | Chile | 6 | + | | | | + | |
| <i>M. rionegrensis</i> | Hoffmeyer 1993 | 41°S–42°S | Argentina | 20–49 | + | | | | + | |
| <i>Mysifaun erigenis</i> | Witmann 1996 | | Wed | 100–700 | + | | + | | | |
| <i>Mysis australe</i> | O. Tattersall 1955 | 53°S | SG | 0–50 | + | | + | | | |
| <i>Neognathophausia gigas</i> | W.-Suhm 1873 | 66°N–74°S | wide distr., Wed, SG | 650–4000 | + | | + | | | |
| <i>N. ingens</i> | (Dohrn 1870) | 40°N–45°S | wide distr. | 350–4000 | | + | | | | + |

Table I. (cont.) Mysidacea of the Antarctic, Subantarctic and Magellan regions.

| Species | first described by | Latitude | Distribution | Depth (m) | Hyperbenthic | Pelagic | Antarctic | Ant. endemic | Magellan | Mag endemic | Kerguelen |
|----------------------------------|------------------------|---------------|---------------------------|-----------|---|---------|-----------|--------------|----------|-------------|-----------|
| <i>Neomysis iliyapai</i> | Holmquist 1957 | 41°S–53°S | Mag, Chile | | + | | | | + | | + |
| <i>N. meridionalis</i> | Colosi 1924 | 48°S–53°S | Mag, Chile | | + | | | | + | | + |
| <i>N. monticellii</i> | Colosi 1924 | 40°S–53°S | Mag, Chile, Pat | 66 | + | | | | + | | + |
| <i>N. patagona</i> | Zimmer 1907 | 41°S–55°S | Mag, Chile, Pat | 38 | + | | | | + | | + |
| <i>N. sopayi</i> | Holmquist 1957 | 41°S–53°S | Mag, Chile | 11 | + | | | | + | | + |
| <i>Paramblyops brevitrostris</i> | O. Tattersall 1955 | 68°S | A. Pen | 160–500 | + | | + | | | | |
| <i>Pseudomma antarcticum</i> | Zimmer 1914 | 63°S–80°S | Antarctic, S.Sh., SG, Wed | 300–3425 | + | | + | | | | |
| <i>P. armatum</i> | Hansen 1913 | 53°S–75°S | Ross, S.Ork., SG | 60–350 | + | | + | | | | |
| <i>P. belgicae</i> | Holt & Tattersall 1906 | 60°S–80°S | Antarctic, A. Pen, Ross | 150–1000 | + | | + | | | | |
| <i>P. calmani</i> | O. Tattersall 1955 | 41°S–53°S | Chile, Falk | 50–300 | + | | | | + | | + |
| <i>P. longicaudatum</i> | O. Tattersall 1955 | 63°S | A. Pen | 160–336 | + | | + | | | | |
| <i>P. magellanensis</i> | O. Tattersall 1955 | 53°S | Mag | 0–300 | + | | | | + | | + |
| <i>P. minutum</i> | O. Tattersall 1955 | 41°S–52°S | Chile, Falk | 30–280 | + | | | | + | | + |
| <i>P. omoi</i> | Holmquist 1957 | 41°S | Chile | 20–25 | + | | | | + | | + |
| <i>P. sarsii</i> | G.O. Sars 1883 | 35°N, 43–65°S | Kerg, SG, Pat, A. Pen | 75–1248 | + | | + | | + | | + |
| <i>P. schollaertensis</i> | O. Tattersall 1955 | 63°S | A. Pen | 160–350 | + | | + | | + | | |
| | | | | | 41 | 14 | 37 | 19 | 31 | 15 | 5 |
| | | | | | Antarctic species: 37, 19 endemic (51%) | | | | | | |
| | | | | | Magellan species: 31, 15 endemic (48%) | | | | | | |
| | | | | | Species overlap Ant : Mag 19% | | | | | | |

Abbreviations: SG = South Georgia; Wed = Weddell Sea; Bel = Bellingshausen Sea; A. Pen = Antarctic Peninsula; Ross = Ross Sea; S. Ork. = South Orkney Islands; S. Sh. = South Shetland Islands; Falk = Falkland Islands; Mag = Magellan region; Pat = Patagonia; Kerg = Kerguelen Island; wide distr. = wide distribution.

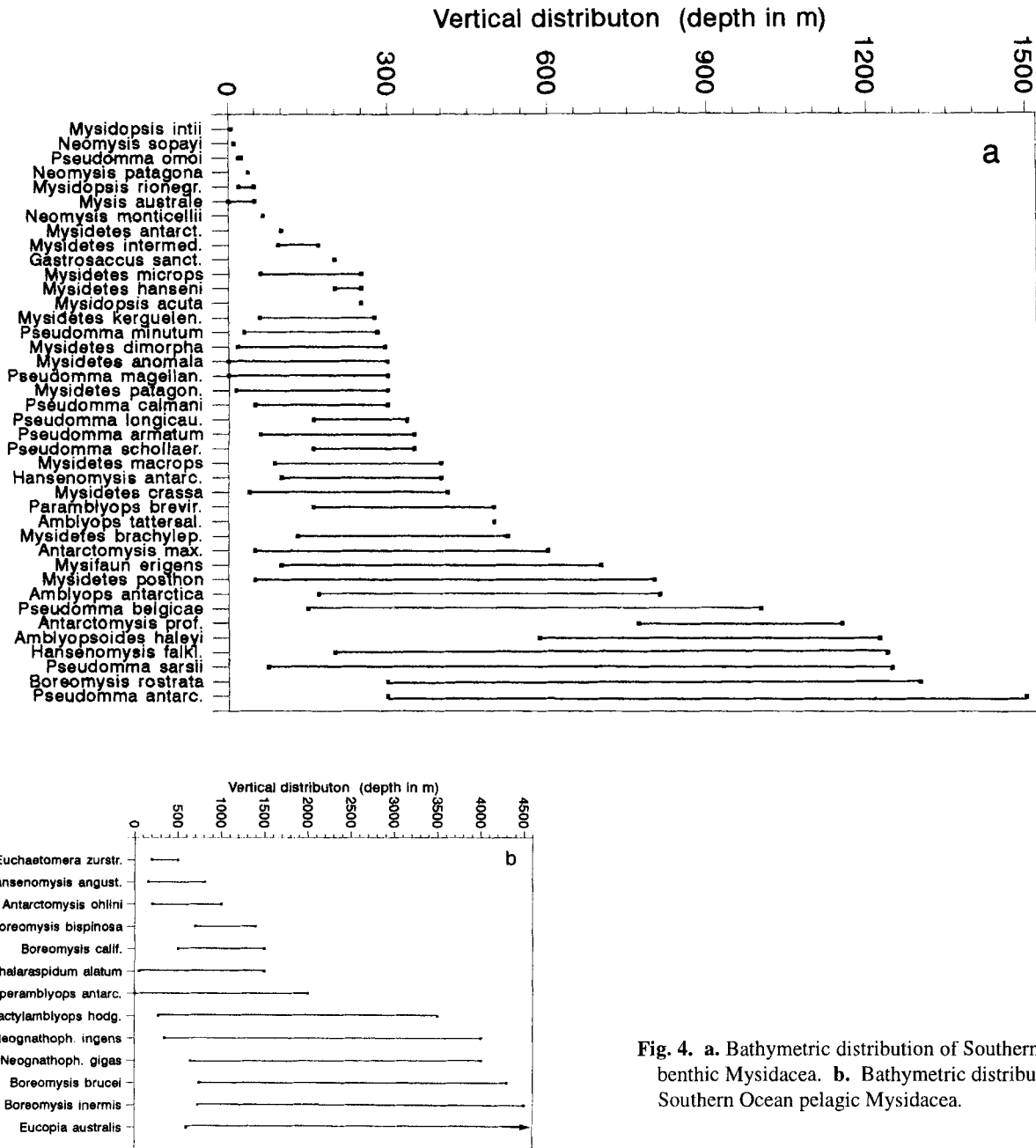


Fig. 4. a. Bathymetric distribution of Southern Ocean benthic Mysisidacea. b. Bathymetric distribution of Southern Ocean pelagic Mysisidacea.

North Pacific (seven species); few species are reported from the tropical Indo-Pacific. As the origin of this genus is most likely to have been located in the cooler waters of the northern hemisphere, it is not surprising that the species diversity beyond the tropical regions in the southern hemisphere is so low (although it must be remembered that this genus consists mainly of meso- to bathypelagic species). Interestingly the Southern Ocean *Dactylamblyops* species is endemic to the Antarctic region.

Other genera, like *Mysidopsis* and *Gastrosaccus*, show a different zoogeography. Both genera have their highest diversity in shallow tropical waters. From the tropics,

Mysidopsis species probably penetrated into northern temperate Atlantic and Pacific shelf areas, as well as temperate waters off South Africa and in the Subantarctic zone; however, no species reached the Antarctic region. The gradual expansion of this species from the tropics southward was obviously less successful than the northward one. Most of the species of the genus *Mysidopsis* are reported from coastal or littoral areas of the Atlantic (33 species), from where the few Subantarctic species might have originated. Seven species of *Mysidopsis* were also sampled in the Indian Ocean, but only four are known from the Pacific.

All species of *Gastrosaccus* are reported to live in coastal,

shallow waters, i.e. 0–100 m. Only a few (four species) were sampled below 100 m depth. The situation with *Gastrosaccus* seems to be similar to that of *Mysidopsis*, even though most species are found in the tropical Indo-Pacific. *Gastrosaccus* is distributed more evenly in the North Pacific, temperate South African and temperate Australian waters. Whereas the temperate North Atlantic was probably colonized via the African west coast, the continental shelves of the southern hemisphere were probably invaded from the tropical Pacific. This would explain why we find only one species, *Gastrosaccus sanctus*, in the subantarctic region. It should be noted that this species has a very wide distribution range from 53°N in the North Atlantic south to the Magellan region.

For these predominantly coastal genera the deep ocean south of South Africa, Australia and South America would have formed an effective barrier. Besides *Gastrosaccus*, only three further genera, the pelagic *Euchaetomera*, *Eucopia*, and *Neognathophausia*, are widely distributed in all oceans (i.e. Pacific, Indian Ocean and Atlantic), while only a few species of the three genera were found in the Indian Ocean until now (Tattersall 1955).

Neomysis, another coastal living genus, was more successful in the colonization of the Southern Ocean; almost 30% (five species) occur in the Subantarctic, whilst 10 species are known from the Pacific, and only three from the Atlantic. Only one species of *Amblyops* is known from the Indian Ocean (six species are known from the Atlantic and five from the Pacific). *Mysis* is also most frequently found in the Atlantic (12 species, only one species being recorded from the Pacific). *Paramblyops* has two species in the Atlantic and Pacific oceans, respectively, while other genera are more speciose in the Pacific Ocean: *Hyperamblyops* has two species in the Pacific (one in the Atlantic), *Hansenomysis* has 12 Pacific species (three in the Atlantic), *Pseudomma* has 19 Pacific species (eight in the Atlantic) (Mauchline & Murano 1977). The latter genera most probably originated in the Pacific Ocean, while the former, probably colonized the Southern Ocean from the Atlantic Ocean. Hypotheses for the cosmopolitan species' centre of origin can only be substantiated after a full phylogenetic analysis of all relevant taxa.

These examples of the distribution of different genera show that the Mysidacea of the Southern Ocean most likely had various geographical origins, because of a benthic or a pelagic lifestyle, different dispersal strategies, as well as bathymetric preferences. Some of these undoubtedly led to successful radiation of species in Subantarctic and Antarctic waters within some genera (cf. Crame 1992, 1994).

Fifty one percent of Antarctic mysids and 48% of those species occurring in the Magellan region are endemic. Compared to the other peracarid taxa, this is the lowest endemicity reported for either the Subantarctic or Antarctic part of the Southern Ocean.

De Broyer & Jazdzewski (1996) reported 531 amphipod species for the Antarctic (with 72% endemics and 79% endemic benthic species), and 821 species in the whole

Southern Ocean (with 72% endemics and 85% endemic benthic species). The Amphipoda are the most diverse peracarid taxon in the Southern Ocean. Of the 53 species of Cumacea, 62% are endemic for the Antarctic (Mühlenhardt-Siegel, in press). Three hundred and forty eight species of Antarctic Isopoda (87%) are endemic, however, if the southern Magellan area (only the Magellan Strait, Beagle Channel, southern tip of South America, the Falkland Islands and Burdwood Bank) is included in this calculation, 412 isopod species are known from this area (southern Magellan area and Antarctic) (Brandt, in press). Within the 50 recorded species of Tanaidacea, the rate of endemism differs for the West and East Antarctic. In the West Antarctic 78% of the species are endemic, and in the East Antarctic the figure is 91% (Sieg 1988).

In a cruise report, Wittmann (1991) disclosed that he found 35 species of Mysidacea in the Weddell Sea. The only new species described by Wittmann (1996) is *Mysifaun erigens*. Until now only 37 species have been reported for the entire Antarctic. This suggests that most of these species are probably circum-Antarctic.

Though the species richness of the Antarctic Mysidacea is much lower than that of the other Peracarid taxa, it is high compared to the 15 known Antarctic species of Decapoda (of which only one species, is endemic; M. Gorny, personal communication 1997). Decapoda are also known from fossil records in the Antarctic (Feldmann 1986, Feldmann & Quilty 1997) and support the theory of an Early Cenozoic "Weddellian Province". Typical Tertiary genera, such as *Lyreidus*, *Chasmocarcinus*, or *Antarctidromia*, did not survive the various climatic changes. Today, however, only a few *Natantia* occur in the Antarctic (cf. Förster *et al.* 1987), and these species cannot be derived from the Cenozoic taxa (Arntz *et al.* 1997). Thus the recent decapod fauna must have recolonized the Antarctic shelf in the Neogene (and perhaps several times). As the Antarctic Mysidacea fauna is more diverse than that of the Decapoda, it may mean that the pelagic or benthopelagic lifestyle of the latter group cannot be the principal reason for its scarcity in Antarctica. Perhaps the brood protection in the Peracarida is a reason why Mysidacea has been more successful in the Southern Ocean than the Decapoda (see discussion in White 1984). In general, habitat heterogeneity, niche fragmentation and specialization is more pronounced in benthic animals than in hyperbenthic, bathy- or mesopelagic ones, and so is most probably the principal reason why the benthic Peracarida are more speciose in the Southern Ocean.

As none of the mysid species is a true deep-sea species, and most occur on the shelf or at the shelf break (see Figs 3 & 4), an emergence of species onto the Antarctic shelf in the Neogene is quite unlikely. It is more probable that the ancestors of the present day species colonized the Southern Ocean via shallower waters during the course of the Gondwana fragmentation (e.g. Crame 1997).

Phylogenetic investigations on Antarctic and Subantarctic

Euphausiacea (Patarnello *et al.* 1996) indicated that the Antarctic species separated from the non-Antarctic species around 20 Ma ago. This is comparable with the geological time of the formation of the circum-Antarctic Polar Frontal Zone and the disappearance of the last shallow water connections between South America and the Antarctic Peninsula. It seems possible that some mysid genera with a hyperbenthic lifestyle lost their potential to invade Antarctic shelf areas via the disappearing South America/Antarctic Peninsula archipelago at the same time. This led to an independent radiation for some genera in Subantarctic and Antarctic shelf areas. However, the process of colonization of Antarctic waters seemed to continue for meso- and bathypelagic species, for which we find very few endemic species in the Antarctic.

Acknowledgements

We are grateful to the Universidad de Magallanes for invitation to the IBMANT-workshop, in Punta Arenas 1997. The Alfred-Wegener-Institute for Polar and Marine Research, and the German Science Foundation, supported the first two authors to join the workshop. The idea to write this paper was born shortly after our return to Germany. We are very grateful to Dr A. Crame for interesting and valuable discussions during the workshop; he and Drs M. Angel, C. De Broyer, D.W.H. Walton, P. Ward, and M. White read the manuscript and their comments improved it considerably.

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