

Diversity and zoogeography of Antarctic deep-sea Munnopsidae (Crustacea, Isopoda, Asellota)

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Abstract

The family Munnopsidae was the most abundant and diverse among 22 isopod families collected by the ANDEEP deep-sea expeditions in 2002 and 2005 in the Atlantic sector of the Southern Ocean. A total of 219 species from 31 genera and eight subfamilies were analysed. Only 20% species were known to science, and 11% of these were reported outside the ANDEEP area mainly from other parts of the SO or the South Atlantic deep sea. One hundred and five species (50%) were rare, occurring at only 1 or 2 stations. Seventy-two percent of all munnopsid specimens belong to the most numerous 25 species with a total abundance of more than 75 specimens; 5 of these species (40% of all specimens) belong to the main genera of the world munnopsid fauna, *Eurycope*, *Disconectes*, *Betamorpha*, and *Ilyarachna*. About half of all munnopsid specimens and 34% of all species belong to the subfamily Eurycopinae, which is followed in occurrence by the Lipomerinae (19%). Munnopsinae is the poorest represented subfamily (1.5%). The composition of the subfamilies for the munnopsid fauna of the ANDEEP area differs from that of northern faunas. Lipomerinae show a lower percentage (7%) in the North Atlantic and are absent in the Arctic and in the North Pacific. This subfamily is considered as young and having a centre of origin and diversification in the Southern Ocean. The analyses of the taxonomic diversity and the distribution of Antarctic munnopsids and the distribution of the world fauna of all genera of the family revealed that species richness and diversity of the genera are highest in the ANDEEP area. The investigated fauna is characterised also by high percentage of endemic species, the highest richness and diversity of the main munnopsid genera and subfamily Lipomerinae. This supports the hypothesis that the Atlantic sector of SO deep sea may be considered as the main contemporary centre of diversification of the Munnopsidae. It might serve as a diversity pump of species of the Munnopsidae to more northern Atlantic areas via the deep water originating in the Weddell Sea.

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1. Introduction

The three recent deep-sea expeditions of ANDEEP project; ANDEEP I and II (2002) and ANDEEP III

(2005) in the Atlantic sector of the South Ocean (SO), yielded a rich collection of Isopoda, the most abundant and diverse group of which was the Munnopsidae. The Munnopsidae Lilljeborg, 1864 is the largest family of the natatory deep-sea janiroidean Asellota. Munnopsids are an important fraction in any deep-sea benthic communities in the world ocean,

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especially at high latitudes (Hessler et al., 1979; Hessler and Wilson, 1983; Wilson, 1989; Brandt, 1991, 2004; Svavarsson, 1987, 1997; Kussakin, 2003; Raupach et al., 2004). This cosmopolitan family includes nine subfamilies, about 40 genera, and about 400 species. The high species diversity, impressive variety of body forms, and life styles of munnopsids evince a great evolutionary radiation.

New finds and intensive investigations of four large genera, *Eurycope*, *Storothyngura*, *Ilyarachna*, and *Echinozone*, have led to a systematic revision of the munnopsid families. Five new genera, *Disconectes*, *Tytthocope*, *Belonectes*, *Baeonectes* and *Dubinctes* were separated from the genus *Eurycope* (Wilson, 1982a,b, 1983a,b; Wilson and Hessler, 1980, 1981; Malyutina and Brandt, 2006). The former genus *Storothyngura* was divided into six genera with erecting five new: *Microprotus*, *Storothyngurella*, *Sursumura*, *Rectisura*, *Vanhoeffenura* (Wilson et al., 1989; Malyutina, 1999, 2003). For some former *Ilyarachna* species three new genera, *Betamorpha*, *Amuletta*, and *Hapsidohedra* were described (Hessler and Thistle, 1975; Wilson and Thistle, 1985; Wilson, 1989). Recent investigations (Merrin, 2004, 2006; Merrin et al., in press) restored two genera *Notopais* and *Bathybadistes* formerly being synonymised with *Echinozone*. These taxonomic reconstructions have led to a much more restricted distribution of each of these newly separated genera.

In spite of the numerous publications, including Wägele (1989), the phylogenetic system of the Munnopsidae is still not well understood. Wilson (1989) tried to elucidate some systematic problems of the munnopsids *sensu lato*. He analysed some characters of most of the munnopsid genera and proposed a revised classification. He placed all munnopsid families (Munnopsidae, Acanthocopidae, Bathyopsuridae, Eurycopidae, Ilyarachnidae, Lipomeridae, and Syneurycopidae), reducing these to subfamily status, into one large family Munnopsidae, as originally proposed by Sars (1899). Before, the composition of the large family Eurycopidae was reconsidered by Wolff (1962), who enclosed the genera *Eurycope*, *Storothyngura*, *Lipomera*, *Munneurycope*, and *Munnopsurus* into it. However, Wilson left in the Eurycopinae only *Eurycope* from Wolff's genera besides the established four new genera. He revised one of the most difficult munnopsids: a problematic group of "ilyarachnid-like eurycopids". Wilson described four new genera, *Coperonus*, *Hapsidohedra*, *Lionectes* and *Mimoco-*

pelates, and two new subgenera for *Lipomera* and placed these into the newly constituted subfamily Lipomerinae. For some genera, which remained *incertae sedis* according to Wilson, Kussakin (2003) erected the subfamilies Betamorphinae and Storothyngurinae. A large heterogeneous genus *Munneurycope*, as well as *Munnopsurus* and *Munneurycope* are still *incertae sedis* and likely might be combined into one additional subfamily.

After the intensive sampling in Atlantic sector of the SO during the expeditions of the ANDEEP project, we got a rich collection of Munnopsidae with many new species. Some species with an unclear intermediate position between *Tytthocope* (Eurycopinae) and *Munneurycope*, *Mimocopelates* (Lipomerinae) and *Tytthocope*, *Lionectes* and *Hapsidohedra* (both Lipomerinae) have been found and are planned to be described and analysed in more detail in future. The findings of these species which cannot be easily placed into the existing genera and some other difficult species with unclear relationships within the Munnopsidae demand careful study. Detailed morphological and genetic comparisons of the species will be required. Such comparisons are difficult because we still deal with sketchy data on morphology, biology and distribution of the species from other regions. Most descriptions of the species are incomplete and not very informative. Taxonomic work on the collected munnopsids is therefore still ongoing. Twelve new species of Storothyngurinae, Acanthocopinae and Eurycopinae have already been described from the ANDEEP collections and 10 known species were redescribed (Brandt and Malyutina, 2002; Malyutina and Brandt, 2004a–d; Merrin et al., in press). Two new genera, *Dubinctes* and *Gurjanopsis* were established and the subfamily Eurycopinae was reevaluated (Malyutina and Brandt, 2006, 2007).

Phylogeographical analyses are important and may indicate the potential origin and relationships of the taxa, as well as the degree of evolutionary advancement. We therefore placed an emphasis on the analyses of the distribution of the genera of the Munnopsidae sampled during the ANDEEP expeditions and collected all data on the distribution of all munnopsid genera in the world oceans. On a basis of the present knowledge, we tried to estimate potential faunal migrations and exchanges of the Munnopsidae and the potential role of the investigated region as a recent centre of diversification of the family.

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