Census of Antarctic Marine Life
SCAR-Marine Biodiversity Information Network

BIOGEOGRAPHIC ATLAS OF THE SOUTHERN OCEAN

CHAPTER 6.8. AMPHIPODA : HYPERIIDEA.

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THE BIOGEOGRAPHIC ATLAS OF THE SOUTHERN OCEAN

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6.8. Amphipoda Hyperiidea

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1. Introduction

A comprehensive catalogue of hyperiidean amphipods recorded from the Southern Ocean is provided by Zeidler & De Broyer (2009), together with introductory notes on the group and useful identification tools. In this catalogue we list 74 species as having been recorded from the Southern Ocean s.l. (see occurrence records on Map 1) but only 15 are more or less restricted to the region between the Sub-Tropical Front and the Antarctic continent; the other species have a more widespread distribution and their occurrence in the Southern Ocean is regarded a temporary incursion south. Since the publication of our catalogue one additional new species, *Mimonecteola antarctica* Zeidler, 2012, has been recorded from the Southern Ocean, north of Amundsen Sea (Pacific Sector) and N.W. of Elephant Island (Atlantic Sector). Thus, 16 species of hyperiideans are now recorded as belonging to the Southern Ocean fauna. Of these, eight are restricted to the region between the continent and the Antarctic Polar Front (rarely beyond) (Maps 2–7), three (*Cyllopus lucasii*, *Hyperiella dilatata, Hyperoche luetkenides)* range between the continent and the Sub-Antarctic Front (Maps 9–11), and the other five have been recorded to the Sub-Tropical Front (*Hyperiella antarctica*: Map 12) or rarely beyond (*Cyllopus magellanicus* and *Themisto gaudichaudii*: Maps 13, 15), or have been recorded well north of the Sub-Tropical Front (*Vibilia antarctica* and *Primno macropa*: Maps 14, 16) but we regard some of these records as suspect, resulting from incorrect identifications.

Biogeographical data for hyperiidean amphipods is very limited because, being pelagic, their distribution is strongly influenced by ocean currents that can result in range extensions beyond normal limits. Also, their association with gelatinous plankton complicates field studies and hence the study of their biogeography. Similarly, depth distribution data is not well defined because most records are from vertical hauls to the surface, with opening/closing nets rarely used. In addition, collections from deeper waters (>300 m) are still relatively rare and collections from depths greater than 1000 m extremely rare. Thus, to date, all except *Mimonecteola antarctica* seem to be near surface species. Biogeographical data is also limited, in general, because there are few records from the Atlantic Sector south of South Africa and the Pacific Sector between New Zealand and South America, reflecting a lack of collecting effort.

From a taxonomic perspective, only one hyperiidean family, Cyllopodidae, is endemic to the Southern Ocean, but with only two species, in the genus *Cyllopus*. *Hyperiella* (family Hyperiidae), with three species, is the only other genus endemic to the Southern Ocean. Representatives of the families of the superfamily Platysceloidea are seldom recorded south of the Sub-Tropical Front and almost never south of the Antarctic Polar Front and their occurrence in the Southern Ocean is considered a temporary incursion.

In consideration of the extensive data provided for species of hyperiidean amphipods from the Southern Ocean by Zeidler & De Broyer (2009), we limit the following discussion to the 16 species we consider to be endemic to the Southern Ocean.

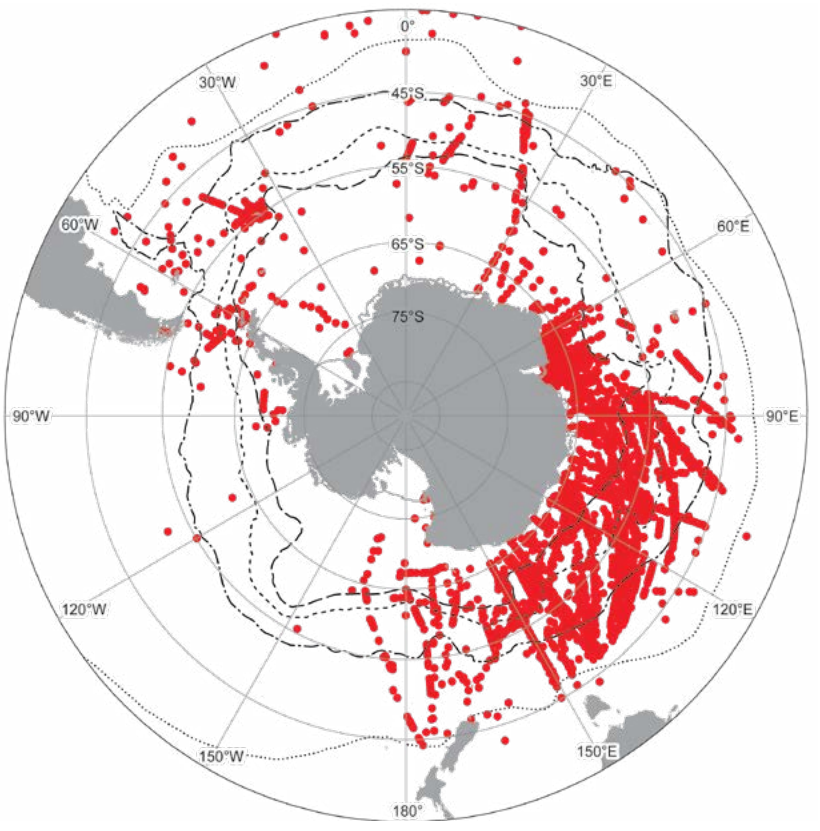
2. Distribution

2.1. Family Archaeoscinidae Stebbing, 1904

***Paralanceola anomala* K.H. Barnard, 1930 (Map 2)**

This species is known only from the unique holotype from the Ross Sea, *Terra Nova* stn. 282 (71°41'S, 166°47'W), 0–1000 m.

Photo 1 *Cyllopus lucasii* Bate, 1862, 22 mm, *Polarstern*, ANT XXI/2, stn. 299, 500 m. Image © Volker Siegel, Institute of Sea Fisheries, Hamburg.



Hyperiidea Map 1. All occurrences of Southern Ocean (s.l.) hyperiid species used in the biogeographic analysis (data from SCAR-MarBIN / OBIS and Zeidler & De Broyer 2009, updated).

2.2. Family Mimoscinidae Zeidler, 2012

***Mimoscina setosa* (K.H. Barnard, 1930) (Map 2)**

This species is known from only three records, two from the Pacific Sector, the Ross Sea, *Terra Nova* stn. 178 (67°23'S, 177°59'W), 0–500 m and near the Balleny Islands, *Ob* stn. 57 (64°03'S, 161°59'E), 0–3000 m, and one from the Indian Sector, the Davis Sea, *Ob* stn. 111 (64°25'S, 92°52'E), 0–2700 m (Vinogradov 1962).

2.3. Family Scinidae Stebbing, 1888

***Scina antarctica* Wagler, 1926 (Map 8)**

This seems to be a circumpolar species occurring mainly between the continent and the Antarctic Polar Front, with most catches from 1000–2000 m to the surface, but also 400–0 m and even 200–0 m.

There are no records of associations with gelatinous plankton and only a few unsubstantiated reports of *Scina* species with siphonophores.

Wagler (1926) described this species from a series of 143 specimens collected by the *Valdivia*, during the *Deutschen Tiefsee-Expedition 1898–1899*, mostly from the Southern Ocean. However, three stations, stn. 36, from the N.E. Atlantic (20°54'N, 19°52'W) and stns. 228 & 230, from the Indian Ocean, near the Seychelles (02°38'S, 65°59'E & 02°43'S, 61°12'E), are well outside the Southern Ocean limits. Similarly, Wagler (1927) recorded more specimens of this species, collected by the *Gauss*, during the *Deutsche Südpolar-Expedition 1901–1903*; again from the Southern Ocean, except for one station off South Africa (27°18'S, 02°51'E). The later specimens have been examined by one of us (WZ) and their identity confirmed. However, the specimens from the type series could not be located in any museological institution in Germany (O. Coleman pers. com.) and thus we have been unable to check the identity of the specimens from the non-Southern Ocean stations. The record from off South Africa may be explained as a result of the incursion of cold water, as occurs off South America, but the three records of Wagler (1926) from the N.E. Atlantic and the Indian Ocean are more puzzling. Considering the large amount of material of this species that Wagler examined, it is likely that he did not examine all of them in detail, and it is possible that he made an error in the identification of these specimens, and we consider their identity suspect, especially since they are the only other records of this species from beyond the Antarctic Polar Front. The record of Behning (1939) from the Bering Sea and Sea of Okhotsk are almost certainly of *Scina rattrayi keilhacki* Wagler, 1926 (see Vinogradov 1962), a morphologically similar species that is very common in the colder waters of the North Pacific.

2.4. Family Lanceolidae Bovallius, 1887

***Lanceola loveni antarctica* Vinogradov, 1962 (Map 3)**

This species is known only from the type series, collected by the *Ob*, from the following five stations between the continent and the Antarctic Polar Front. From the Indian Sector, stn. 36, off Wilkes Land (62°55'S, 118°52'E), 0–3700 m; stn. 105, near the Davis Sea (55°40'S, 106°13'E), 240–600 m; stn. 111 (64°25'S, 92°52'E), 0–2000 m; stn. 285 (59°29'S, 97°08'E), 0–4500 m and from the Pacific Sector, near the Balleny Islands, stn. 57 (64°03'S, 161°59'E), 0–2000 m and 0–3000 m.

The gelatinous host for this species is not known but there are a few records of *Lanceola* species associated with scyphozoan medusa, *Pelagia* sp. (Chevreux 1900; Schellenberg 1927) and even the bathypelagic narcomedusa, *Aegina citrea* Eschscholtz, 1929 (Gasca *et al.* 2006).

It seems surprising that this species has not been recorded since its original discovery. This is most likely a reflection of collecting effort, but may also be explained by the lack of taxonomic expertise, enabling recognition of this species, amongst collections from the Southern Ocean held by research institutions worldwide.

2.5. Family Mimonecteolidae Zeidler, 2009

***Mimonecteola antarctica* Zeidler, 2012 (Map 7)**

This species was recently described from two specimens collected by the *Eltanin* from the Atlantic Sector, N.W. of Elephant Island (60°12'–60°21'S, 59°00'–59°14'W), 1610 m and from the Pacific Sector, off the Amundsen Sea (62°11'–62°20'S, 115°02'–114°24'W), 3477–3678 m. It is likely that other material exists in other collections because these two specimens, from the collections of the Smithsonian Institution, were incorrectly labelled "*Mimonectes* sp." and would have remained undetected if it were not for one us (WZ) undertaking a taxonomic revision of that genus.

2.6. Family Cyllopodidae Bovallius, 1887

***Cyllopus lucasii* Bate, 1862 (Map 9) and *C. magellanicus* Dana, 1853 (Map 13)**

This is the only family of Hyperiidea endemic to the Southern Ocean. Both species are relatively common, especially near the surface and are sometimes abundant enough to provide a substantial food source for predators. *Cyllopus lucasii* is restricted to the region between the continent and the Sub-Antarctic Front while *C. magellanicus* is less common near the continent and ranges to the Sub-Tropical Front and sometimes beyond.

Weigmann-Haass (1983) made extensive studies of both species in the western Atlantic Sector and Weddell Sea region and concluded that "*C. magellanicus* occurs probably only within the West Wind Drift while *C. lucasii* was found within both the West and the East Wind Drift". She also found large numbers of males of *C. magellanicus* in the uppermost layer (0–30 m) while females were only found in deeper waters. In addition she was able to study the '*pantochelis'* stage larvae of both species and found it to possess the same special morphological features found in larvae of *Vibilia* (Laval 1963), suggesting that both species may lead a similar parasitic way of life (associated with salps), at least in their early stages.

2.7. Family Vibiliidae Dana, 1852

***Vibilia antarctica* Stebbing, 1888 (Map 14)**

This species is relatively common in the Southern Ocean, south of the Sub-Tropical Front, with incursions further north occurring as a result of the influx of cold water. It seems to be more common near the surface but has been found in catches to about 1000 m and even 3000–1400 m. It is the only species of *Vibilia* inhabiting Antarctic waters; previous records of *V. stebbingi* Behning & Woltereck, 1912, having been re-determined as this species (Zeidler & De Broyer 2009).

There are several records of this species from well beyond the limits of the Southern Ocean that should be noted. Behning & Woltereck (1912) and Behning (1925) record specimens collected by the *Valdivia*, during the *Deutschen Tiefsee-Expedition 1898–1899*, from four non-Southern Ocean stations; two off South Africa, stn. 112 (35°32.8'S, 18°20.1'E) and stn. 115 (36°23.4'S, 17°38.1'E), also noted by Siegfried (1963), and two from the tropical Atlantic, stn. 54 (01°51'S, 00°31.2'E) and stn. 66 (03°55.5'S, 07°48.5'E). The occurrence of this species at the former two stations can be explained as a result of the incursion of cold water as occurs off South America, but the latter two are more puzzling and may be a result of misidentification. Unfortunately we have been unable to examine the specimens in question to confirm their identity because they seem to be lost. Hurley's (1960) records from north of New Zealand (21°21'S, 175°29.1'W and 23°54'S, 176°38.5'E) are probably of *V. stebbingi* as he had confused *V. antarctica* with this species previously (Zeidler & De Broyer 2009). Records from the S.E. Pacific, off Peru, by Semenova (1973) and Vinogradov (1990, 1991), and from Mexican waters by Escobar-Briones *et al.* (2002), Garcia-Madrigal (2007) and Gasca (2009) are also suspect and may be due to misidentifications, probably of *V. stebbingi* or *V. propinqua*, as both are very similar species, often found in these regions, but this needs to be confirmed by an examination of the specimens concerned. If the above records are because of misidentifications, as we suspect, then *V. antarctica* does not occur north of the Sub-Tropical Front, except for incursions off South Africa.

Weigmann-Haass (1990) made extensive studies of this species in the western Atlantic Sector and Weddell Sea region and concluded that "it is the only species of *Vibilia* living in Antarctic waters. Its distribution is circumpolar within the West Wind Drift, while the cold areas near the coast (areas of the East Wind Drift) are avoided". It is the most common species in the Atlantic Sector after *Themisto gaudichaudii*.

Species of *Vibilia* are known to be associates of salps but the host for *V. antarctica* is unknown.

2.8. Family Hyperiidae Dana, 1852

This family is well represented in the Southern Ocean with four genera comprising seven species, considered endemic to the region, as follows.

***Hyperia macrocephala* (Dana, 1853) (Map 4)**

This species is restricted to the region between the Antarctic continent and the Antarctic Polar Front, where it is relatively common, especially near the continental shelf. The most northerly records are from South Georgia. It is found mainly near the surface down to about 800 m. It sometimes occurs in sufficient abundance to provide a substantial food source for predators, judging by its occurrence in the stomachs of fish and sea birds, including penguins.

This species is known to be associated with medusae (Thurston 1977) and has questionably been recorded with *Diplulmaris antarctica* Maas, 1908 (Larson 1986).

***Hyperiella antarctica* Bovallius, 1887 (Map 12), *H. dilatata* Stebbing, 1888 (Map 10) and H. macronyx (Walker, 1906) (Map 5).**

Hyperiella is the only genus of the family Hyperiidae that is endemic to the Southern Ocean. *H. macronyx* ranges from the continent to the Antarctic Polar Front, *H. dilatata* occurs to the Sub-Antarctic Front, and *H. antarctica* to the Sub-Tropical Front. *Hyperiella antarctica* and *H. dilatata* are relatively more common than *H. macronyx*. All three species seem to prefer shallow waters.

Weigmann-Haass (1989) made extensive studies of all three species in the western Atlantic Sector and the Weddell Sea region and concluded that *H. antarctica* was only found in the West Wind Drift, near the Antarctic Peninsula (but the east Antarctic records mapped here indicated an occurrence also in the East Wind Drift), whereas the other two species were found in both the West and East Wind Drift and tended to be most common between the Antarctic continent and the limit of the pack ice and near the shelf ice in the inner Weddell Sea.

There are no records of associations with gelatinous plankton for any species of *Hyperiella*.

***Hyperoche capucinus* K.H. Barnard, 1930 (Map 6) and H. luetkenides Walker, 1906 (Map 11).**

From the limited records available, both species seem to be restricted to the region between the continent and the Antarctic Polar Front, except for a few records of *H. luetkenides* from near Macquarie Island. Both species are relatively rare and seem to prefer near-surface waters. Weigmann-Haass (1991) also found both species to be rare in the western Atlantic Sector and Weddell Sea region, especially *H. luetkenides*.

The gelatinous host for either species is unknown but species of *Hyperoche* have been recorded consistently with ctenophores and rarely with medusae (e.g. Harbison *et al.* 1977, Laval 1980, Lavaniegos & Ohman 1999).

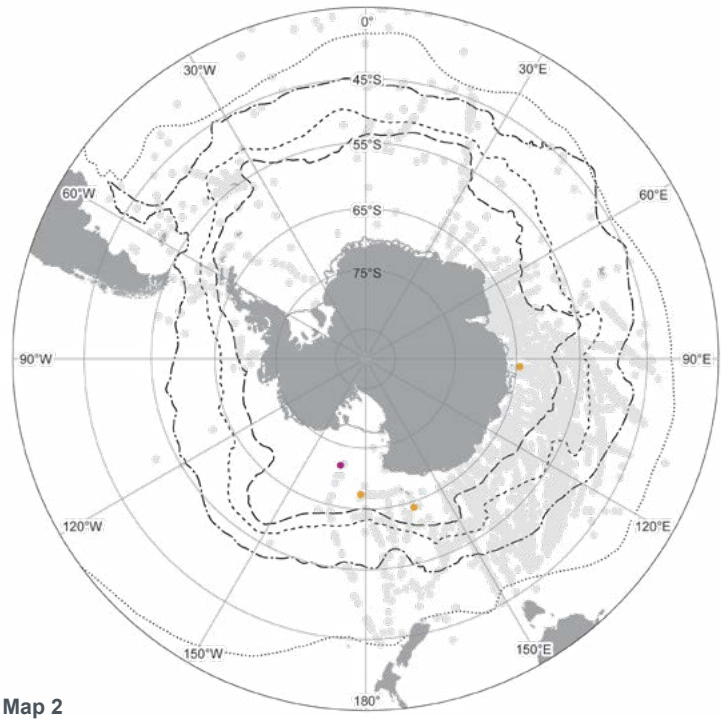
***Themisto gaudichaudii* Guérin, 1825 (Map 15)**

This is the most common, and sometimes the most abundant, species of hyperiidean in the Southern Ocean, found mainly between the Sub-Tropical Front and the Antarctic continent, being less common near the pack ice. The type locality for *T. gaudichaudii* is the Falkland Islands, and in the Atlantic Sector it is relatively common around the sub-Antarctic islands and the Antarctic Peninsula (see Schneppenheim & Weigmann-Haass 1986), possibly a reflection of collecting effort in that region. In the Pacific Sector there are few records from between New Zealand and South America, again most likely a reflection of collecting effort. However, south of New Zealand, to the Ross Sea, it seems to be relatively common. In the Indian Sector the Australian Antarctic Division has collected numerous specimens, mainly from southern Australia to Prydz Bay and around Heard Island. It can be very abundant at the surface at night but descends to about 25–50 m during the day, and sometimes deeper, to the 100–200 m and 200–500 m layer.

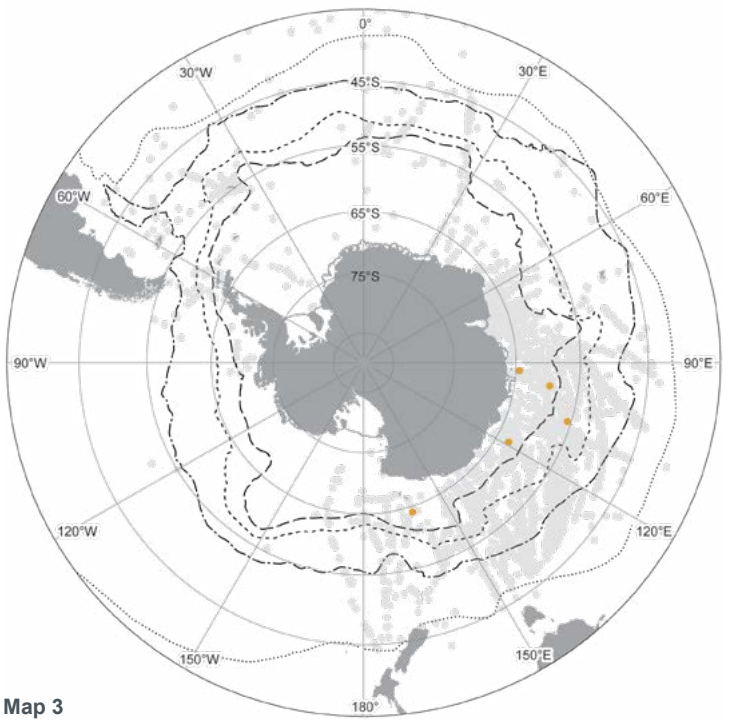
Species of *Themisto* are generally considered to be free living but Madin & Harbison (1977) recorded juvenile specimens attached to salps but concluded that the relationship is more tenuous than that of *Vibilia.* The possibility that at least the juveniles of *Themisto* are parasitoids of salps warrants further investigation, particularly as it relates to their biogeography.

The genus, *Themisto*, is still providing taxonomic difficulties for researchers and is in need of revision. Currently seven species are recognised as valid (Zeidler 2004); *T. libellula* (Lichtenstein in Mandt, 1822), *T. abyssorum* (Boeck, 1871) and *T. compressa* Goës, 1865 are restricted to the colder waters of the Northern Hemisphere, *T. japonica* (Bovallius, 1887) and *T. pacifica* (Stebbing, 1888) are found in the central Pacific and *T. australis* Stebbing, 1888 and *T. gaudichaudii* are found in the colder waters of the Southern Hemisphere. *Themisto australis* seems to be restricted to the colder waters of western Pacific region just north of the Sub-Tropical Front.

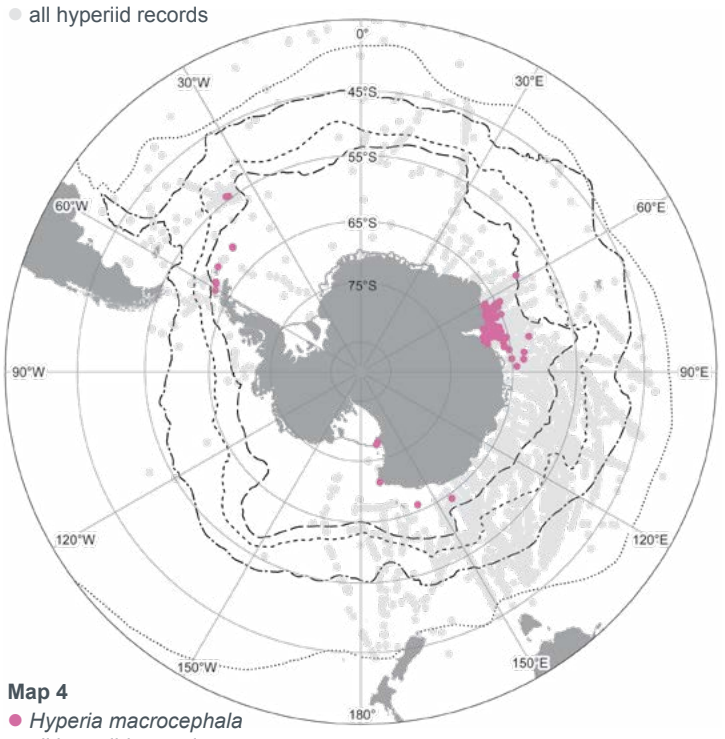
Recently one of us (WZ) re-examined some specimens from Prydz Bay and compared them to specimens recently collected from south of New Zealand with surprising results. Morphologically the New Zealand material was close to the type of *T. gaudichaudii* (see Zeidler 1997) but the Prydz Bay specimens differed in several characters and may represent a new species or require the validation of one of the many synonyms of *T. gaudichaudii*. This discovery



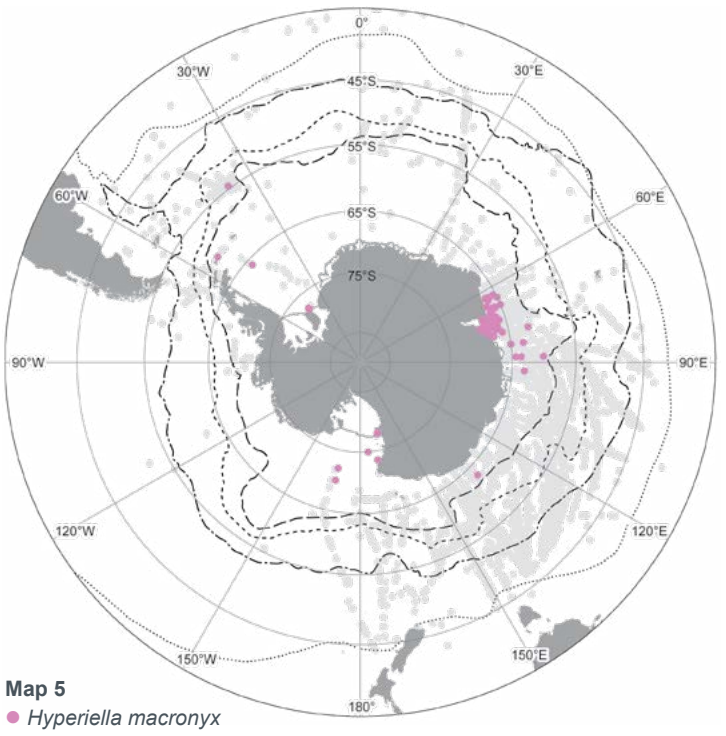
Map 2
- *Paralanceola anomala*
- *Mimoscina setosa*
- all hyperiid records



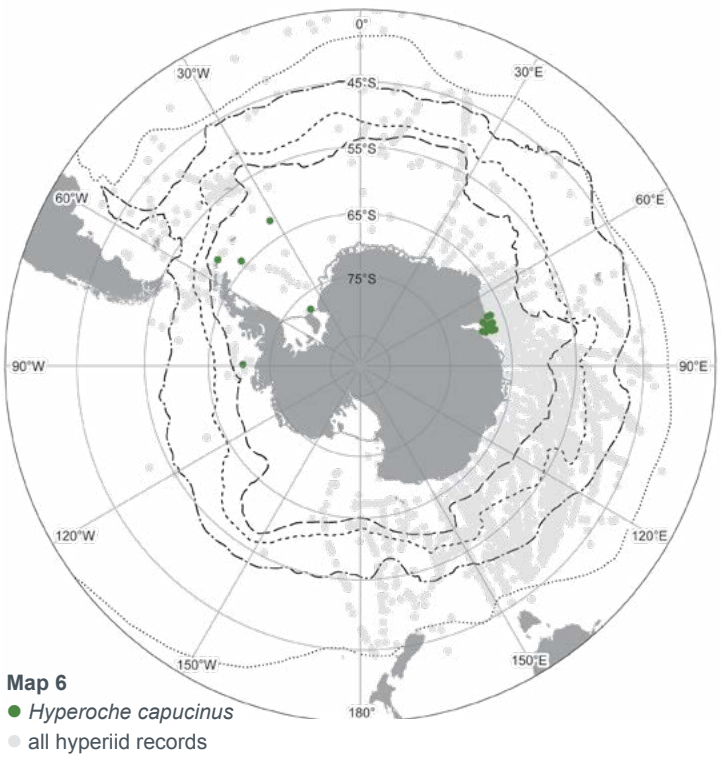
Map 3
- *Lanceola loveni antarctica*
- all hyperiid records



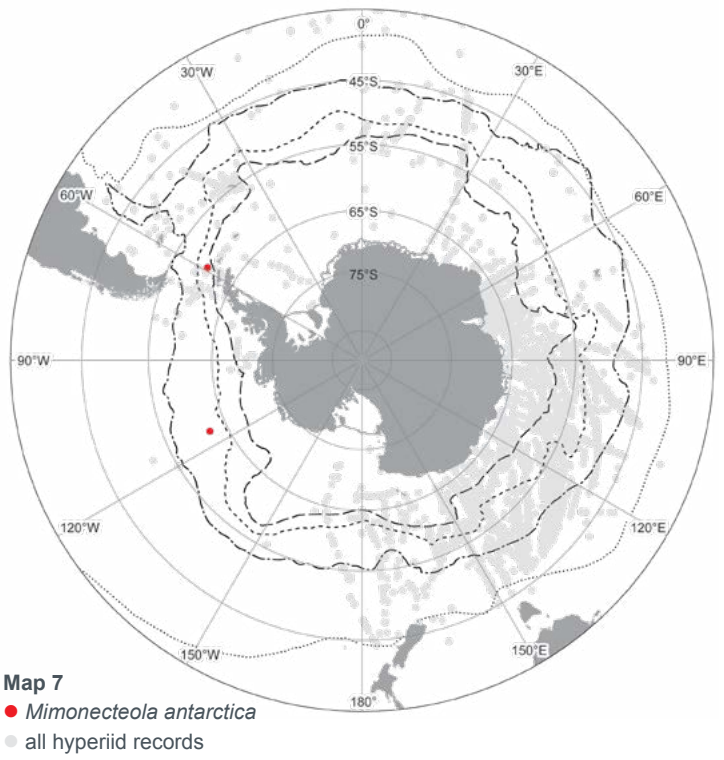
Map 4
- *Hyperia macrocephala*
- all hyperiid records



Map 5
- *Hyperiella macronyx*
- *all hyperiid records*

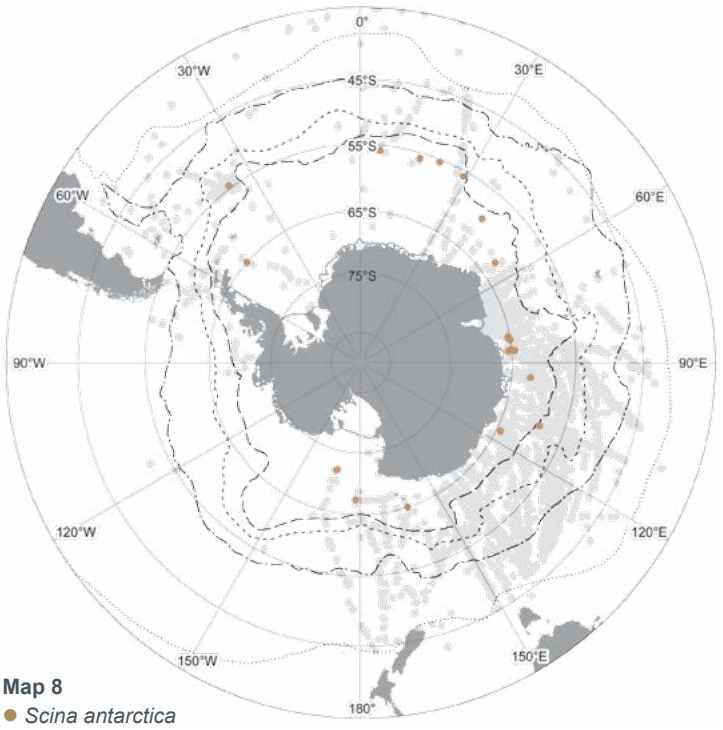


Map 6
- *Hyperoche capucinus*
- all hyperiid records

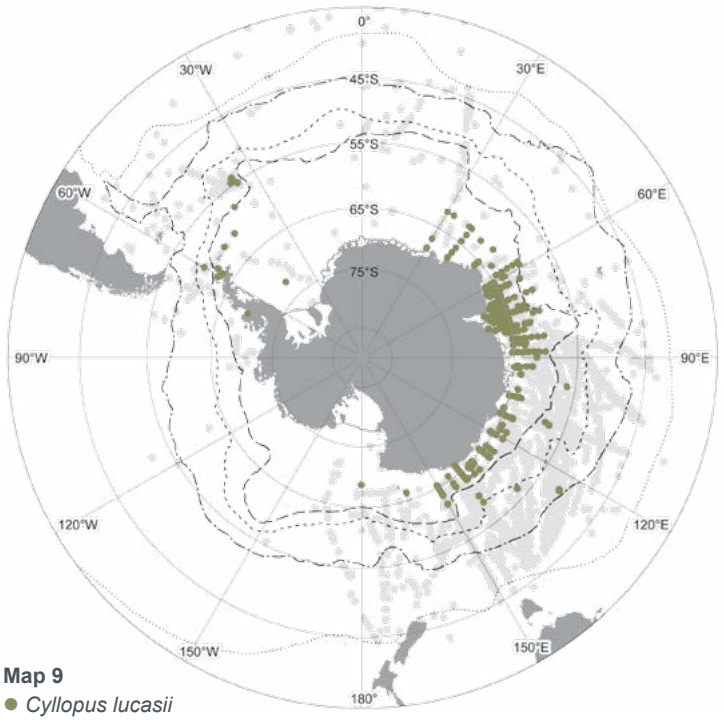


Map 7
- *Mimonecteola antarctica*
- all hyperiid records

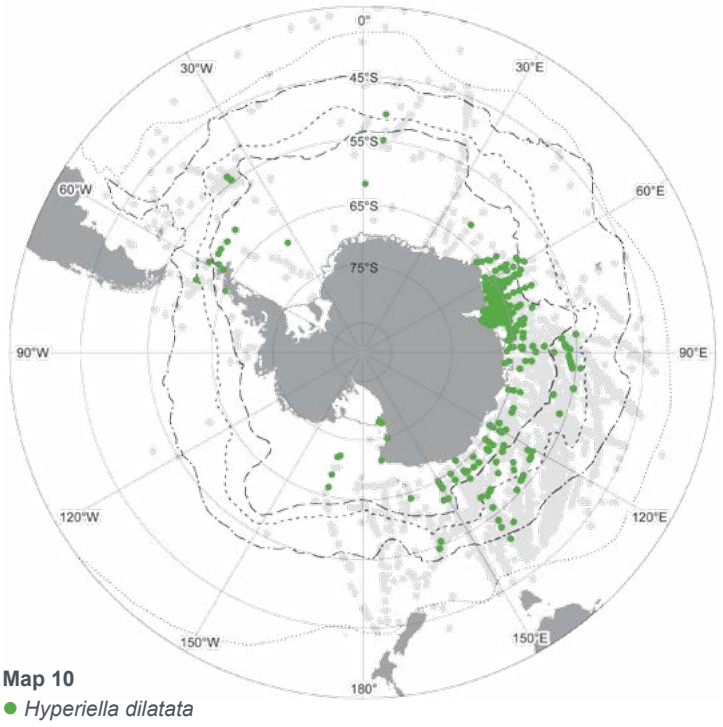
Hyperiidea Maps 2–7. Species recorded only south of the Polar Front: Map 2. *Paralanceola anomala* K.H. Barnard, 1930 and *Mimoscina setosa* (K.H. Barnard, 1930); Map 3. *Lanceola loveni antarctica* Vinogradov, 1962; Map 4. *Hyperia macrocephala* (Dana, 1853); Map 5. *Hyperiella macronyx* (Walker, 1906) Map 6. *Hyperoche capucinus* K.H. Barnard, 1930. Species recorded in the Polar Frontal Zone: Map 7. *Mimonecteola antarctica* Zeidler, 2012.



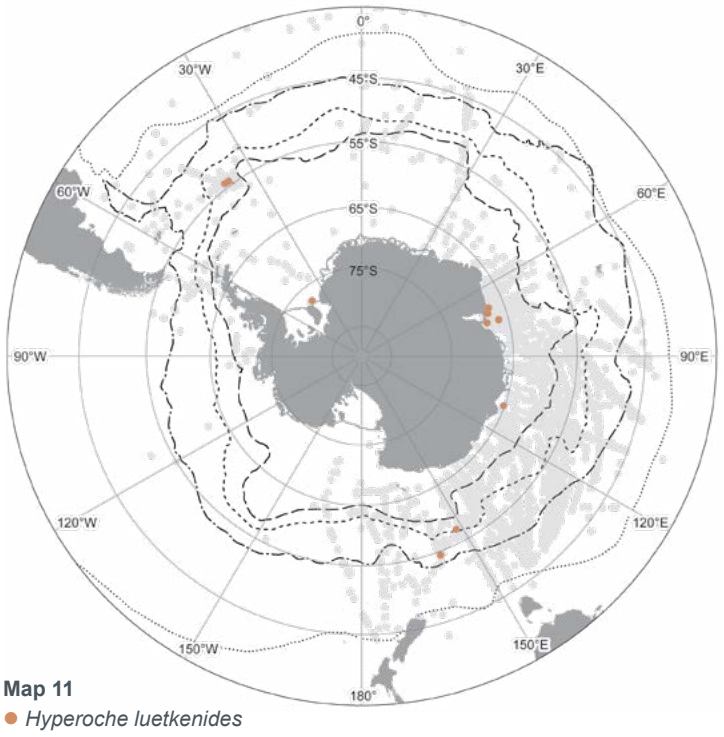
Map 8
● *Scina antarctica*
● all hyperiid records



Map 9
● *Cyllopus lucasii*
● all hyperiid records



Map 10
● *Hyperiella dilatata*
● all hyperiid records



Map 11
● *Hyperoche luetkenides*
● all hyperiid records

Hyperiidea Maps 8–11. Species recorded south of the Polar Front and possibly beyond (see text): Map 8. *Scina antarctica* Wagler, 1926. Species recorded between the continent and the Sub-Antarctic Front: Map 9. *Cyllopus lucasii* Bate, 1862; Map 10. *Hyperiella dilatata* Stebbing, 1888; Map 11. *Hyperoche luetkenides* Walker, 1906.

raises the possibility that there may be two or three distinct populations, if not species, of *Themisto* in the Southern Ocean; one in each of the main ocean sectors. Obviously this cannot be resolved without a comprehensive review of the genus, preferably using molecular techniques to distinguish populations/species. Thus, the biogeographical limits of the species, of this most common and abundant genus of Hyperiidea in the Southern Ocean, need to be re-evaluated.

2.9. Family Phrosinidae Dana, 1852

***Primno macropa* Guérin-Méneville, 1836 (Map 16)**

This is the most common species of Hyperiidea in the Southern Ocean, after *T. gaudichaudii*. Its distribution is between the Sub-Tropical Front and the continent with incursions further north most likely because of the influx of cold water. Off the Argentine coast it is only found in oceanic waters, not penetrating into warmer neritic waters, with the boundary at the 11–12°C surface isotherm (Ramiraz & Vinas 1985). It is often found near the surface in the 200–500 m layer but can occur down to 1000 m.

This seems to be a free living species and there are no records of associations with gelatinous plankton. However, as for *Themisto*, the possibility that the development of juvenile stages relies on a gelatinous host warrants investigation.

As for *Scina antarctica* and *Vibilia antarctica*, there are some records of this species well outside the limits of the Southern Ocean that deserve comment. Most records from the Northern Hemisphere are most likely of *P. abyssalis* (Bowman, 1968) (Bowman 1985, Zeidler & De Broyer 2009), and the record of Zeidler (1978) has been re-determined as *P. latreillei* Stebbing, 1888. It is also listed as occurring in the eastern Pacific off Costa Rica by Vincencio-Aguilar & Fernández-Alamo (1995) and in Mexican waters by Escobar-Briones *et al.* (2002) and Gasca (2009), without reference to any specimens, and we regard these records as suspect, probably representing misidentifications of *P. abyssalis.* Thus, we believe that the distribution of *P. macropa* is confined to the Southern Ocean, with minor incursions further north as the result of the influx of cold water currents.

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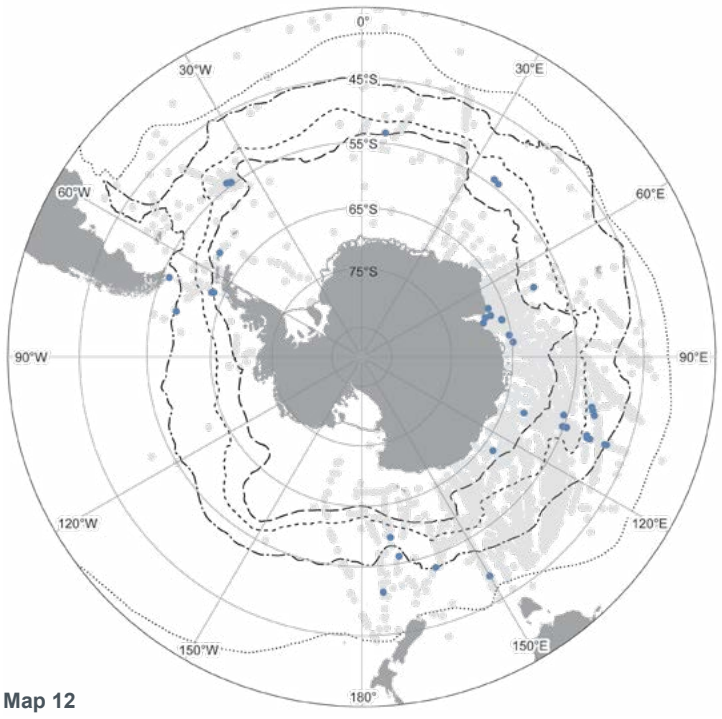
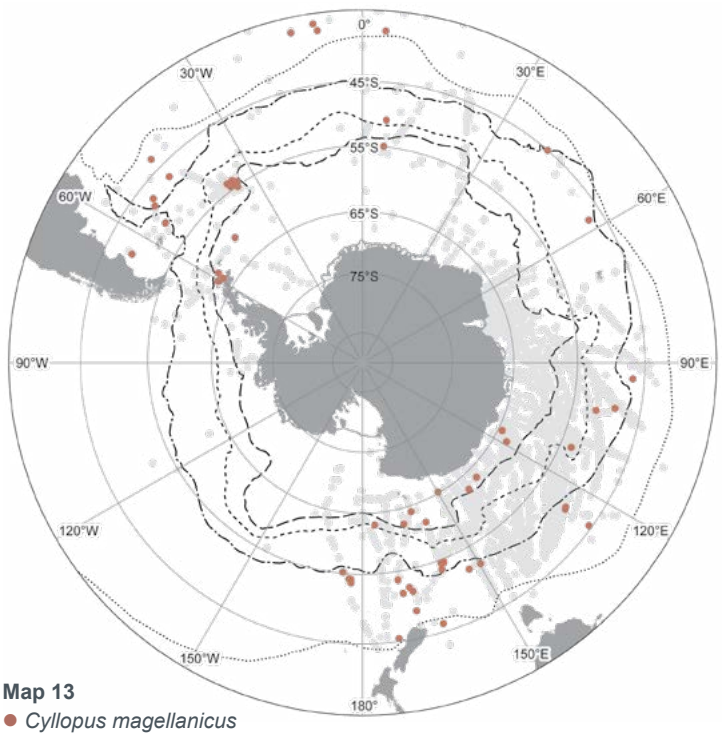
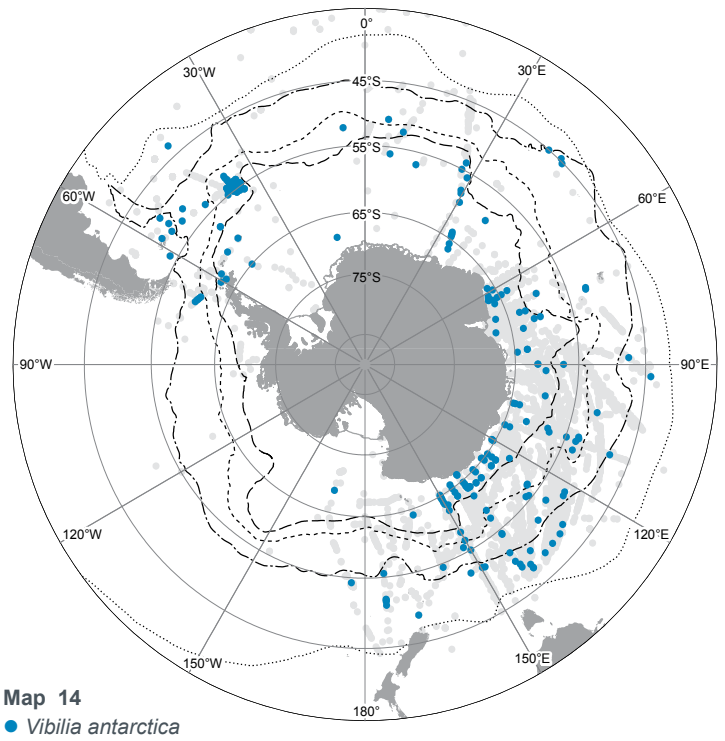


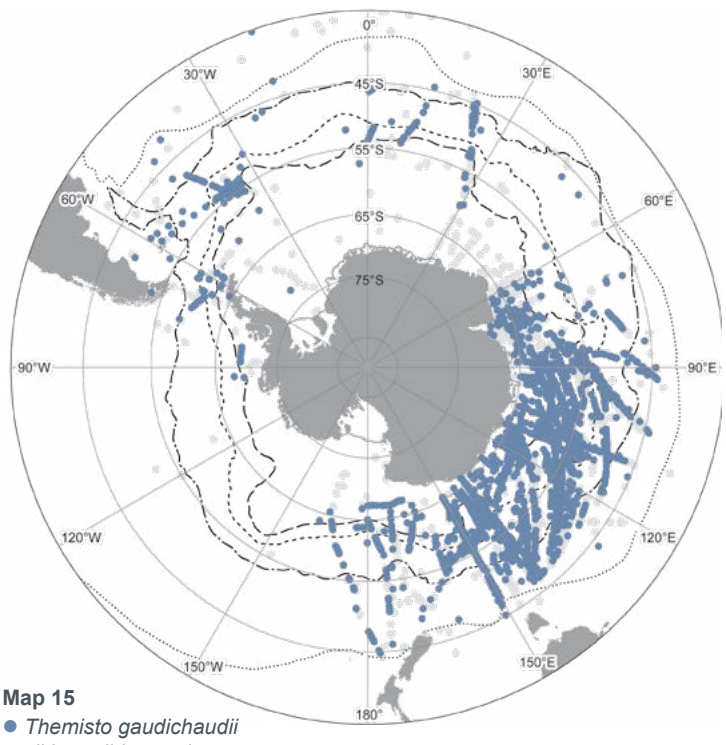
Map 12
- *Hyperiella antarctica*
- all hyperiid records



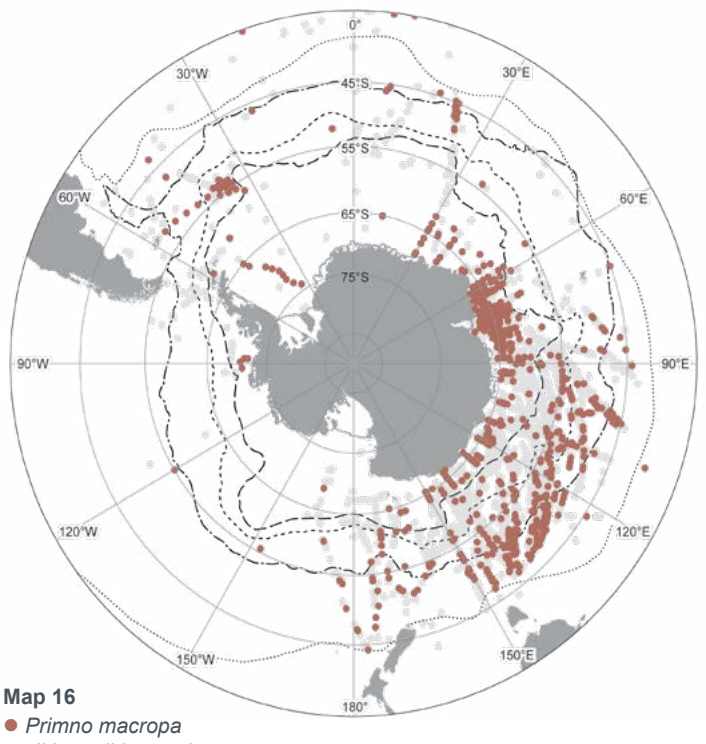
Map 13
- *Cyllopus magellanicus*
- all hyperiid records



Map 14
- *Vibilia antarctica*
- all hyperiid records



Map 15
- *Themisto gaudichaudii*
- all hyperiid records



Map 16
- *Primno macropa*
- all hyperiid records

Hyperiidea Maps 12–16. Species recorded between the continent and the Sub-Tropical Front: Map 12. *Hyperiella antarctica* Bovallius, 1887. Species recorded between the continent and north of the Sub-Tropical Front (see text): Map 13. *Cyllopus magellanicus* Dana, 1853; Map 14. *Vibilia antarctica* Stebbing, 1888; Map 15. *Themisto gaudichaudii* Guérin, 1825; Map 16. *Primno macropa* Guérin-Méneville, 1836.

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THE BIOGEOGRAPHIC ATLAS OF THE SOUTHERN OCEAN

Scope

Biogeographic information is of fundamental importance for discovering marine biodiversity hotspots, detecting and understanding impacts of environmental changes, predicting future distributions, monitoring biodiversity, or supporting conservation and sustainable management strategies.

The recent extensive exploration and assessment of biodiversity by the Census of Antarctic Marine Life (CAML), and the intense compilation and validation efforts of Southern Ocean biogeographic data by the SCAR Marine Biodiversity Information Network (SCAR-MarBIN / OBIS) provided a unique opportunity to assess and synthesise the current knowledge on Southern Ocean biogeography.

The scope of the Biogeographic Atlas of the Southern Ocean is to present a concise synopsis of the present state of knowledge of the distributional patterns of the major benthic and pelagic taxa and of the key communities, in the light of biotic and abiotic factors operating within an evolutionary framework. Each chapter has been written by the most pertinent experts in their field, relying on vastly improved occurrence datasets from recent decades, as well as on new insights provided by molecular and phylogeographic approaches, and new methods of analysis, visualisation, modelling and prediction of biogeographic distributions.

A dynamic online version of the Biogeographic Atlas will be hosted on www.biodiversity.aq.

The Census of Antarctic Marine Life (CAML)

CAML (www.caml.aq) was a 5-year project that aimed at assessing the nature, distribution and abundance of all living organisms of the Southern Ocean. In this time of environmental change, CAML provided a comprehensive baseline information on the Antarctic marine biodiversity as a sound benchmark against which future change can reliably be assessed. CAML was initiated in 2005 as the regional Antarctic project of the worldwide programme Census of Marine Life (2000-2010) and was the most important biology project of the International Polar Year 2007-2009.

The SCAR Marine Biodiversity Information Network (SCAR-MarBIN)

In close connection with CAML, SCAR-MarBIN (www.scarmarbin.be, integrated into www.biodiversity.aq) compiled and managed the historic, current and new information (i.a. generated by CAML) on Antarctic marine biodiversity by establishing and supporting a distributed system of interoperable databases, forming the Antarctic regional node of the Ocean Biogeographic Information System (OBIS, www.iobis.org), under the aegis of SCAR (Scientific Committee on Antarctic Research, www.scar.org). SCAR-MarBIN established a comprehensive register of Antarctic marine species and, with biodiversity.aq provided free access to more than 2.9 million Antarctic georeferenced biodiversity data, which allowed more than 60 million downloads.

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