# Meddelelser om Grønland

## The Species Composition of the Peracarid Fauna (Crustacea, Malacostraca) of the Northeast Water Polynya (Greenland)

*Angelika Brandt, Stella Vassilenko,*
*Dieter Piepenburg & Michael Thurston*

Bioscience
44 · 1996

## Meddelelser om Grønland

The series *Meddelelser om Grønland* was started in 1879 and has since then published results from all fields of research in Greenland. In 1979 it was split into three separate series:

*Geoscience*
*Bioscience*
*Man & Society*

The series should be registered as *Meddelelser om Grønland, Bioscience (Geoscience, Man & Society)* followed by the number of the paper. Example:
*Meddr Grønland, Biosci. 1,* 1979.

The new series are issued by Kommissionen for Videnskabelige Undersøgelser i Grønland (The Commission for Scientific Research in Greenland).

## Correspondence

All correspondence and manuscripts should be sent to:

The Secretary
Kommissionen for videnskabelige Undersøgelser i Grønland
Danish Polar Center
Strandgade 100 H
DK-1401 Copenhagen K

Questions concerning subscription to all three series should be directed to the agent.

## Agent

Geografforlaget, Fruerhøjvej 43, DK-5464 Brenderup. Tlf. +45 64 44 16 83.

ISSN 0106-1046
ISBN 87-601-5706-2

## Meddelelser om Grønland, Bioscience

*Meddelelser om Grønland, Bioscience* invites papers that contribute significantly to studies of flora and fauna in Greenland and of ecological problems pertaining to all Greenland environments. Papers primarily concerned with other areas in the Arctic or Atlantic region may be accepted, if the work actually covers Greenland or is of direct importance to continued research in Greenland. Papers dealing with environmental problems and other borderline studies may be referred to any of the series *Geoscience, Bioscience,* or *Man & Society* according to emphasis and editorial policy.

## Scientific editor – Botany

Gert Steen Mogensen, Botanical Museum, Gothersgade 130, DK-1123 Copenhagen K, Telephone +45 35 32 22 00

## Scientific editor – Zoology

G. Høpner Petersen, Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen Ø. Telephone +45 35 32 10 82

This volume is edited by G. Høpner Petersen.

## Instructions to authors.
## See page 3 of cover.

# The Species Composition of the Peracarid Fauna (Crustacea, Malacostraca) of the Northeast Water Polynya (Greenland)

*Angelika Brandt, Stella Vassilenko,*
*Dieter Piepenburg &*
*Michael Thurston*

Meddelelser om Grønland, Bioscience 44 · 1996

# Contents



Accepted: 7. May 1995
ISSN 0106-1054
ISBN 87-90369-00-9

# The Species Composition of the Peracarid Fauna (Crustacea, Malacostraca) of the Northeast Water Polynya (Greenland)

ANGELIKA BRANDT, STELLA VASSILENKO, DIETER PIEPENBURG & MICHAEL THURSTON

Angelika Brandt, Stella Vassilenko, Dieter Piepenburg & Michael Thurston. The Species Composition of the Peracarid Fauna (Crustacea, Malacostraca) of the Northeast Water Polynya (Greenland) - Meddelelser om Grønland, Bioscience 44. 30 pp. Copenhagen 1996-03.18.

The species composition of Crustacea, Peracarida was investigated over a period of almost three months in the Northeast Water Polynya (NEW) off Greenland. Samples were collected in May - July 1993 during the *Polarstern* expedition ARK IX/2-3 using an epibenthic sledge. Within the macrobenthos on the shelf, peracarids were an important component, besides polychaetes, molluscs and brittle stars. At 22 stations in depths from 45-517 m, about 38 000 specimens were identified and have been listed. In total, 229 species belonging to 51 families, and 121 genera were found. Seven species assemblages were characterized: the "deep assemblage", the "shallow assemblage", the "Westwind Trough assemblage", the "Norske Trough assemblage", the "common species assemblage", the "high-accumulation area assemblage", and the "ice-associate assemblage". Differences in abundance and composition do *not* primarily reflect bathymetric gradients, but more the availability of food (phytoplankton, more importantly ice algae incorporation into the sediment) and therefore the temporal and spatial opening of the polynya. It is suggested that primary production, hydrography, and ice conditions (lateral advection due to the anticyclonic gyre around Belgica Bank, and upwelling at a southern fast-ice extension) are the main factors influencing the peracarid crustacean community.

*Keywords: Greenland, Crustacea, Peracarida, taxonomy, biogeography, species composition, peracarid assemblages, bentho-pelagic coupling.*

*Angelika Brandt, Zoological Institute and Museum Martin-Luther-King Platz 3 20146 Hamburg, Germany; Stella Vassilenko, Zoological Institute of the Russian Academy of Sciences (RAS), St. Petersburg 199034, Russia; Dieter Piepenburg, Institute for Polar Ecology, University of Kiel, Wischhofstr. 1-3 Geb. 12, D-24148 Kiel, Germany; Michael Thurston, Southampton Oceanography Centre, European Way, Southampton SO14 3ZH, United Kingdom.*

## Introduction

The hydrography of the northeastern Greenland Sea is strongly influenced by cold polar water flowing from the Arctic Ocean along the Greenland coast to the south (Machoczek 1989; Birgisdottir 1990). The environmental conditions are characterized by very low, but relatively constant water temperatures, long periods of ice cover, large seasonal fluctuations in light regime and, hence, generally only low biological activity (Hempel 1985). However, recent investigations have shown that benthic communities can be surprisingly rich, both in biomass and diversity, at various locations on the Greenland shelf as well as on the continental and mid ocean ridge slopes (Brandt 1993; Brandt & Piepenburg 1994; Piepenburg 1988; Piepenburg & v. Juterzenka 1994; Svavarsson et al. 1990). These communities are thought to be nourished by the temporarily high surplus of sympagic and/or pelagic production in the marginal ice zones and polynya regions of the East Greenland Current (Piepenburg 1988).

Seasonally sedimented fresh phytodetritus in the deep sea has been observed (Billett et al. 1983) and strongly pulsed sedimentation events of organic material from the ice-edges or open water to the bottom have been postulated (Hebbeln & Wefer 1991). The seasonal input of organic carbon has a direct effect on benthic communities (Graf 1989, 1992; Carey 1991; Grebmeier et al. 1988; Suess 1980). The bulk of suspended matter is accumulated in the benthic nepheloid layer (BNL) and advected, mostly by topography-driven currents in certain depth zones to the areas of eventual deposition (Wainwright 1990; Graf 1992).

The aim of the International Arctic Polynya Program (working platforms "Polarstern" and "Polar Sea") is to focus on critical roles polynyas may play in the dynamics of the Arctic environment, especially with regard to the identification of biological and chemical processes of the carbon flow (Deming 1993). The international interdisciplinary study on Polarstern (ARK IX/2-3) will contribute to this aim.

To assess the relationship between quality and quantity of sedimentation and benthic response, a meso-scale study was undertaken in the NEW Polynya (Deming 1993; Hirche & Kattner 1994). The study was carried out by an international team, part of which was a group working for a multidisciplinary research programme of the University of Kiel (Sonderforschungsbereich 313). A major objective of our programme is to assess the interrelationships between benthic community patterns and particle flux from the seafloor, and sediment-water interface into the near bottom BNL (Graf 1992). Endobenthic and epibenthic mega- and macrofauna organisms play a significant role in this feedback system, although their abundance is lower than that of meiobenthos. The impact of these animals on the micro-scale environment by bioturbation, bio-irrigation, habitat diversification etc. is substantial (Romero-Wetzel & Gerlach 1991; Gage & Tyler 1991; Barthel, 1992). However, the smaller macrofauna (≤ 0.5 mm) has been neglected in many previous investigations, in part because of methodological problems.

The present paper focusses on the peracarid crustaceans (Amphipoda, Cumacea, Isopoda, Mysidacea, Tanaidacea), which are common and important macrobenthic organisms, occurring from shallow habitats to the abyssal plains in high abundance and diversity (Grassle & Maciolek 1992). Extensive faunistic surveys of individual taxa in northern seas are scarce, although the bathyal and abyssal macrofauna has been investigated in detail in many parts of the North Atlantic (e.g. Grassle & Maciolek 1992; Harrison 1988; Hessler 1970; Hessler & Sanders 1967; Sanders et al. 1965; Sanders & Hessler 1969). Qualitative data are available for some macrobenthic taxa from the deep Norwegian and Greenland Seas and from the Arctic Ocean (e.g. Dahl et al. 1976; Gurjanova 1930, 1933, 1946, 1964; Hansen 1916; Sars 1885; Svavarsson 1982, 1984 a, b, 1987 a, b, 1988 a, b; Svavarsson et al. 1990), in addition to previous extensive faunistic works on the Greenland continental shelf (e.g. Ahrens 1994; Bertelsen 1937; Heegaard 1941; Madsen 1936; Piepenburg 1988; Spärck 1933; Stephensen 1943, 1944; Thorson 1933, 1934, 1936). The present study on the species composition, distribution, abundance, and diversity of peracarid crustaceans aims to investigate the influence the NEW Polynya may have on the epibenthic peracarid fauna. The main aspects considered in this survey are 1) the diversity of the peracarid fauna (species list, which will be the basis for the community analysis); 2) a community analysis using multivariate statistics to distinguish species groups, allowing the description of the spatial distribution of the fauna; 3) the characteristic features of the different species assemblages based on composition and abundance; 4) probable factors influencing the described zonation (sediment, temperature, depth, food supply).

Usage of the term "community" follows the concept of Mills (1969).

## Study area

The North East Water polynya (NEW) is an ice-free area south of Kronprins Christian Land, East Greenland. It is regarded as the northernmost of a series of polynyas occurring along this coast (Vinje 1970, 1984). It opens annually and has been reported to do so at least since the beginning of the present century (Koch 1945). The NEW can cover 40,000-44,000 km$^2$ (Parkinson et al. 1987; Schneider & Budéus 1994; Wadhams 1981). It begins to open in April or May, persists throughout the summer and starts closing in September. The NEW lies over much of the northern part of the Belgica Bank. The Bank has a complicated topography, and is delineated by the surrounding trough system comprising Belgica Trough, Norske Trough and Westwind Trough (Fig. 1). Depths on Belgica Bank can be as shallow as 25 m, whereas soundings exceed 300 m in the troughs and reach 500 m in Belgica Trough (Schneider & Budéus 1994). To the north, the NEW is bordered by Kronprins Christian Land and the Ob Bank. The western part of the NEW extends into two fjords, the northern Ingolfsfjord and the more southerly Dijmpna Sound. South of these, over the Norske Trough at about 79°N, a distinct extension of fast ice is present, possibly grounded on the very shallow Belgica Bank (Schneider & Budéus 1994). Fjord complexes are found frequently in Greenland, and can be rather large. They are quite variable and can be distinguished by morphological and hydrographical characteristics, which have been shown to influence the distribution and composition of the benthic community (Wesenberg-Lund 1950). Recent investigations indicate a northward coastal current, which is part of an anticyclonic gyre over the Belgica Bank (Bourke et al. 1987; Schneider & Budéus 1994; Rumohr, pers. comm.), instead of an overall southward circulation along the coast.

The hydrography is characterized by two main water layers in the NEW Polynya. The upper cold, low salinity Polar Water (PW) (Bourke et al. 1987; Budéus et al. 1993), extends to about 100 m depth and is characterized by a salinity of 34.4 (Hopkins 1991). Underneath this layer, a gradual rise in temperature and salinity oc-

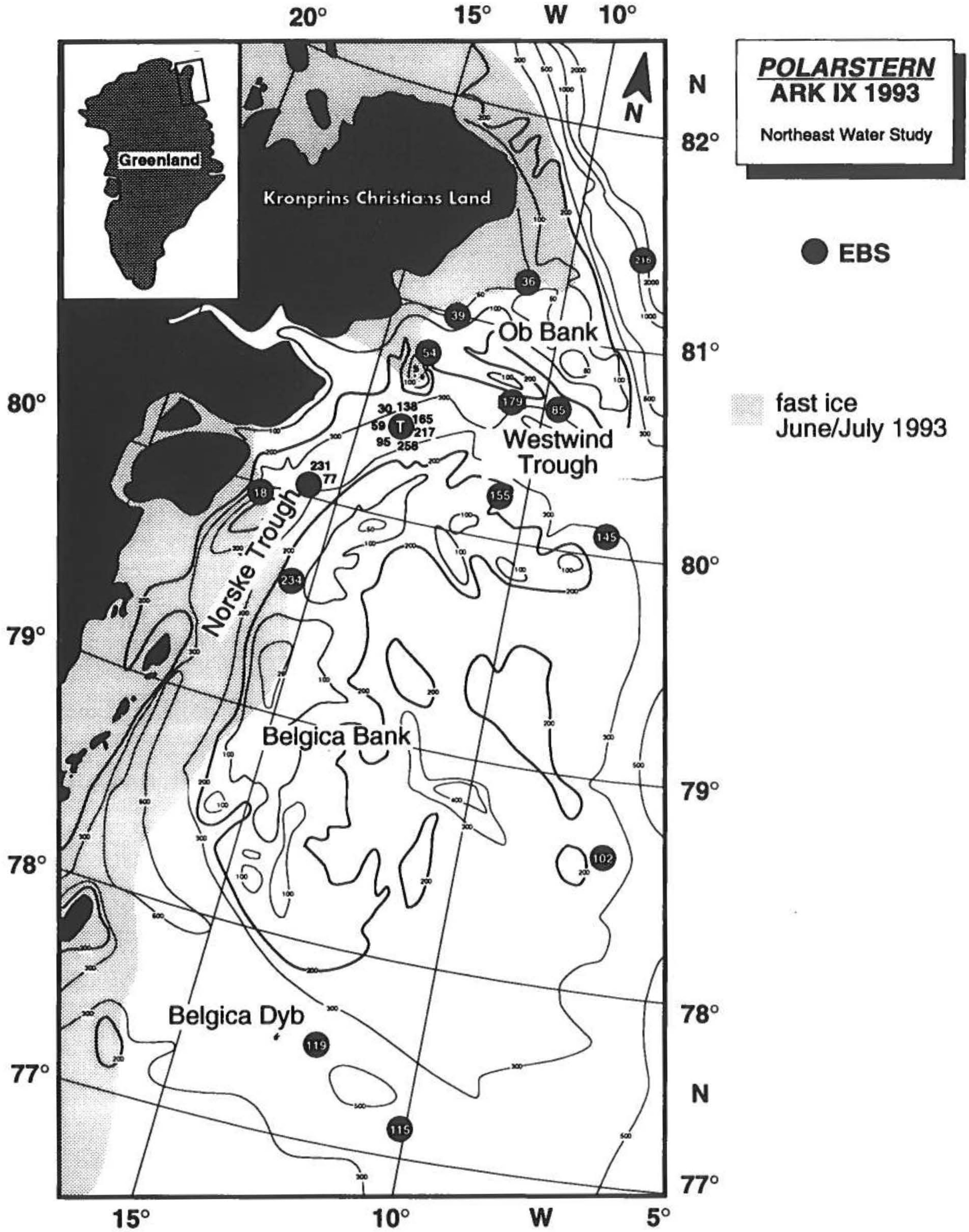


Figure 1. Bathymetry of the NEW Polynya and positions of the EBS-stations sampled during ARK IX/2 and 3.

curs with increasing depth to about 0.7-0.8°C and 34.8 respectively (Schneider & Budéus 1994). Conditions below 300 m are homogenous. This fairly stable vertical layering probably is due to both sea ice melting and run-off from land. Schneider & Budéus (1994) postulate development of plankton blooms, especially in the northern part of the NEW. Pelagic and benthic biomass were higher in the polynya than in the surrounding area (Hirche & Bohrer 1987; Hirche et al. 1991; Piepenburg 1988; present investigation).

# Material and methods

## Sampling

This investigation is based on material collected in the Northeast Water Polynya (NEW) 1993, off Greenland during the expedition on RV "Polarstern" (ARK IX/2-3) from May to early August (Table 1). Twentytwo hauls, of which 20 were successful, were made with an epibenthic sledge (EBS) (Rothlishberg & Pearcy 1977), modified after Buhl-Jensen (1986) and Brattegard and Fosså (1991), which carries a sampling box in the middle position within the frame. The opening, 100 cm wide and 33 cm high, extend from 27 to 60 cm above the bottom. A plankton net of 0.5 mm mesh size with a cod end of 0.3 mm mesh was used. The mouth of the net is closed by a door during deployment and recovery. The door is

Table 1. Station list of the expedition ARK IX (2 and 3) with RV *Polarstern* to the NEW Polynya, off northeast Greenland.

| Station | Date | Latitude (N) | Longitude (W) | Depth (m) | haul length (m) |
|---|---|---|---|---|---|
| 18 | 5/27/1993 | 79°54.78-79°54.63 | 16°58.29-16°58.70 | 310 | 366 |
| 36 | 6/3/1993 | 80°25.30-80°25.27 | 13°47.44-13°48.65 | 45 | 339 |
| 39 | 6/4/1993 | 80°39.93-80°39.73 | 12°34.82-12°34.91 | 50 | 469 |
| 54 | 6/7/1993 | 80°44.84-80°45.06 | 13°42.27-13°42.59 | 174 | 443 |
| 77 | 6/12/1993 | 80°04.73-80°04.55 | 15°44.04-15°44.23 | 425 | 361 |
| 85 | 6/14/1993 | 80°35.34-80°35.19 | 09°18.58-09°17.61 | 270 | 413 |
| T 95 | 6/17/1993 | 80°27.11-80°27.00 | 13°25.24-13°24.12 | 315 | 357 |
| 102 | 6/20/1993 | 78°38.41-78°38.28 | 06°59.47-06°59.00 | 232 | 351 |
| 115 | 6/30/1993 | 77°10.00-77°09.80 | 10°28.20-10°28.80 | 492 | 490 |
| 119 | 7/9/1993 | 77°43.24-77°43.09 | 14°07.32-14°07.61 | 377 | 338 |
| T 138 | 7/5/1993 | 80°29.02-80°29.10 | 13°38.18-13°36.90 | 314 | 383 |
| 145 | 7/8/1993 | 80°01.73-80°01.65 | 06°44.65-06°43.55 | 310 | 339 |
| 155 | 7/11/1993 | 80°06.89-80°06.86 | 10°41.71-10°42.62 | 186 | 308 |
| T 165 | 7/12/1993 | 80°28.06-80°27.88 | 13°36.64-13°37.06 | 320 | 406 |
| 179 | 7/14/1993 | 80°36.56-80°36.38 | 11°17.20-11°17.98 | 260 | 431 |
| 216 | 7/19/1993 | 81°12.65-81°12.45 | 08°42.21-08°42.69 | 517 | 420 |
| T 217 | 7/19/1993 | 80°27.28-80°27.29 | 13°33.87-13°33.02 | 328 | 289 |
| 231 | 7/22/1993 | 80°04.27-80°04.13 | 15°45.59-15°45.83 | 411 | 305 |
| 234 | 7/22/1993 | 79°56.47-79°56.27 | 15°02.37-15°02.25 | 180 | 388 |
| T 258 | 7/26/1993 | 80°27.01-80°26.85 | 13°36.85-13°36.70 | 326 | 308 |

(T) time series station
(*) Ritzrau, after Ahrens (1994)
(+) data from Ahrens (% Vol) (1994)
* not measured
SWT - surface water temperature (°C)
(psu) – salinity (‰)
BWT - bottom water temperature (°C)
curr. vel. - current velocity (cm/s)
# foraminifera >63 µm(Ind./ 10ccm)
Abund. - number of peracarid specimens (values normalized to 1000 m hauls)
S - number of peracarid species

opened mechanically on bottom contact and reclosed by means of springs when the sledge leaves the sea-floor.

Although the sledge is designed to sample the water column just above the sediment, observations by scuba divers have revealed that the water below the opening is also sampled, because of the turbulences in front of the gear (Buhl-Jensen 1986). This explains why epifauna constitutes the bulk of the EBS samples.

The sledge was hauled over the ground for 10 min at a mean velocity of about one knot. The haul distances were calculated on the basis of the GPS derived positions of the ship at start and end of the haul (Brandt 1993; Brattegard, pers. comm.).

The area swept was calculated by multiplying the distance travelled by the net width. As the haul distances varied (see Table 1), abundances were calculated for a standardized 1000 m haul (Basford et al. 1989; Brandt 1993; Svavarsson et al. 1990).

The positions of EBS stations sampled are documented in Fig. 1 and Table 1. The station indicated with a "T" is a time-series-station, which was visited seven times at approximatelly 10 day intervals during the period of three months. The EBS catches of sts. 30 and 59 (same locality as station 95) were not quantitative. The qualitative data are considered in the results (Tables 2 and 3), but not presented in figures and species analyses.

When the sledge reached the deck of the vessel, the samples were sieved through a 0.3 mm screen and preserved in 4% buffered formaldehyde solution. After three days the samples were washed and transferred into

| S | Abund. | SWT | (psu) | BWT (*) | curr. vel. (*) | sand (+) | silt (+) | # (+) |
|---|---|---|---|---|---|---|---|---|
| 73 | 3456 | -1.5 | * | * | * | * | * | * |
| 42 | 4803 | -1.3 | * | * | n.v | * | * | * |
| 48 | 7146 | -1.1 | * | * | * | * | * | * |
| 53 | 1752 | -0.8 | * | * | * | * | * | * |
| 61 | 3143 | -1.0 | * | * | * | * | * | * |
| 66 | 4607 | -1.5 | * | * | * | * | * | * |
| 82 | 8898 | -0.9 | * | 0.7 | 0.4 | 10 | 88 | 236 |
| 90 | 4355 | -1.1 | * | * | * | * | * | * |
| 44 | 481 | -1.5 | 32.13 | 0.8 | 26.0 | 1 | 97 | 172 |
| 40 | 757 | -1.3 | * | 1.1 | 23.5 | 4 | 96 | 166 |
| 79 | 5610 | 0.1 | * | 0.7 | 8.5 | * | * | 117 |
| 75 | 3952 | 0.6 | 31 | 0.4 | 7.1 | 10 | 89 | 155 |
| 85 | 11666 | -1.4 | 30.96 | -0.2 | 21.0 | 6 | 93 | 364 |
| 79 | 9524 | 4.3 | 32.35 | 0.5 | 14.9 | 10 | 84 | 177 |
| 82 | 15796 | -0.2 | 31.39 | 0.4 | 6.5 | 20 | 78 | 507 |
| 35 | 307 | 1.0 | * | * | * | * | * | * |
| 64 | 5688 | 1.4 | * | 0.5 | 6.4 | 9 | 86 | 141 |
| 73 | 4024 | 1.3 | * | * | * | 4 | 95 | 139 |
| 73 | 3954 | 0.6 | 32.42 | * | 2.9 | 28 | 67 | 424 |
| 84 | 5427 | -0.1 | 32.16 | 0.6 | 10.4 | 11 | 69 | 291 |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| **Amphipoda** | | | | | | | | | | | | | | | | | | | | | | |
| **Ampeliscidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Ampelisca eschrichti* | | | | 4 | | | | 44 | | 14 | | | | 18 | 19 | 2 | 67 | | 10 | | 15 | 7 |
| *Ampelisca latipes* | | | | | | | | | 6 | 9 | | | 3 | | | | | 5 | | | | |
| *Ampelisca sp.* | | | | | 2 | | 6 | | | 3 | | | 13 | | | | 7 | | | | 3 | |
| *Byblis abyssi* | | | | | | | | | 3 | | | | | | | | | | | | | |
| *Byblis gaimardi* | | | 133 | 134 | | | | | 11 | 17 | | | 3 | 6 | 84 | | 204 | | 3 | | 113 | 16 |
| *Byblis longicornis* | | | | | | | | | | | | | | | | 7 | | | | | | |
| *Byblis sp.* | | | | | 2 | | | 2 | | 3 | | | | | | | | | | | | |
| *Haploops sp.* | | | | | | | | | 6 | 3 | 2 | | 3 | 6 | | 5 | | | | | | |
| *Haploops setosa* | | | | | | | | | 14 | 3 | | | | 3 | | | | | 3 | | | |
| *Haploops sibirica* | | | | | | | | | | | | | | | | | | | | | | 10 |
| *Haploops tubicola* | | | | | 2 | | 3 | 10 | | 6 | | 3 | | | | | 21 | | 3 | | | |
| **Amphilochidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Amphilochopsis hamatus* | 3 | | 3 | | | | 28 | 58 | 3 | | 8 | 6 | 57 | | | 27 | 2 | | 7 | | | 13 |
| *Amphiochopsis sp. A* | | | | | | | | | 213 | | | | | | 6 | | | | | | | |
| *Amphilochus tenuimanus* | | | | | 47 | | | | | | | | | | | | | | | | | |
| *Gitanopsis arctica* | | | | 113 | | | | | | | | | | | | | | | | | | |
| *Gitanopsis bispinosa* | | | | | | | | | | | | | | | | | | | | | | 6 |
| *Gitanopsis inermis* | | | 6 | | | | | | | | | | | | | | | | | | | |
| **Aoridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Autonoe sp.* | | | | 2 | 11 | | | | | | | | | | | | | | | | | |
| *Unciola laticornis* | | | | | | | | | | | | | | 3 | | | | | | | | |
| *Unciola planipes* | | | | | | | | | 11 | 3 | | | 29 | | | | | | 38 | | | 7 |
| **Astyridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Astyra abyssi* | | | | | 9 | | | 22 | 3 | 3 | | | | | 19 | | 28 | | 10 | | | 3 |
| *Parastyra longipes* | | | | | | | | | | | | | | | 2 | | | | | | | |
| **Atylidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Atylus smitti* | | | 221 | 136 | | | | | | | | | | 3 | 3 | | | | | | | |
| **Calliopiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Amphithopsis longicaudata* | | | | | | | | | | | | | | | | | | | | 33 | | |
| *Halirages elegans* | | | | | | | | | | | | 3 | 3 | | | | 5 | | 10 | | | |
| *Halirages fulvocincta* | 596 | · 3 | | | | | | | 70 | | | | 91 | | 6 | 79 | 79 | | 17 | 20 | | 29 |
| *Halirages quadridentatus* | 66 | | | | | | 17 | | 3 | | | | | | | 7 | | | | 7 | | 23 |
| *Haliragoides inermis* | | | | | 7 | | | 31 | | 3 | | | | 3 | 3 | | | | | | | 7 |
| *Calliopiidae sp.* | | | | 2 | | | | 1 | | | | | 3 | | 23 | | | | | | | 13 |
| **Caprellidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Aeginina aenigmatica* | | | 3 | | | | | 31 | | | | | | | | 5 | | | | | | |
| *Aeginina longicornis* | | | 12 | 80 | 2 | | | 2 | 6 | | | | | | 36 | 5 | | | | | | |
| *Caprella microtuberculata* | | | | | | | 3 | | | | | | | | | | | | | | | |
| **Cressidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Cressa dubia* | | | | | | | 6 | | | | | | | | | | | | | 3 | | |

Table 2. List of all peracarid species sampled with an epibenthic sledge in the NEW Polynya. Abundance figures are catch numbers normalized to a 1000 m haul. This species list includes the "time-series-stations" 30 and 59 (for locality see Fig. 1), which are not quantitative, as the EBS was blocked during these hauls. However, the qualitative data are presented here.

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| **Epimeriidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Epimeria loricata* | 3 | | | | | | | 5 | 8 | 3 | | | 8 | | | 2 | | | | 3 | 3 | 3 |
| *Paramphithoe hystrix* | | | | 6 | | | | | | | | | | | | | | | | | | |
| *Paramphithoe sp.* | | | | 8 | | | | | | | | | | | 3 | | | | | | | |
| *Spindlerella groenlandica* | | | | | | | | | | | | | | | | 17 | | | | | 21 | 26 |
| **Eusiridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Eusirus cuspidatus* | | | | | | | 3 | | | | | | | | | | | | | | | |
| *Eusirus holmi* | 5 | | | | | | | | | | | | | | | | | | 3 | | | 3 |
| *Eusirus leptocarpus* | | | | | | | | | 95 | | | | | | | | | | | 3 | | |
| *Eusirus longipes* | | | | | | | | | | | | | | | | | | | | 23 | | |
| *Eusirus propinquus* | | | | | | | 8 | | | | | 12 | | 3 | | 10 | | | | | | 16 |
| *Eusirus sp.* | | | | | | | 8 | | | | 4 | | 3 | | | | | | | | | |
| *Rhachotropis aculeata* | | | | | | | | | | | | | | | | | | | | 3 | | |
| *Rhachotropis helleri* | | | | | 2 | | 14 | 395 | | 6 | | | | 142 | 36 | 5 | 216 | | | | | 3 |
| *Rhachotropis inflata* | | | | | | | | | | | | | | | | | | | | | | 7 |
| *Rhachotropis leucophthalma* | | | | | | | | 2 | | | | | | | | 7 | | | | | | |
| *Rhachotropis lomonosovi* | 5 | | | | | | | | 11 | | 4 | 9 | 3 | 24 | | 39 | | 10 | 38 | | | 16 |
| *Rhachotropis macropus* | 8 | | | | | | | | 39 | 225 | | | 3 | | | | | | | | 209 | |
| *Rhachotropis oculata* | | | 112 | 284 | | | | | | | | | | | | | | | | | | |
| *Rhachotropis sp.* | 3 | | | | 16 | | | | | 63 | | | 13 | 38 | | 17 | 28 | | 7 | | | 3 |
| **Hyperiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Hyperoche sp.* | | | | | | | | | | | | | | | 3 | | | | | | | |
| **Iphimediidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Acanthonotozoma cristatum* | | | | | | | 6 | | | | | | 5 | | | | | | | 7 | | |
| *Acanthonotozoma serratum* | | | | | | | | | | | | | | | | 10 | | | | | | |
| *Acanthonotozoma sinuatum* | | | | | 2 | | | 7 | | | | | 8 | 3 | | | | | | | | |
| *Acanthonotozoma sp.* | | | | | | | | 2 | | | | | 8 | | | | 5 | | | | | |
| **Isaeidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Protomedeia fasciata* | | | 139 | 53 | | | | | 6 | 6 | | | 5 | | 496 | | 21 | | | | | |
| **Ischyroceridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Ericthonius sp.* | | | | | 2 | | 17 | 2 | | 3 | | | | | 341 | 20 | 46 | | | | 10 | 10 |
| *Ericthonius tolli* | | | 6 | | | | | | | | | | | | | | | | | | | |
| *Ischyrocerus brevicornis* | | | | | | | | | | | | | | 3 | | | | | | | | |
| *Ischyrocerus megacheir* | | | | 2 | | | | | | | | | | | 3 | | 2 | | | 13 | | |
| **Liljeborgiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Idunella aequicornis* | 3 | | | | 7 | | 6 | 7 | 39 | 14 | 6 | | 39 | 56 | 6 | 5 | 14 | | 10 | | 64 | 26 |
| *Liljeborgia fissicornis* | | | 6 | | | | | | | | | | | | 3 | | | | | | 3 | |
| **Lysianassidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Anonyx lilljeborgi* | | | | | | | | | | | | | | | 16 | 9 | 2 | | | | 3 | 13 |
| *Anonyx nugax* | | | 62 | 927 | | | | 7 | 3 | 20 | | 6 | | 12 | 139 | 5 | 269 | | 52 | 39 | 39 | 6 |
| *Aristias tumidus* | | | | | | | | | | | | | | | | 7 | | | | | | |
| *Hippomedon holbolli* | | | | | | | | | 3 | 6 | | | | 15 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| *Hippomedon propinquus* | | 6 | | | | | | | | | | | | 9 | | 37 | | | | | | |
| *Lepidepecreum umbo* | | | | | | | 6 | 10 | 3 | 28 | | 3 | 3 | | 3 | 10 | 9 | | 3 | 7 | | 7 |
| *Menigrates sp.* | | | | | | | | | | | | | | | | | | | | | 5 | |
| *Onisimus sp.* | | | | | | | | | | | | | | | | 2 | | | | | | |
| *Orchomene pectinatus* | | | | | | | | | 3 | | | | | | | | | | | | 3 | |
| *Schisturella pulchra* | | | | | | | | | | | | | | | | | | | | | 3 | |
| *Tryphosa oxystoma* | | | | | | | | | | | | | | | | | | | | | 13 | |
| *Lysianassidae sp. indet.* | 107 | | 186 | 60 | 51 | 2 | | 46 | 95 | 276 | 47 | 41 | 162 | 56 | 182 | 66 | 132 | 5 | 180 | 749 | 32 | |
| **Melitidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Maera sp.* | | | | | | | | | | | | | | | | | | | | | | 3 |
| *Melita quadrispinosa* | | | 3 | 12 | | | | | | | | | | | | | | | | | 5 | |
| **Melphidippidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Melphidippa goesi* | 14 | | 3 | 41 | | | | | | 3 | | | | | 3 | | | | | 3 | | |
| *Melphidippa sp.* | | | | | | | | | | | | | | | 13 | | | | | | | |
| **Oedicerotidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Acanthostepheia malmgreni* | 3 | | 3 | 18 | 18 | | | 34 | 39 | 3 | | | 10 | 3 | 45 | 2 | 14 | 2 | 3 | | 72 | 13 |
| *Aceroides latipes* | | | | 29 | 142 | | | | 3 | | 2 | 3 | | 3 | 39 | 5 | 2 | | 3 | 16 | 5 | 3 |
| *Arrhis phyllonyx* | 5 | | | | 29 | | 8 | 44 | 28 | 20 | 4 | 9 | 55 | 24 | 149 | 66 | 246 | 5 | 41 | | 232 | 7 |
| *Bathymedon longimanus* | | | | | | | | | | | | | | | | | | | | 13 | | |
| *Bathymedon obtusifrons* | | | | | | | | | | | | | | | | 7 | | | | | | |
| *Bathymedon sp.* | | | | | 442 | | | | 56 | 3 | | | | | 705 | | 2329 | | 7 | | | 7 |
| *Monoculodes borealis* | 3 | | | | | | | | | | | | | | | | | | | | | |
| *Monoculodes latimanus* | | | | | | | | | | | | | | | | | | | | 10 | | |
| *Monoculodes longirostris* | 3 | | 3 | | | | | | 31 | 28 | | | | | | | | | | | | |
| *Monoculodes packardi* | 38 | | | | | | | | | 11 | | | | 9 | | 37 | | | | 33 | | |
| *Monoculodes sp.* | 19 | | 608 | 1177 | 41 | | | | | | 2 | | | 6 | 204 | | 596 | | | | 5 | 81 |
| *Paroediceros lynceus* | | | 148 | 2 | | | 28 | 85 | | 69 | 8 | 24 | 26 | 56 | 3 | 54 | 14 | | 90 | 92 | 3 | 65 |
| *Paroediceros propinquus* | | | | | | | 33 | | | | | | | | | | | | | | | |
| *Perioculodes longimanus aff.* | | | | | | | | | | 11 | | | | | | | | | | | | |
| *Westwoodilla acutifrons* | | | | | | | | | | | | | | | | | | | | 7 | | |
| *Westwoodilla megalops* | | | | 1779 | | | | | | | | | | | | | | | | | | |
| *Oedicerotidae sp. indet.* | | | | 21 | | | | 39 | 310 | 43 | | | 222 | 77 | | 20 | | | 69 | | | |
| **Odiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Imbrexodius polarsterni* | | | 3 | | 2 | | 6 | | | 11 | | | 19 | | | | 21 | | 31 | 3 | | |
| **Pardaliscidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Halice abyssi* | 41 | | | | | | 102 | | 14 | 3 | 4 | 6 | 44 | 3 | | 7 | | | | 210 | | 7 |
| *Pardalisca abyssi* | 3 | | 35 | | | | | | 28 | | | 3 | | 6 | 6 | 20 | | | 73 | 36 | | 7 |
| *Pardalisca cuspidata* | | | 53 | 41 | | | | | | | | | | 12 | | | | | | 23 | | |
| *Pardalisca sp.* | | | | | | | | | | | | 24 | | | | | | | | | 3 | |
| *Pardalisca tenuipes* | 19 | | | | | | | | | | | | | | 3 | 32 | 2 | | | | 31 | 16 |
| *Pardaliscella boecki aff.* | | | | | | | | | | | | | | | | | | | | 30 | | |
| *Pardaliscella malygini* | | | 6 | | | | | | | | 25 | | 5 | | | | | | | | | |
| *Pardaliscella sp.* | | | | | | | 86 | | | 3 | | | 68 | | | | | | | | | |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| **Phoxocephalidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Harpinia mucronata* | | | 3 | | | | | 7 | 106 | 74 | 10 | | 21 | | 16 | | 100 | | | 53 | | 23 |
| *Harpinia pectinata* | | | | | | | | | 8 | | | | | | | | | | | | | |
| *Harpinia serrata* | | | | | 23 | | | | | | | | | | | | | | | | | |
| *Harpinia sp.* | | | | | | | 3 | | 28 | 31 | | | 21 | 3 | 448 | 10 | 169 | | 10 | | 31 | 46 |
| *Paraphoxus oculatus* | | | | | 20 | | | 5 | | | | | | | 107 | | | | | | | 3 |
| **Pleustidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Neopleustes pulchellus* | | | | | | | | 29 | | 3 | | | 11 | 71 | 52 | | 53 | | 3 | | | 7 |
| **Podoceridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Dulichia sp.* | | | | 62 | | | | | | | | | | | 23 | | | | | | | 13 |
| *Dulichia tuberculata* | | | | | | | | | 14 | | | | | | | | | | | 49 | 3 | |
| *Dulichiopsis macera* | | | | | | | 3 | 2 | | | | 6 | 8 | | | 10 | | | | | | |
| *Dulichiopsis nordlandicus* | | | | | | | | | | | | | | | | | | | | | | 10 |
| *Dulichiopsis sp.* | 3 | | | | | | 39 | | 3 | | | | 13 | | | | 7 | | 7 | | | |
| **Pontoporeiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Pontoporeia femorata* | | | | | 5 | | | | | | | | | | | | | | | | | |
| **Stegocephalidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Andaniella pectinata* | | | | | | | | | 8 | | | | | | 107 | | | | | 59 | 3 | |
| *Andaniexis abyssi* | | | | | 25 | | | 34 | 39 | 9 | 8 | 41 | 115 | 21 | | 106 | 58 | 5 | 211 | | | 85 |
| *Phippsia romeri* | 8 | | 3 | | | | 52 | | | | | | | | | | | | | | | |
| *Phippsiella minima* | 11 | | | | | | | | | | | | | | | | | | | | 3 | |
| *Phippsiella similis* | | | | | | | | 12 | | | | | | | | | | | | | | |
| *Stegocephalus inflatus* | | | | | 11 | | | | 34 | 9 | | | | | 42 | | 35 | | | | 5 | |
| *Stegocephalus sp.* | | | 6 | 2 | | | | | | | | | | 9 | | | | | | | | 98 |
| **Stenothoidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Metopa alderi* | | | | | | | | | | 3 | | | | | | | | | | 7 | | |
| *Metopa boecki* | | | | | | | | | | | | | | 27 | | | | | | | | |
| *Metopa cf. longicornis* | | | | | | | | | | 3 | | | | | | | | | | | | |
| *Metopa cf. robusta* | 2 | | | 70 | | | | 5 | | | | | | | 2 | | | | | | | |
| *Metopa sp.* | | 3 | 92 | 342 | | | 3 | 65 | 17 | 6 | 2 | | 3 | | 8 | 10 | 46 | | 3 | 13 | 3 | 16 |
| *Proboloides schokalskii* | | | | | | | | | | | | | | 3 | | | | | | | | |
| *Torometopa sp.* | 6 | | | 25 | | | | 5 | | | | | | | 6 | | | | | | | |
| **Synopiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Syrrhoe crenulata* | 22 | | 599 | 255 | 38 | | | 5 | 8 | 3 | | | | 3 | 84 | | 25 | | | | 52 | 7 |
| **Amphipoda indet.** | | | | | 5 | | | | 107 | 746 | 4 | | 251 | | 169 | | | | | 249 | | 78 |
| | | | | | | | | | | | | | | | | | | | | | | |
| **Cumacea** | | | | | | | | | | | | | | | | | | | | | | |
| **Diastylidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Brachydiastylis nimia* | 3 | | | | 6 | | 11 | 220 | 67 | 686 | 26 | 6 | 34 | 142 | 382 | 214 | 818 | 2 | 90 | 108 | 304 | 68 |
| *Brachydiastylis resima* | | | | 70 | | | | | | | | | | | | | | | | | | |
| *Diastylis echinata* | 3 | | | | | | | | | | | 3 | | | | | | | | | | |
| *Diastylis glabra* | | | | | | | | | | 105 | | | | | | | | | | | | |
| *Diastylis goodsiri* | | | | 25 | | | | | | | | | | 3 | | | | | | | 10 | |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| *Diastylis lepechini* | | | | | 45 | | | | | | | | 23 | | | | 86 | | | | 8 | |
| *Diastylis lucifera aff.* | | | | | | | | | | 3 | | | | | | | | | | | | |
| *Diastylis oxyrhyncha* | 8 | | | | 9 | | 17 | 501 | 92 | | 6 | 3 | 193 | 322 | 136 | 167 | 480 | | 187 | 82 | 54 | 172 |
| *Diastylis polaris* | | | | | | | | | | | | | | | | | | 17 | | | | |
| *Diastylis rathkei typica* | | | | | | | | | | 6 | | | | | | | | | | | | |
| *Diastylis scorpioides* | | | 510 | 284 | | | | | 3 | | | | | | 165 | | | | | | | |
| *Diastylis spinulosa* | 5 | | | 8 | 6 | | 6 | | 84 | 3 | | 9 | 99 | 24 | 29 | 47 | 81 | | 121 | 3 | 57 | 75 |
| *Leptostylis gorbunovi* | | | | | | | 72 | | | | | 3 | | | | | | 2 | | | | |
| *Leptostylis longimana* | | | | | | | | | 3 | 117 | 2 | | | | | | | | | | | |
| *Leptostylis villosa* | 17 | 3 | | 2 | 43 | | | 259 | 943 | | | | 1104 | 440 | 1327 | 1322 | 1625 | | 256 | 56 | 245 | 231 |
| **Lampropidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Hemilamprops uniplicata* | | | | | | | | | | | | | | | | | | 19 | | | | |
| *Platysympus tricarinatus* | 36 | | | | | | | | | | | | | | | | | | | | | |
| **Leuconidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Eudorella groenlandica* | | | | | | | | | | 17 | | | | | | | | | | | | |
| *Eudorella hispida* | 284 | | | | | | 35 | 5 | 258 | 54 | 12 | | 128 | 62 | 19 | 108 | 218 | 2 | 135 | 220 | 111 | 195 |
| *Leucon fulvus* | | | 599 | | | | | | | | | | | | | | | | | | | |
| *Leucon nasica* | | 3 | | | 187 | | 22 | 107 | 115 | 154 | | 6 | 84 | 215 | 1570 | 52 | 651 | | 93 | 13 | 129 | 7 |
| *Leucon nasicoides* | | | 384 | 452 | | | | | | | | | | | | | | | | | | |
| *Leucon nathorstii* | 5 | | | | 11 | | | | 680 | 117 | 2 | 3 | 579 | 286 | 16 | 537 | 1057 | 17 | 225 | 20 | 363 | 250 |
| *Leucon pallidus* | 96 | | | | 22 | 2 | 64 | 114 | 907 | 356 | 2 | 12 | 731 | 118 | 16 | 1212 | 1242 | 2 | 671 | 89 | 210 | 650 |
| *Leucon spinulosus* | 8 | | | | | | 11 | | | | | | | 3 | | | | 2 | | 23 | | |
| **Nannastacidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Campylaspis globosa aff.* | | | | | | | | | | | | | | 6 | | | | | | | | |
| *Campylaspis intermedia* | 3 | | | | | | | | | | | | | | | | | | | | | |
| *Campylaspis rubicunda* | 11 | | | 2 | | | 6 | | 17 | 17 | 2 | | 8 | 9 | 6 | 12 | 2 | | | 60 | 41 | 3 |
| *Campylaspis stephenseni* | 14 | | 6 | | 16 | | | | 25 | 9 | 39 | 6 | 8 | | 3 | 7 | 28 | | | 7 | 18 | |
| *Cumella carinata* | | | 118 | 143 | 2 | | | | | | | | | | 12 | | | | | | | |
| **Pseudocumidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Petalosarsia declivis* | | | 254 | 72 | 18 | | | 10 | | | | | | | 117 | | 16 | | | | 18 | |
| | | | | | | | | | | | | | | | | | | | | | | |
| **Isopoda** | | | | | | | | | | | | | | | | | | | | | | |
| **Anthuridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Calathura brachiata* | 19 | 3 | | | 149 | 4 | 36 | 48 | 140 | 63 | 10 | 44 | 198 | 9 | 237 | 216 | 225 | 10 | 263 | 46 | 8 | 107 |
| **Arcturidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Arcturus hastiger* | | | | 70 | | | | 2 | | | | | | | | | | | | | | |
| *Astacilla cf. arietina* | | | 56 | | | | | | | | | | | | | | | | | | | |
| *Pleuroprion hystrix* | | | | | | | | 15 | | 6 | | | 123 | 24 | | 5 | 2 | | | | 10 | |
| **Bopyridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Notophryxus clypeatus* | 3 | | | | | | 3 | 7 | 3 | | | 3 | 3 | 3 | | | | | 7 | 3 | | 3 |
| **Dajidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Hemiarthrus abdominalis* | | | 3 | 17 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| **Desmosomatidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Cryodesma agnari* | | | 6 | | | | | | 14 | 9 | | | 18 | | 13 | | 2 | | | | 3 | |
| *Desmosoma lineare* | | | | | | 4 | | | | | | | | | | | | | | | | 10 |
| *Desmosoma stroembergi* | 19 | | | | | | | 27 | 98 | 37 | 2 | | 39 | 32 | 23 | 76 | 56 | | 17 | | 52 | 23 |
| *Eugerda arctica* | 3 | | | 107 | 2 | | 30 | | | 9 | | | | | | 12 | 2 | | | | | |
| *Eugerda reticulata* | | | | | | | 3 | | | 3 | 4 | | | 44 | | | 58 | | | 42 | | |
| *Eugerdella cf. armata* | | | | | | | | | | | | | | | | | | | | | | 10 |
| *Eugerdella hessleri* | | 3 | | | | | 3 | 9 | 87 | 3 | 2 | | 44 | 21 | 3 | 185 | 12 | | 38 | 3 | 13 | 55 |
| *Oecidiobranchus nanseni* | | | | | | | 6 | 2 | | 54 | | | 13 | 3 | 84 | 37 | 53 | | 7 | 36 | 28 | |
| *cf. Oecidiobranchus plebejum* | | | | | | | | | | | | | | | | | | | | | | 3 |
| *Pseudomesus brevicornis* | 16 | | | | | | | | | 3 | | | | | | | | | | 3 | | |
| *Whoia dumbshafensis* | 19 | | | 11 | | | | | 8 | | | | 34 | | 6 | 57 | 5 | | 3 | | 5 | 10 |
| **Eurycopidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Baeonectes muticus* | 14 | | 3 | 49 | | | | 22 | | 170 | | | | | 188 | | 364 | 2 | | | 26 | |
| *Eurycope brevirostris* | 88 | | 6 | | | | 1193 | 615 | 1455 | 487 | 20 | | 128 | 637 | 10 | 1069 | 188 | 10 | 228 | 324 | 5 | 390 |
| *Eurycope inermis* | 63 | | | | 11 | | 282 | 189 | 624 | 65 | 14 | 53 | 34 | 65 | 143 | 554 | 426 | 32 | 356 | 538 | 5 | 787 |
| *Eurycope producta* | 197 | | | | | | 8 | 36 | 62 | 9 | 6 | 6 | 39 | 106 | 52 | 57 | 148 | 2 | 24 | 3 | 31 | 107 |
| *Munnopsurus giganteus* | | | | | | | | 2 | 6 | 3 | | 12 | 13 | 9 | 6 | 12 | 28 | 7 | 28 | 32 | | 33 |
| *Tytthocope megalura* | 3 | | | | | | | | | | | | | | | | | | | | | |
| **Gnathiidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Gnathia elongata* | | 3 | | | 36 | | | 19 | 143 | | | | 86 | 27 | | 71 | 47 | | | | | 29 |
| *Gnathia hirsuta* | | | | | | 2 | | | | | | | | | | | | | | | | |
| *Gnathia stygia* | | | | | | | 64 | | 46 | | 92 | | | | | | | | 72 | | 23 | |
| *Praniza sp.* | 90 | | | | | | | | | | | 44 | | | 16 | | | 5 | 45 | | | |
| **Haploniscidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Haploniscus bicuspis* | 52 | | | | | | 8 | | | | 2 | | | | | | | | | 49 | | |
| *Haploniscus ingolfi* | | | | | | | | | | | 2 | | | | | 5 | | | | | | |
| **Ilyarachnidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Echinozone arctica* | 16 | | | | 9 | | 22 | | 14 | | | | 13 | 6 | 26 | 20 | 86 | 2 | 14 | 62 | 5 | 42 |
| *Ilyarachna bergendali* | 44 | 3 | | | | | 61 | 29 | 152 | 117 | 6 | | 201 | 15 | 88 | 397 | 399 | 27 | 24 | 361 | 10 | 46 |
| *Ilyarachna dubia* | | | | | | | | | | | 2 | | 3 | | | | | | | | | 13 |
| *Ilyarachna hirticeps* | 85 | | | | | | 3 | | 59 | 49 | 12 | 18 | 39 | 6 | 10 | 89 | 88 | 10 | 35 | | 118 | 49 |
| *Ilyarachna torleivi* | 60 | | | | 2 | | 6 | 5 | 372 | 57 | | | 34 | | 117 | 51 | 169 | | 31 | 3 | 18 | 81 |
| **Ischnomesidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Ischnomesus norvegicus* | | | | 2 | | | | | | 3 | | | | | | | 2 | | | | 5 | |
| **Janiridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Jaera sp.* | | | | | | | | | 25 | | | | | | | | | | | | | 7 |
| *Thambema cf. amicorum* | 27 | | | | | | | | | | | | | | | | | | | | | |
| **Katianiridae** | | | | | | | | | | | | | | | | | | | | | | |
| *Katianira bilobata* | 315 | | | | | | | | | 3 | | | | | | | | 5 | | 16 | | |
| **Macrostylidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Macrostylis subinermis* | 33 | | | | | | | | | 3 | | | | | | | | | | 3 | | |

| Station | 18 | 30 | 36 | 39 | 54 | 59 | 77 | 85 | 95 | 102 | 115 | 119 | 138 | 145 | 155 | 165 | 179 | 216 | 217 | 231 | 234 | 258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | | | | | | | | | | | | | | | | | | | | | | |
| **Munnidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Munna acanthifera* | 115 | | | | | | 61 | 58 | | 34 | | 6 | 110 | 53 | | 16 | 443 | | 35 | 98 | 3 | 91 |
| *Munna boecki* | | | | | 9 | | | | | | | | | | | | | | | | | |
| *Munna groenlandica* | | | 555 | 164 | | | | 5 | | | | | | | | | 2 | | | | | |
| *Munna hanseni* | 227 | | | | 5 | | 3 | 36 | 143 | 9 | 4 | | 180 | 68 | 39 | 337 | 109 | 2 | 128 | 32 | 10 | 20 |
| *Munna minuta* | | | | | | | | | | | | | | 3 | | | | | | | | |
| **Munnopsidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Munnopsis typica* | 19 | | 3 | 2 | 45 | | 3 | 75 | 33 | | | 3 | 5 | 71 | 146 | 52 | 447 | 10 | 31 | | 5 | 26 |
| **Nannoniscidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Nannoniscella groenlandica* | 8 | | | | | | 6 | | | 3 | | | | 3 | 26 | | 102 | | | | 5 | |
| *Nannoniscoides angulatus* | 79 | | | | | | | | 90 | 17 | | | 41 | | 23 | | | | | | 52 | 3 |
| *Nannoniscus arcticus* | | | | | | | | | 90 | | | | 26 | | | 66 | | | 14 | 13 | 18 | 20 |
| *Nannoniscus armatus* | | | | | | | | | | 17 | | | | | | | | | | | | |
| *Nannoniscus equiremis* | | | | | | 2 | | | | | | | | | | | 2 | | | | | |
| *Nannoniscus reticulatus* | 192 | | | | | | | | | 23 | 2 | | | | | | 2 | | | | | |
| *Nannoniscus cf. spinicornis* | 8 | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| **Mysidacea** | | | | | | | | | | | | | | | | | | | | | | |
| **Mysidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Ambylops abbreviata* | 3 | | | | | | 44 | 2 | 92 | | | 18 | 13 | 6 | 16 | 222 | 2 | 25 | 273 | 82 | | 39 |
| *Boreomysis arctica* | | | | | | | | | | | | | | | | | | | | 3 | | |
| *Erythrops abyssorum* | | | | | | | | | 123 | | | | | | | | | 15 | | | | |
| *Erythrops erythrophthalma* | 27 | | | 21 | 187 | | | 1130 | 585 | 382 | | 9 | 290 | 437 | 1424 | 155 | 1049 | 2 | 156 | 3 | 873 | 88 |
| *Erythrops glacialis* | 36 | | | | | | 227 | 12 | | | | 160 | 55 | | | 933 | 2 | 2 | 435 | 197 | | 270 |
| *Meterythrops robusta* | | | | | 11 | | | | | | | | | | | | | | | | | |
| *Parerythrops spectabilis* | 38 | | | | | | 108 | | | 3 | 35 | 18 | 28 | 3 | 29 | 10 | 7 | | 17 | 101 | | 3 |
| *Pseudomma frigidum* | | | | | 2 | | 172 | 34 | 104 | 231 | 76 | 148 | 21 | 32 | 52 | 305 | 7 | 37 | 892 | 190 | 10 | 540 |
| | | | | | | | | | | | | | | | | | | | | | | |
| **Tanaidacea** | | | | | | | | | | | | | | | | | | | | | | |
| **Tanaidae** | | | | | | | | | | | | | | | | | | | | | | |
| *Cryptocope arctica* | 22 | | | | | | 6 | 5 | | | | | | 3 | 26 | 10 | 5 | | | 13 | 5 | |
| *Cryptocope cf. arctophylax* | | | | | | | | | | | | | | | | | | | | 79 | | |
| *Leptognathia longiremis* | 68 | | | 41 | 5 | | 14 | | 28 | 6 | 2 | | 3 | 3 | 1498 | 2 | 25 | 5 | | 7 | 33 | |
| *cf. Neotanais giganteus* | | | | | | | | | | 3 | | | | | | | | | | | | |
| *cf. Neotanais serratispinosus* | | | | | | | | | | | | | | | | | | 2 | | | | |
| *Pseudotanais macrocheles* | 63 | 6 | 26 | | 2 | | 30 | 36 | 65 | 74 | 2 | | 50 | 21 | 272 | 118 | 172 | 5 | 31 | 154 | 26 | 94 |
| *Sphyrapus anomalus* | | | 3 | | 5 | 2 | 3 | 2 | 20 | 9 | 6 | 6 | 16 | 6 | 3 | 2 | 16 | | 10 | 16 | 18 | |
| *cf. Taenella ochracea* | | | | | | | | | | | | | | | | | | | | 13 | | |

70 % ethanol. For faunistic comparison of the 22 stations the complete samples were analysed.

In addition a CTD, Agassiz trawl, box corer, multicorer, bottom water sampler and bongo net were employed at almost all EBS stations providing measures of environmental parameters which helped to explain the variation in abundance and diversity at the different stations.

## Data analysis

The peracarid crustacean species caught are summarized in Table 2. For differentiation of distinct species assemblages according to the pattern of their co-occurences (R-mode) an explorative statistical approach as proposed by Field et al. (1982) was applied. The multivariate data set was double-square-root transformed and subjected to both classification and ordination analyses, i.e. agglomerative hierarchical cluster analysis (Piepenburg and Piatkowski 1992; Romesburg 1984) and nonmetric multidimensional scaling (Kruskal & Wish 1978; Wilkinson et al. 1983), respectively.

Species occurring at less than two stations or with less than 5% relative dominance at any one station were excluded from community analyses to minimize stochastic bias of the distribution pattern by random occurrences of rare species. The Bray-Curtis coefficient (Bray & Curtis 1957) was used as parameter of species resemblance both for classification and ordination. For the computation of similarities between any two clusters the "Unweighted Pair-Group Method using Arithmetic Averages" (UPGMA) has been used.

The multivariate pattern in terms of species similarities was depicted by dendrograms for cluster analysis and ordination biplots for multidimensional scaling. Based on discontinuities recognized in these graphical representations of the overall resemblance patterns distinct species assemblages were arbitrarily differentiated and marked.

Abundance and constancy of peracarid species in the assemblages were summarized using mean numbers, presence at stations, maximum numbers of individual species caught and a "Biological Index" (McCloskey, 1970; Table 3). The latter is a measure of species importance combining aspects of constancy and dominance. It is computed for each species over n stations by summing scores X in the range from 10 to 1 which are attributed to each species according to its abundance rank $R_j$ at each of the n stations concerned. When standardized to its theoretical maximum (10n) and multiplied by 100 the range of this index is from 0 to 100:

$$B1 = \left(\left(\sum_{j=1}^{n} X(R_j)\right)\Big/10n\right)100$$

Numbers of individuals of the 45 species which attained 5% dominance at one or more stations, and which were included in the community analysis, are listed in Tables 3 and 4. The geographical and bathymetric extent of assemblages were based on groupings identified by classification and ordination (Q mode) (see Brandt 1995) in conjunction with the species groupings obtained by the same methodology in this paper. Within each cluster, total number of individuals in station groups, or at single stations if more appropriate, were examined. Because clusters were very unequal in terms of number of individuals, a similar exercise was conducted using the mean number of individuals averaged over all 20 quantitative stations and all clustered species. Those totals of individuals for station groups or single stations which were significantly higher than mean expected values (chi-squared = 10.83, $p<0.001$) were used to define the extent of species assemblages.

# Results

## Species composition

The 20 successful hauls made in the NEW Polynya yielded 38322 specimens of peracarid crustaceans in at least 229 species from 121 genera and 51 families. Among these species, some amphipods could be distinguished at the species level but could not be named because of small size, immaturity or damage, and are assigned to genus only in Table 2. Other amphipod specimens could not be identified, even at the generic level. These are listed under Lysianassidae sp. indet., Oedicerotidae sp. indet. and Amphipoda sp. indet. in Table 2, but excluded from further analysis. Thus it is likely that the total number of species collected was higher than the total number recognized. When standardized to 1000 m hauls, 110323 individuals are represented, of which 105346 belong to the 229 species recognized (Table 2).

## Abundance, diversity, and zonation

In terms of individuals, cumaceans were most abundant (31.2%) followed by amphipods (28.5%, including those not fully identified), isopods (25.2%), mysids (12.2%) and tanaids (3.0%) (Fig. 2, Table 2). In contrast, species diversity was highest among amphipods (130 spp., 57.0%), with lower values among the isopods (52 spp., 22.4%), cumaceans (31 spp., 13.6%) and mysids and tanaids (8 spp. each, 3.5%) (Table 2). The most abundant family sampled was the Diastylidae (Cumacea), and one of the species in that family, *Leptostylis villosa*, was the dominant peracarid captured in the Polynya (7.1% of all individuals collected). 45 species

Table 3. List of numerically most important peracarid species (i.e. those occurring at any one station with 5% dominance). BI = biological index after McCloskey (1970).

| Species | Presence (%) | Mean density * | Max. density * | BI | Sum |
|---|---|---|---|---|---|
| *Leptostylis villosa* | 70 | 393.5 | 1625 | 38 | 7870 |
| *Eurycope brevirostris* | 85 | 342.6 | 1455 | 42 | 6853 |
| *Erythrops erythrophthalma* | 85 | 340.9 | 1424 | 35 | 6818 |
| *Leucon pallidus* | 90 | 325.7 | 1242 | 36 | 6514 |
| *Eurycope inermis* | 90 | 212.1 | 787 | 36 | 4241 |
| *Leucon nathorstii* | 80 | 208.4 | 1057 | 28 | 4168 |
| *Bathymedon* sp. | 35 | 177.4 | 2329 | 13 | 3549 |
| *Leucon nasica* | 75 | 170.2 | 1570 | 18 | 3405 |
| *Brachydiastylis nimia* | 90 | 159.3 | 818 | 22 | 3187 |
| *Pseudomma frigidum* | 85 | 142.7 | 892 | 32 | 2853 |
| *Monoculodes* sp. | 50 | 136.9 | 1177 | 12 | 2739 |
| *Diastylis oxyrhyncha* | 80 | 121.5 | 501 | 12 | 2429 |
| *Erythrops glacialis* | 55 | 116.5 | 933 | 22 | 2329 |
| *Ilyarachna bergendali* | 80 | 98.8 | 399 | 14 | 1977 |
| *Eudorella hispida* | 80 | 92.3 | 284 | 12 | 1846 |
| *Calathura brachiata* | 90 | 91.4 | 263 | 12 | 1828 |
| *Westwoodilla megalops* | 5 | 89.0 | 1779 | 5 | 1779 |
| *Leptognathia longiremis* | 75 | 87.0 | 1498 | 4 | 1740 |
| *Anonyx nugax* | 70 | 79.3 | 927 | 4 | 1586 |
| *Munna hanseni* | 85 | 67.6 | 337 | 6 | 1352 |
| *Syrrhoe crenulata* | 60 | 55.0 | 599 | 6 | 1101 |
| *Halirages fulvocincta* | 45 | 49.4 | 596 | 5 | 987 |
| *Arrhis phyllonyx* | 85 | 48.6 | 246 | 3 | 972 |
| *Diastylis scorpioides* | 20 | 48.1 | 510 | 6 | 962 |
| *Eurycope producta* | 85 | 44.6 | 197 | 4 | 893 |
| *Ambylops abbreviata* | 70 | 41.9 | 273 | 7 | 837 |
| *Leucon nasicoides* | 10 | 41.8 | 452 | 6 | 836 |
| *Rhachotropis helleri* | 45 | 41.0 | 395 | 5 | 819 |
| *Andaniexis abyssi* | 60 | 37.6 | 211 | 3 | 752 |
| *Metopa* sp. | 80 | 37.5 | 437 | 3 | 750 |
| *Munna groenlandica* | 20 | 36.3 | 555 | 4 | 726 |
| *Leucon fulvus* | 5 | 29.9 | 599 | 4 | 599 |
| *Petalosarsia declivis* | 35 | 25.2 | 254 | 2 | 505 |
| *Rhachotropis macropus* | 25 | 24.2 | 225 | 4 | 484 |
| *Halice abyssi* | 55 | 22.1 | 210 | 6 | 441 |
| *Parerythrops spectabilis* | 65 | 20.0 | 108 | 8 | 400 |
| *Katianira bilobata* | 20 | 16.9 | 315 | 4 | 339 |
| *Gnathia stygia* | 25 | 14.8 | 92 | 6 | 297 |
| *Aceroides latipes* | 65 | 12.8 | 142 | 3 | 255 |
| *Nannoniscus reticula* | 20 | 10.9 | 192 | 2 | 219 |
| *Praniza* sp. | 25 | 10.0 | 90 | 4 | 200 |
| *Campylaspis stephenseni* | 65 | 9.3 | 39 | 4 | 186 |
| *Pardaliscella malygini* | 15 | 1.8 | 25 | 2 | 36 |
| *Hemilamprops uniplicata* | 5 | 0.9 | 19 | 3 | 19 |
| *Diastylis polaris* | 5 | 0.8 | 17 | 2 | 17 |

* Mean density (ind. 1000 $m^2$)
* Maximum density (ind. 1000 $m^2$)

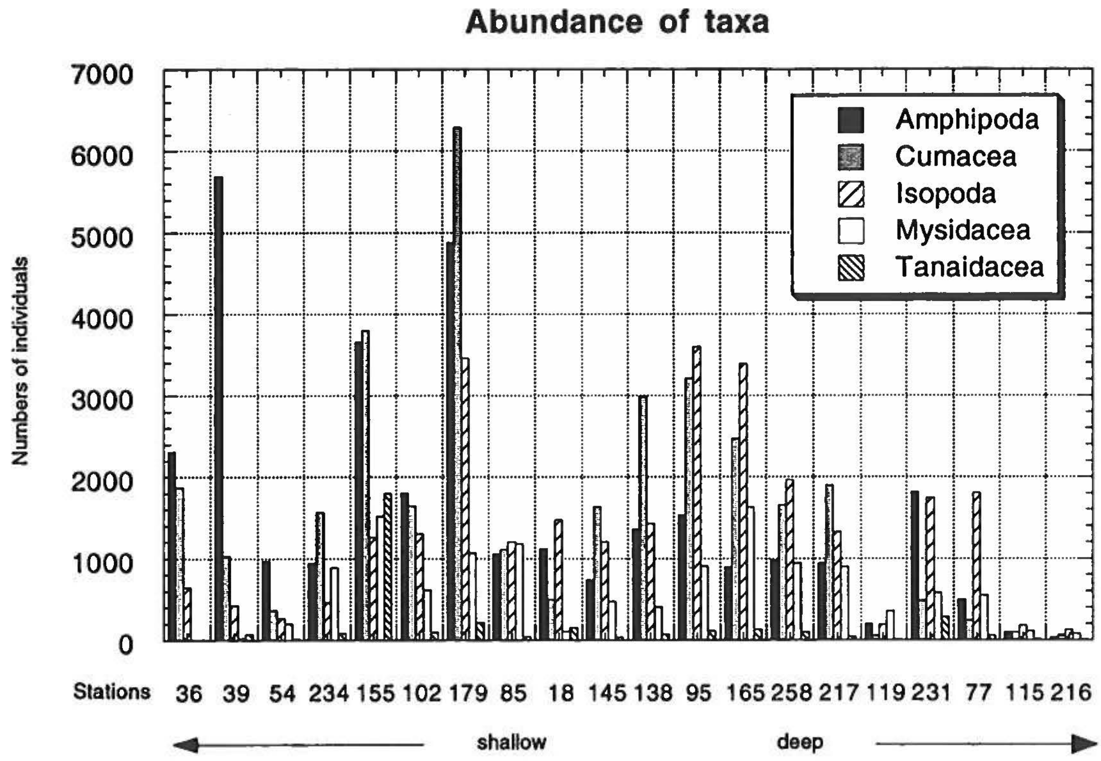


Figure 2. Abundance of peracarid taxa in the NEW Polynya. Stations are ordered by depth (compare table 1).

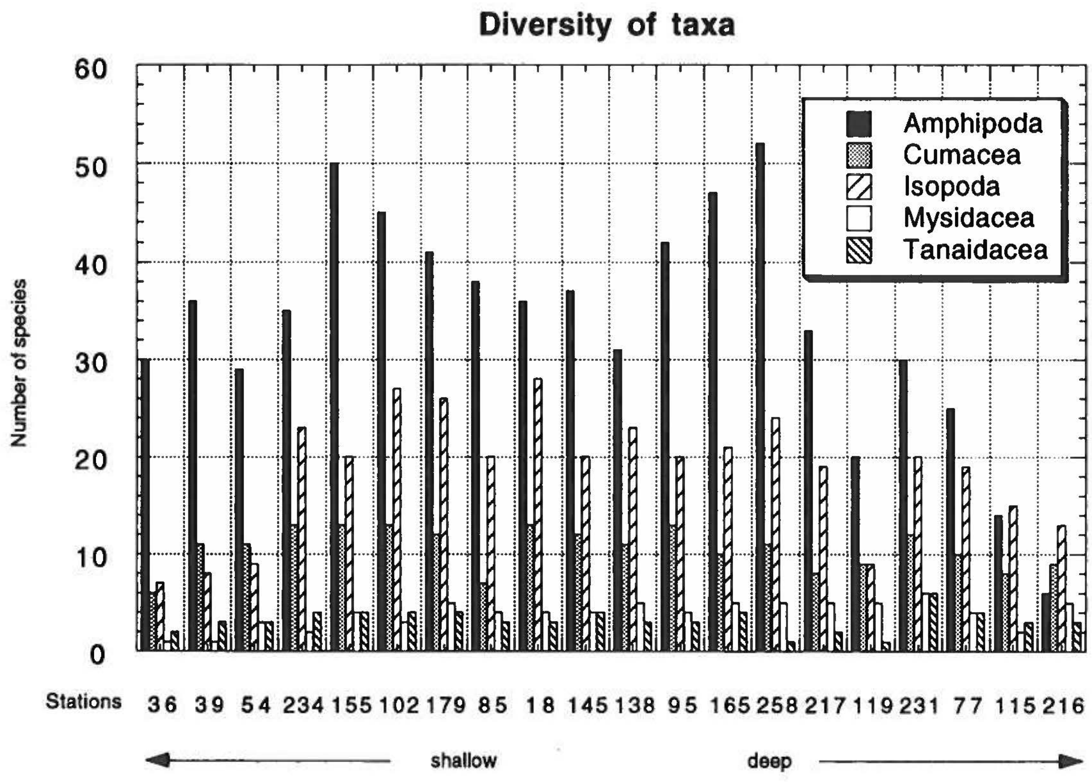


Figure 3. Diversity of peracarid taxa in the NEW Polynya. Stations are ordered by depth (compare table 1).

| Tax. | Species/Stations | 36 | 39 | 217* | 258* | 138* | 165* | 95* | 155 | 179 | 234 | 85 | 145 | 102 | 77 | 231 | 18 | 115 | 119 | 216 | 54 | **assemblage** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | depth (m) | 45 | 50 | 328 | 326 | 314 | 320 | 315 | 186 | 260 | 180 | 270 | 310 | 232 | 425 | 411 | 310 | 492 | 377 | 517 | 174 | **name** |
| C | *Leucon fulvus* | 599 | | | | | | | | | | | | | | | | | | | | |
| I | *Munna groenlandica* | 555 | 164 | | | | | | | 2 | | 5 | | | | | | | | | | |
| A | *Syrrhoe crenulata* | 599 | 255 | | 7 | | | 8 | 84 | 25 | 52 | 5 | 3 | 3 | | | 22 | | | | 38 | |
| C | *Diastylis scorpioides* | 510 | 284 | | | | | 3 | 165 | | | | | | | | | | | | | "shallow |
| C | *Petalosarsia declivis* | 254 | 72 | | | | | | 117 | 16 | 18 | 10 | | | | | | | | | 18 | assemblage" |
| A | *Metopa sp.* | 92 | 437 | 3 | 16 | 3 | 10 | 17 | 16 | 46 | 3 | 75 | | 6 | 3 | 13 | 8 | 2 | | | | |
| C | *Leucon nasicoides* | 348 | 452 | | | | | | | | | | | | | | | | | | | |
| A | *Anonyx nugax* | 62 | 927 | 52 | 6 | | 5 | 3 | 139 | 269 | 39 | 7 | 12 | 20 | | 39 | | | 6 | | | |
| A | *Monoculodes* sp. | 608 | 1177 | | 81 | | | | 204 | 596 | 5 | | 6 | | | | 19 | 2 | | | 41 | |
| A | *Westwoodilla megalops* | | 1779 | | | | | | | | | | | | | | | | | | | |
| A | *Aceroides laticeps* | | 29 | 3 | 3 | | 5 | 3 | 39 | 2 | 5 | | 3 | | | 16 | | 2 | 3 | | 142 | |
| C | *Leucon nathorstii* | | | 225 | 250 | 579 | 537 | 680 | 16 | 1057 | 363 | | 286 | 117 | | 20 | 5 | 2 | 3 | 17 | 11 | |
| C | *Leucon pallidus* | | | 671 | 650 | 731 | 1212 | 907 | 16 | 1242 | 210 | 114 | 118 | 356 | 64 | 89 | 96 | 2 | 12 | 2 | 22 | |
| C | *Leptostylis villosa* | | 2 | 256 | 231 | 1104 | 1322 | 943 | 1327 | 1625 | 245 | 259 | 440 | | | 56 | 17 | | | | 43 | |
| I | *Eurycope brevirostris* | 6 | | 228 | 390 | 128 | 1069 | 1455 | 10 | 188 | 5 | 615 | 637 | 487 | 1193 | 324 | 88 | 20 | | 10 | | "common |
| I | *Eurycope inermis* | | | 356 | 787 | 34 | 554 | 624 | 143 | 426 | 5 | 189 | 65 | 65 | 282 | 538 | 63 | 14 | 53 | 32 | 11 | species |
| C | *Leucon nasica* | | | 93 | 7 | 84 | 52 | 115 | 1570 | 651 | 129 | 107 | 215 | 154 | 22 | 13 | | | 6 | | 187 | assemblage" |
| M | *Erythrops erythrophthalma* | | 21 | 156 | 88 | 290 | 155 | 585 | 1424 | 1049 | 873 | 1130 | 437 | 382 | | 3 | 27 | | 9 | 2 | 187 | |
| C | *Brachydiastylis nimia* | | | 90 | 68 | 34 | 214 | 67 | 382 | 818 | 304 | 220 | 142 | 686 | 11 | 108 | 3 | 26 | 6 | 2 | 6 | |
| C | *Diastylis oxyrhyncha* | | | 187 | 172 | 193 | 167 | 92 | 136 | 480 | 54 | 501 | 322 | | 17 | 82 | 8 | 6 | 3 | | 9 | |
| C | *Eudorella hispida* | | | 135 | 195 | 128 | 108 | 258 | 19 | 218 | 111 | 5 | 62 | 54 | 35 | 220 | 284 | 12 | | 2 | | |
| I | *Munna hanseni* | | | 128 | 20 | 180 | 337 | 143 | 39 | 109 | 10 | 36 | 68 | 9 | 5 | 32 | 227 | 4 | | 2 | 5 | |
| I | *Eurycope producta* | | | 24 | 107 | 39 | 57 | 62 | 52 | 148 | 31 | 36 | 106 | 9 | 8 | 3 | 197 | 6 | 6 | 2 | | |
| I | *Calathura brachiata* | | | 263 | 107 | 198 | 216 | 140 | 237 | 225 | 8 | 48 | 9 | 63 | 36 | 46 | 19 | 10 | 44 | 10 | 149 | |
| I | *Ilyarachna bergendali* | | | 24 | 46 | 201 | 397 | 152 | 88 | 399 | 10 | 29 | 15 | 117 | 61 | 361 | 44 | 6 | | 27 | | "Westwind |
| A | *Arrhis phyllonyx* | | | 41 | 7 | 55 | 66 | 28 | 149 | 246 | 232 | 44 | 24 | 20 | 8 | | 5 | 4 | 9 | 5 | 29 | Trough |
| A | *Andaniexis abyssi* | | | 211 | 85 | 115 | 106 | 39 | | 58 | | 34 | 21 | 9 | | | | 8 | 41 | | 25 | assemblage" |
| M | *Ambylops abbreviata* | | | 273 | 49 | 13 | 222 | 92 | 16 | 2 | | 2 | 6 | | 44 | 82 | 3 | | 18 | 25 | | |
| M | *Erythrops glacialis* | | | 435 | 270 | 55 | 933 | | | 2 | | 12 | | | 227 | 197 | 36 | | 160 | 2 | | |
| M | *Pseudomma frigidum* | | | 892 | 540 | 21 | 305 | 104 | 52 | 7 | 10 | 34 | 32 | 231 | 172 | 190 | | 76 | 148 | 37 | 2 | |
| A | *Rhachotropis helleri* | | | | 3 | | 5 | | 36 | 216 | | 395 | 142 | 6 | 14 | | | | | | 2 | "high |
| A | *Bathymedon* sp. | | | 7 | 7 | | | 56 | 705 | 2329 | | | | 3 | | | | | | | 442 | accumulation |
| T | *Leptognathia longiremis* | | 41 | | | 3 | 2 | 28 | 1498 | 25 | 33 | | 3 | 6 | 14 | 7 | 68 | 2 | | 5 | 5 | area |
| A | *Rhachotropis macropus* | | | | | 3 | | 39 | | | 209 | | | 225 | | | 8 | | | | | assemblage" |
| I | *Katianira bilobata* | | | | | | | | | | | | | 3 | | 16 | 315 | | | 5 | | |
| I | *Nannoniscus reticulatus* | | | | | | | | | 2 | | | | 23 | | | 192 | 2 | | | | "ice associate |
| A | *Halirages fulvocinctus* | | | 17 | 29 | 91 | 79 | 70 | 6 | 79 | | | | | | 20 | 596 | | | | | assemblage" |
| I | *Praniza* sp. | | | 45 | | | | | 16 | | | | | | | | 90 | | 44 | 5 | | |
| A | *Halice abyssi* | | | | 7 | 44 | 7 | 14 | | | | | 3 | 3 | 102 | 210 | 41 | 4 | 6 | | | |
| M | *Parerythrops spectabilis* | | | 17 | 3 | 28 | 10 | | 29 | 7 | | | 3 | 3 | 108 | 101 | 38 | 35 | 18 | | | "Norske |
| C | *Campylaspis stephenseni* | 6 | | | | 8 | 7 | 25 | 3 | 28 | 18 | | | 9 | | 7 | 14 | 39 | 6 | | 16 | Trough |
| I | *Gnathia stygia* | | | 72 | | | | 46 | | | 23 | | | | 64 | | | 92 | | | | assemblage" |
| A | *Pardaliscella malygini* | 6 | | | | 5 | | | | | | | | | | | | 25 | | | | |
| C | *Diastylis polaris* | | | | | | | | | | | | | | | | | | | 17 | | "deep |
| C | *Hemilamprops uniplicata* | | | | | | | | | | | | | | | | | | | 19 | | assemblage" |

Table 4. Table of the peracarid assemblages. Seven assemblages can be distinguished: a "shallow assemblage", a "common species assemblage", a "Westwind Trough assemblage", a "high accumulation area assemblage", an "ice associate assemblage", a "Norske Trough assemblage", and a " deep assemblage". Tax = Taxon, A = Amphipoda, C = Cumacea, I = Isopoda, M = Mysidacea, T = Tanaidacea.

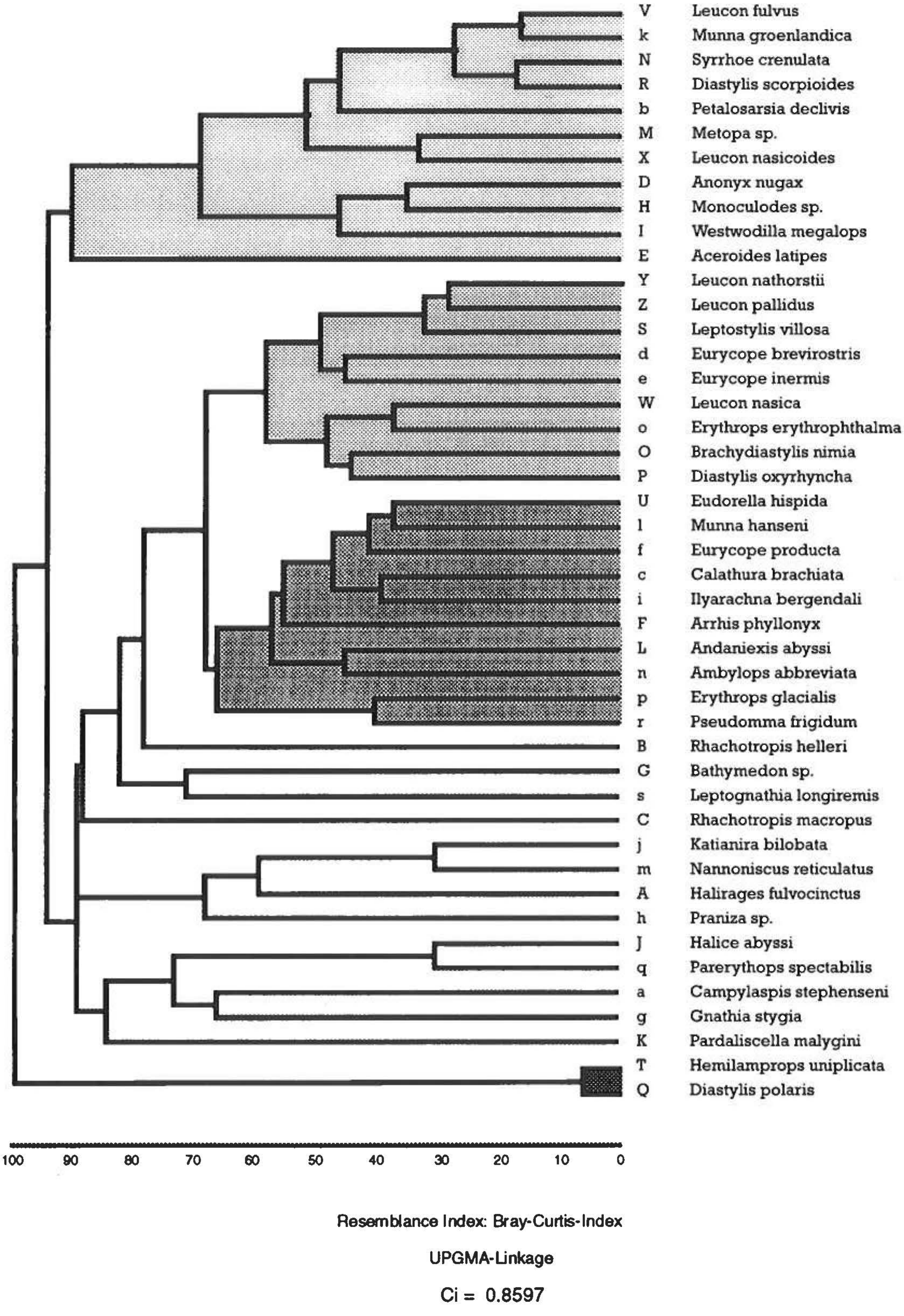


Figure 4. Dendogram from the cluster analysis of the species communities in the NEW Polynya (fourth root – transformation of species abundance values, Bray Curtis Index, UPGMA – linkage; cophenetic index = 0.8597). Abbreviations V-Q are codes for the species, which are used in Figure 5 in the MDS plot. Shaded groupings correspond to assemblages defined in Table 4.

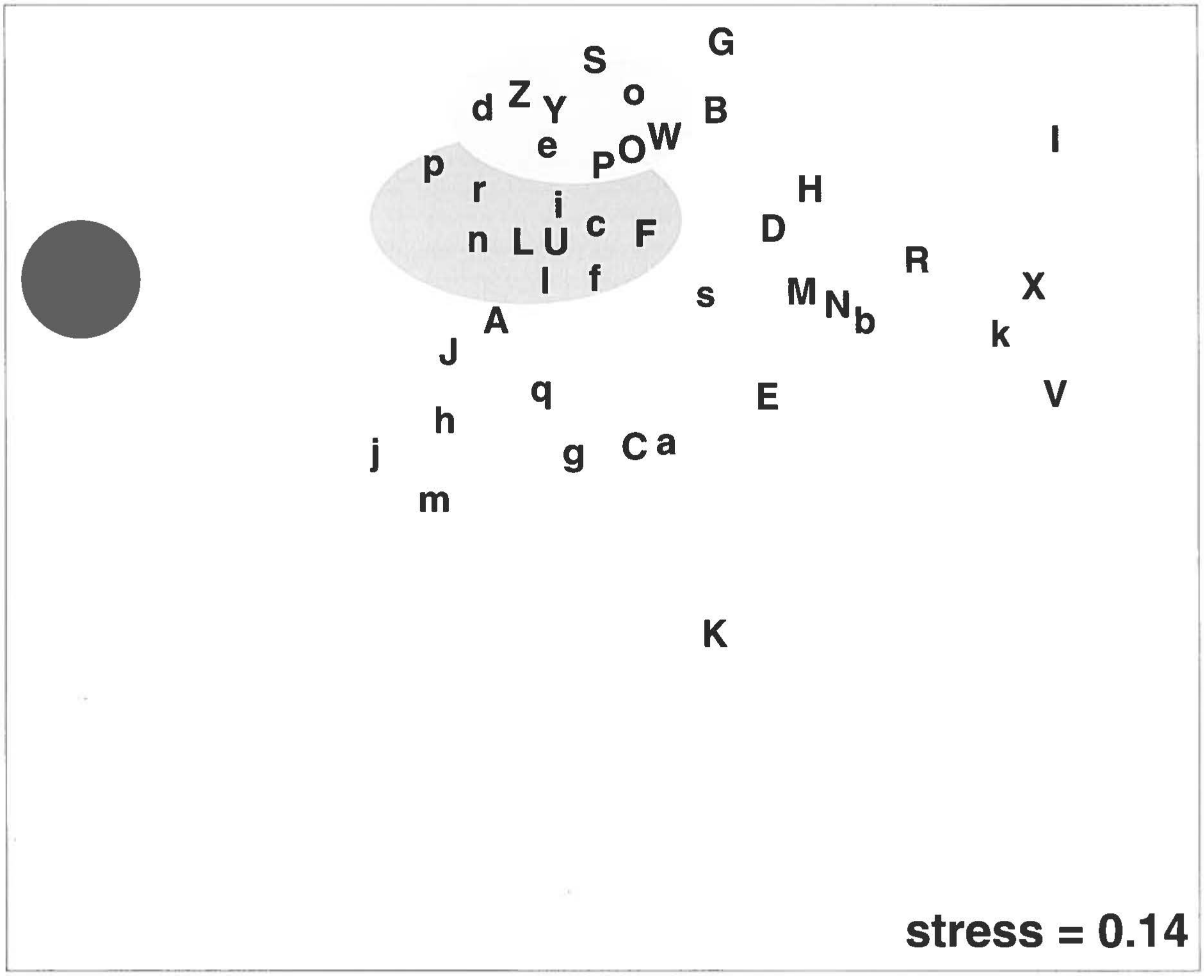


Figure 5. Plot of the multidimensional scaling (two dimensions) of the species communities (raw species abundance values, Bray Curtis Index, stress of MDS solution 0.14). For explanation of the codes (letters), see species names in Fig. 4. Shaded groupings correspond to assemblages defined in Table 4.

achieved a 5% dominance at one or more stations (Table 3), while 22 species exceeded 10% dominance, but only 5 (*Bathymedon sp.*, station 54; *Erythrops erythrophthalma*, station 85; *Erythrops glacialis*, station 119; *Eurycope brevirostris*, station 77; and *Westwoodilla megalops*, station 39) exceeded 20%. None of the 228 species occurred at all 20 stations, but 5 species, *Brachydiastylis nimia*, *Leucon pallidus*, *Calathura brachiata*, *Eurycope inermis* and *Pseudotanais macrocheles*, were found at 18 stations. In four of these cases, species were absent from both of the two shallow stations.

Abundance and diversity were lowest at the deepest station (216; 517 m) and at stations 115 and 119 (377-492 m) (Figs 2 and 3; Tables 1 and 2), suggesting that depth may be a controlling factor. However, there is no general correlation of abundance or diversity with depth (Spearman´s rank correlation coefficient, $\rho > 0.05$) and therefore factors other than depth must be involved. Station 179 showed the highest abundance of Peracarida (Table 1), followed by station 155. Diversity ranged from 35 to 90 species and was highest at stations 102, 155, and 258 (Table 1 [S]). The abundance of cumaceans and isopods was higher than that of amphipods at many stations in the NEW (Table 2), although at the shallow stations 36 and 39 Amphipoda were predominant (Fig. 2). However, amphipods were most diverse at 18 stations and were outranked only at the deep stations 115 and 216 by the Isopoda. Although there are overall no significant relationships between depth and diversity, amphipod numbers are significantly higher (Spearman´s rank correlation coefficient, $\rho < 0.05$) at shallower depths. Both abundance and diversity were highest at stations sampled around 300 m depth, especially in the Westwind Trough, in the north of the Polynya (Table 1).

## Peracarid communities

7 assemblages of peracarid crustaceans could be distinguished (Table 4), of which four were well defined (Figs 4 and 5): The "shallow assemblage" had its main occurrence at station 36 and 39. It consisted mainly of amphipods (6 species), of 3 cumacean species, and 1 isopod species (Table 4, Figs 4 and 5). Species of the "common species assemblage" occurred at all stations, but were most frequent in the Norske and Westwind Troughs. This species assemblage was dominated by 6 cumacean (Table 4; Figs 4 and 5), but also consisted of 2 isopod, and 1 mysid species. The "Westwind Trough assemblage" (Table 4; Figs 4 and 5) had its distributional focus in the Westwind Trough, especially at the "time series station", as well as on stations 179 and 155, which showed very high abundance values for the Peracarida (Table 1). Most species of this assemblage were isopods (4 species), followed by mysids (3 species), amphipods (2 species), and 1 cumacean species. The "high accumulation area assemblage" (Table 4) and the next two assemblages mentioned are not as well defined as the above characterized assemblages. Therefore, they are not highlighted in Figs 4 and 5. The "high accumulation area" assemblage is focussed mainly on the shallower Westwind Trough stations, where the highest concentrations of organic detritus were were found. It consists of 4 species, of which 3 belong to the Amphipoda and only 1 to the Tanaidacea (Table 4). However, *Rhachotropis macropus*, although attributed to this assemblage in the cluster analysis, does not occur on stations 155 and 179. The "ice associated assemblage" comprised mainly isopod species (3 of 4), which were frequent at station 18, close to the ice edge in the Norske Trough (Table 4). Only 1 amphipod species, *Halirages fulvocinctus*, occurred in high numbers at this station. The "Norske Trough assemblage" included species which were concentrated in the Norske Trough, but some were also important in the Belgica Trough (Table 4). This assemblage did not show a distinct importance of a certain peracarid taxon, but combined 5 species of 4 peracarid taxa; two of these were Amphipoda, whereas Cumacea, Isopoda, and Mysidacea were represented by a single species. The "deep assemblage" was well defined (Table 1 and Figs 4 and 5), consisting of 2 cumacean species, *Diastylis polaris* and *Hemilamprops uniplicata*, which occurred only on the deepest station 216.

# Discussion

## Sampling gear

In contrast to megafaunal organisms, macrobenthic peracarid crustaceans are too small for *in situ* analysis by camera or video systems (e.g. Gutt 1991; Hargrave 1985; Hecker 1990; Piepenburg 1988; Piepenburg & v. Juterzenka 1994; Smith 1985), and are rarely sufficiently abundant to be sampled adequately even by grabs or larger box corers covering 0.25 $m^2$. Such samples cannot provide unbiased abundance estimates for species which may occur in rather low densities (some species of amphipods and isopods), form swarms (Mysidacea), or have a patchy distribution due to food availability (all Peracarida) (Holme & McIntyre 1984). Bow-wave effects of corers (Jumars, 1975) influence sampling efficiency to an unknown degree. Towed gears are semi-quantitative only and catches may be biased by avoidance reactions of mobile organisms (mysids or some amphipods). However, our samples were taken with an epibenthic sledge (Rothlishberg & Pearcy, 1977) which is usually towed at one knot, and catches mysids and amphipods in considerable numbers (Buhl-Jensen 1986) (Table 2).

## Species composition, zoogeography, diversity

Information on the occurrence of peracarid crustacean assemblages in the northern North Atlantic is scarce and not easily accessible, as synopses generally are non-existent, and descriptions and keys of families, genera, or species are widely distributed in taxonomic literature. Few publications present the distribution of taxa for specific areas (e.g. Brandt 1993; Buhl-Jensen 1986; Clark & Threlfall, 1993; Gurjanova 1946; Hansen 1916; Kussakin, 1962, 1973, 1983; Svavarsson et al. 1990, 1993 b) or on the diversity (Gray, 1994). Publications on biogeographic distribution of animals or on the composition, abundance, and biomass of faunal groups are the basis for further ecological research (Carey 1991). Such research might be used to deduce environmental effects over larger areas when the investigations of the biodiversity of taxa are repeated in the framework of a monitoring programme (Duineveld et al. 1991). As knowledge of faunal composition facilitates future works on the taxa in question, in terms of comparisons and identifications of species, such work will be of great value to biologists who investigate the Peracarida of the North Atlantic.

The high biodiversity of the Peracarida in the NEW Polynya documented here in the finding of 229 species from 121 genera and 51 families indicates that the environmental conditions such as time of opening and closing of the polynya must have been relatively stable over a long period of time (e.g. Zenkewitch 1954). With respect to current discussions on global change processes, intense melting of ice and subsequent changes of salinity and productivity might strongly disturb the whole benthic community in this area, and hence, affect the biological balance of this ecosystem.

Very few publications on faunal composition of peracarid taxa in the North Atlantic are based on epibenthic sledge hauls and are therefore comparable with our polynya data. However, a monograph on the origin of Arctic Cumacea is in preparation (Vassilenko & Brandt, in prep.), which will consider all known species of the Arctic Ocean and adjacent waters. Buhl-Jensen (1986) registered 159 amphipod species from the Norwegian continental shelf (EBS samples). In the NEW Polynya, which is much further north and is affected by cold Arctic polar water of the East Greenland Current, 130 species have been sampled. Svavarsson et al. (1993 b) and Svavarsson et al. (1990) listed 106 Arctic and Arctic-boreal species of asellote isopods (an important component of the deep sea and polar faunas) in the Norwegian, Greenland, Iceland, and North Polar Seas (all from EBS samples). Only 69 of these species had been reported from the depth range of our study (1-517 m). 42 of these 69 species have been recorded in our study in the NEW Polynya, i.e. two thirds of all known Arctic-boreal and Arctic asellote isopods, suggesting that the diversity of that area is high and also that the epibenthic sledge has a high catch potential, meaning many different habitats were sampled in the polynya and also at each single station leading to a high number of individuals and species per locality. The number of asellotes found in the polynya is high in that our findings refer to only 22 stations, while those of Svavarsson et al. (1993 b) cover their recent investigation and literature data accumulated over the past one hundred years. Poore et al. (1994), however, reported 359 species of Isopoda from 46 EBS samples taken off southeastern Australia. Of these, 249 are asellote isopods. This may seem to be an extraordinarily high diversity, but it may well be "normal" for the Indo-Pacific when compared to the depauperate faunas of the East Pacific or Atlantic. Therefore discussions on diversity values of the Atlantic fauna with those of other oceans can only be done on the background of the age of the oceans.

Gray (1994) summarizes data from a 5 yr monitoring project. The samples taken with a Van Veen grab yielded 620 species (39582 individuals), however, no comments on the respective taxa are given. Without knowledge of the taxa in question and also with regard to the different sampling technique, our data are not comparable with those of Gray (1994). Gray points out that a standardization of sampling (e.g. areas sampled, gears used, sieve sizes) is crucial for a accurate comparison of the diversity of geographical areas and depths. Therefore we could only compare our data with those, which used the same gear in the North Atlantic (Buhl-Jensen, 1986; Svavarsson, 1982, 1984a, 1984b, 1987a, 1987b, 1988a, 1988b, Svavarsson et al., 1990, 1993a, 1993b).

The diversity of Peracarida in the polynya is much higher than expected, if we consider recent discussions on decrease of diversity with latitude (e.g. Brey et al. 1994; Gage & May 1993; May 1992; Poore & Wilson 1993; Rex et al. 1993). However, arguments are based on deep-sea surveys, whereas stations in the NEW Polynya were situated on the continental shelf and upper slope down to about 500 m. Nevertheless, no obvious correlation of abundance or diversity with depth could be found (Figs 2 and 3). At our stations, diversity was highest around 300 m depth (Fig. 3). Isopoda are more diverse than Amhipoda at the deep stations 115 and 216, which might indicate an increasing importance of Isopoda within the peracarid community with depth. Brey et al. (1994) cautioned against general statements, such as a decrease of deep-sea diversity with latitude. Our findings in the NEW Polynya also suggest that a variety of biotic and abiotic parameters must be considered to explain species communities, rather than overemphasis of latitude-based parameters to the exclusion of others. Moreover, studies of biodiversity in high latitudes are few, and recent investigations in the Antarctic (Brey et al. 1994) suggest that diversity there may be higher than assumed by Poore & Wilson (1993).

General discussions on diversity (e.g. Sanders et al. 1965) and uniformity of the deep-sea fauna (Zenkewitch 1954) also have to be considered, as lateral advection and plankton- and ice-algae blooms are unlikely to be the only effects influencing peracarid community composition. The polynya is open for 4-5 months per year and so experiences strong seasonality. However, biological disturbance (Dayton & Hessler 1972; Smith & Hamilton 1988), competition (Grassle & Sanders 1973), competition and predation correlated with production (Rex 1976), of habitat heterogeneity (Jumars 1976), and small scale disturbance within stable communities (Grassle & Morse-Porteous 1987) may influence the communities characterized for the different stations. These biological and physical relationships and effects may be more important during the winter months, when little or no organic matter reaches the seafloor or has remained from summerly deposition. Unfortunately, the feeding behaviour of most peracarid species (Table 3) is poorly known. Some data are available for Amphipoda (Coleman 1989, 1991), and on the feeding of asellote isopods on foraminiferans (Svavarsson et al., 1993b; Wilson & Thistle 1985). Ahrens (1994) discusses a possible control of foraminiferan abundance by predatory benthic isopods, such as ilyarachnids, in the NEW Polynya. Many other peracarids which burrow in the first centimeter of sediment (e.g. Ischnomesidae, Eurycopidae, Ilyarachnidae, Desmosomatidae) (Hessler & Strömberg 1989) are mainly deposit feeders and are supposed to have an important influence on niche diversification, bioturbation, and benthic carbon cycling.

As peracarid crustaceans are generally known to increase in importance with depth (Grassle & Maciolek 1992), it is likely that a transect over the East Greenland shelf and upper slope would reveal highly diverse peracarid communities, at even deeper stations. However, Gray (1994) cautions against a generalization of the hypothesis of an increase of diversity with depth: "the high diversity shown on the Norwegian continental shelf is in marked contrast to the extremely low diversity shown in the deep-sea area of the Norwegian Sea....more data are urgently needed to test the postulate that continental shelf diversity can be as high as that of the deep sea" (Gray, 1994: 208).

## Species assemblages

A multivariate statistical analysis of the peracarid species community revealed various species assemblages being specific for certain station groups (Table 4; Figs 4 and 5; compare also Brandt 1995). An analysis of the stations was presented by Brandt (1995). The "shallow assemblage" contains species which have their highest abundances at the two shallowest stations (36 and 39). Half of the constituent species in this assemblage are amphipods which show a wide spectrum of lifestyles. *Syrrhoe crenulata* may be a shallow infaunal deposit or detritus feeder (Bousfield 1982). *Metopa* sp. is likely to live in association with some larger organism. Species of *Metopa* are known to associate with medusae, actiniarians and bivalves, and appear to feed on host secretions (Vader 1972, 1983; Vader & Beehler 1983). In contrast, *Anonyx nugax* is a necrophage and predator (Sainte-Marie & Lamarche 1985) while *Monoculodes* sp. and *Westwoodilla megalops* may be detritivores or micro-predators (Bousfield 1982). A major difference exists between the "shallow assemblage", characterized mainly by amphipod and cumacean species and the "deep assemblage" marked by the 2 cumacean species (*Diastylis polaris* and *Hemilamprops uniplicata),* found only at the deepest station 216, which lies in the outflow of the cold polar water from the Arctic Ocean, Little is known about differences in lifestyle or substrate preferences of cumaceans, however, it is clear that Amphipoda tend to dominate shallower habitats in the NEW Polynya, whereas Cumacea and Isopoda increase in importance with depth (Fig. 2, Tables 1 and 2).

The "common species assemblage" contains species which occur at almost all stations, but are most frequent in the Norske and Westwind Trough (Table 4). They are present in lower numbers in the Belgica Trough in the south and station 216 in the northeast, where lower amounts of organic matter were available (Brandt 1995; Ritzrau pers. comm. 1994). At station 54, close to the Henrik Krøyer Islands, these animals are also less abundant probably as a result of the influence of the northern Ingolfsfjord (Wesenberg-Lund 1950). Six of these species are cumaceans that burrow and are mainly detritivores. The 2 isopod species of this assemblage, *Eurycope brevirostris*, and *E. inermis*, are known to feed on detritus and foraminifers (Brandt et al. 1994, Svavarsson et al., 1993a). The suprabenthic mysid *Erythrops erythrophthalma* feeds on organic material in the BNL.

Except for the cumaceans, all of the species found for the "Westwind Trough assemblage" (time series stations and stations 155, 179; Figs 4 and 5; Table 4) have a primarily epibenthic lifestyle. *Eurycope producta, Ilyarachna bergendali* and *Munna hanseni* feed on detritus (Hessler & Strömberg 1989), although the first two species and other members of the Eurycopidae and Ilyarachnidae have been found to feed primarily on Foraminifera (Svavarsson et al. 1993a). *Calathura brachiata* is a carnivorous predator that can also burrow. The amphipods of this assemblage are also epibenthic detritivores or carnivores. *Andaniexis abyssi* is often associated with cnidarians (Coleman pers. comm.). The northern Westwind Trough is also characterized by the highest concentrations of chlorophyll equivalents in the upper sediment layers (Graf, Scheltz pers. comm.) and POC (particulate organic carbon) concentration in the BNL (bottom nepheloid layer) (Ritzrau pers. comm., 1994), especially at station 179., this region is obviously a "high accumulation area" (Brandt 1995).

The "high accumulation area assemblage", "Norske Trough assemblage", and "ice associate assemblage" are less clearly defined (therefore they are not marked in Figs 4 and 5). The "high accumulation area assemblage" consists of two species; the amphipod *Bathymedon* sp., a probable detritivore and the tanaid *Leptognathia longiremis*.

In terms of species, Isopoda dominate also the "ice associate assemblage" (station 18). Two of the isopod species, *Katianira bilobata*, and *Nannoniscus reticulatus* are probably detritivores (Hansen 1916; Svavarsson 1987 a), whereas *Praniza* sp. is a fish parasite. *Halirages fulvocinctus*, the only amphipod species in this assemblage belongs to the family Calliopidae, whose species live epibenthically and are either omnivores or carnivores (Bousfield 1982).

The "Norske Trough assemblage" is a mixture of species in 4 different peracarid taxa. It is probable that the amphipod *Halice abyssi* is a free-swimming predator, whereas the cumacean *Campylaspis stephenseni* and the mysid *Parerythrops spectabilis* are filter-feeding detritivores. *Gnathia stygia* (Isopoda) probably lives in association with sponges, as does *Gnathia abyssorum* (Klitgaard 1991), although no poriferans were collected at these stations.

The cluster analysis of the stations revealed that in general stations which lie close together showed the highest resemblance. For example, the stations of the "time-series-station" (95, 138, 165, 217, and 258) showed the best correlation (Brandt 1995, compare Table 1). Stations 179 and 155 in the Westwind Trough were very similar with regard to species composition and abundance and define the "high accumulation assemblage". Biological activity (ATP content) and food availability (chlorophyll-equivalents and POC content)

(Graf, Scheltz, Ritzrau pers. comm.) were highest at station 179 and somewhat lower at station 155, possibly as a result of current direction and accumulation of organic matter due to lateral advection. Stations 115, 119, and 216 were the deepest stations and also show the lowest abundance values. Station 216 characterised this assemblage, which is probably correlated with the low productivity of the water masses and availability of nutrients, resulting from ice cover and hydrography (e.g. circulation pattern).

Although the assemblages identified show varying degrees of overlap, we are confident that they reflect zonation patterns in the polynya. An independent analysis of 125 of the more abundant species listed in Table 2 (the results of which are not reported here) generated a pattern very close to that derived from 45 species.

## Abiotic and biotic parameters

Water masses flowing from the Arctic Ocean south through the Fram Strait are nutrient-poor, and primary production is inhibited by the almost permanent ice cover. The East Greenland Current flows south along the eastern sides of the Ob and Belgica Banks where ice cover is still extensive at least until June. Driven by the topography of the Belgica Trough these water masses form an anticyclonal gyre around the Belgica Bank. Stations 115 and 119 in the mouth of the Belgica Trough are situated under an area where ice cover is almost permanent, and where ice movement is limited. Further to the north, the Polynya becomes more extensive and is open for a greater proportion of the year, and the residual ice cover is more mobile (König pers. comm.). Variations in surface and bottom water temperatures (Ritzrau pers. comm.; Ahrens 1994:108) and salinity (Machoczek 1989) are slight, although Lara et al. (1994) recorded significant insolation effects in the Polynya. In areas of close ice, water column and sea ice production are inhibited, but both are enhanced in areas of lower ice cover and greater movement. The relative importance of water column and sea ice productivity may vary markedly from year to year, depending on hydrography, ice cover, nutrient availability and insolation.

In the NEW Polynya productivity increases from south to north (Lara et al. 1994) and production is carried northward by the coastal current. Thus the potential input of particulate organic carbon (POC) to near-bottom layers of the water column is much higher in the northern part of the Polynya.

Peracarid crustaceans and other epi- and suprabenthic animals depend, directly or indirectly, on organic material which is accumulated in the bottom nepheloid layer (BNL). The content of POC in the BNL as well as chlorophyll incorporation into the sediment must have a strong impact on the peracarid communities. Therefore it is not surprising that we find a positive correlation between peracarid abundance and assemblages dominated by detritivores on one hand and chlorophyll equivalents in the first 10 centimetres of the sediment on the other (Spearman's $\rho = 0.725$, $n = 14$). The values are much higher in the Westwind Trough than in the Belgica Trough. POC content and the resulting bacterial biomass in the BNL also coincided with our abundance data of the peracarids in the north and the Westwind Trough and the Belgica Trough. This also suggests a coupling between POC content in the BNL and peracarid abundance. These differences found for the peracarids between the Westwind Trough and the Belgica Trough resemble that reported for the polychaetes (Ambrose & Renaud, 1995) and also meiobenthic community patterns. The southern Belgica Trough is characterized by a distinct nematode community (Herman & Jensen pers. comm.; Piepenburg et al., subm.).

The fauna identified at stations 36 and 39 is distinct from that found at deeper stations. This clear separation is partly the result of the 120-130 m difference in soundings, but is much influenced by other factors, such as the influence of the northern Ingolfsfjord. Currents are stronger on the banks than in the troughs, and result in lower sedimentation of fine particles, a coarser substrate, and a very different suite of megafaunal organisms (Fig. 6).

Differences are most pronounced in the northern and southern area of the NEW Polynya, especially with regard to abundance of peracarid taxa, as well as between banks and troughs in general (Fig. 6). Generally, the banks are characterized by coarse sediments with many smaller stones or rocks which are inhabited by sessile suspension feeders, sponges, and alcyonarians (Fig. 6 a and b). In general, larger megabenthic animals, such as ophiuroids, asteroids, pycnogonids, bivalves, etc. domiate at these stations (Fig. 6 a and b). However, the slopes of the banks and the bottoms of the troughs are characterized by soft sediments, with fewer megabenthic animals. At these stations the importance of smaller macrobenthic taxa, especially peracarid crustaceans and polychaetes increased (Fig. 6 c and d). These differences might be attributed to different current regimes (study area and Künitzer et al. 1991), different sedimentation patterns (Basford et al. 1990; Grebmeier et al. 1988, 1989; Jensen et al. 1992), sediment erosion, or other abiotic parameters, such as temperature and salinity (Dyer et al. 1983). Chl a and ATP contents of the upper sediment layer (Ahrens 1994: 53, 108; Graf, Scheltz pers. comm., unpublished data) correlate with peracarid abundance. At station 179 we found the highest chlorophyll and ATP values in the sediment and also the highest abundances of Peracarida. This suggests that this station lies in a high accumulation area and might indicate the involvement of epibenthic peracarids on bioturbation processes in this area (Brandt 1993; Brandt & Piepenburg 1994; Grebmeier & Mc Roy 1989).

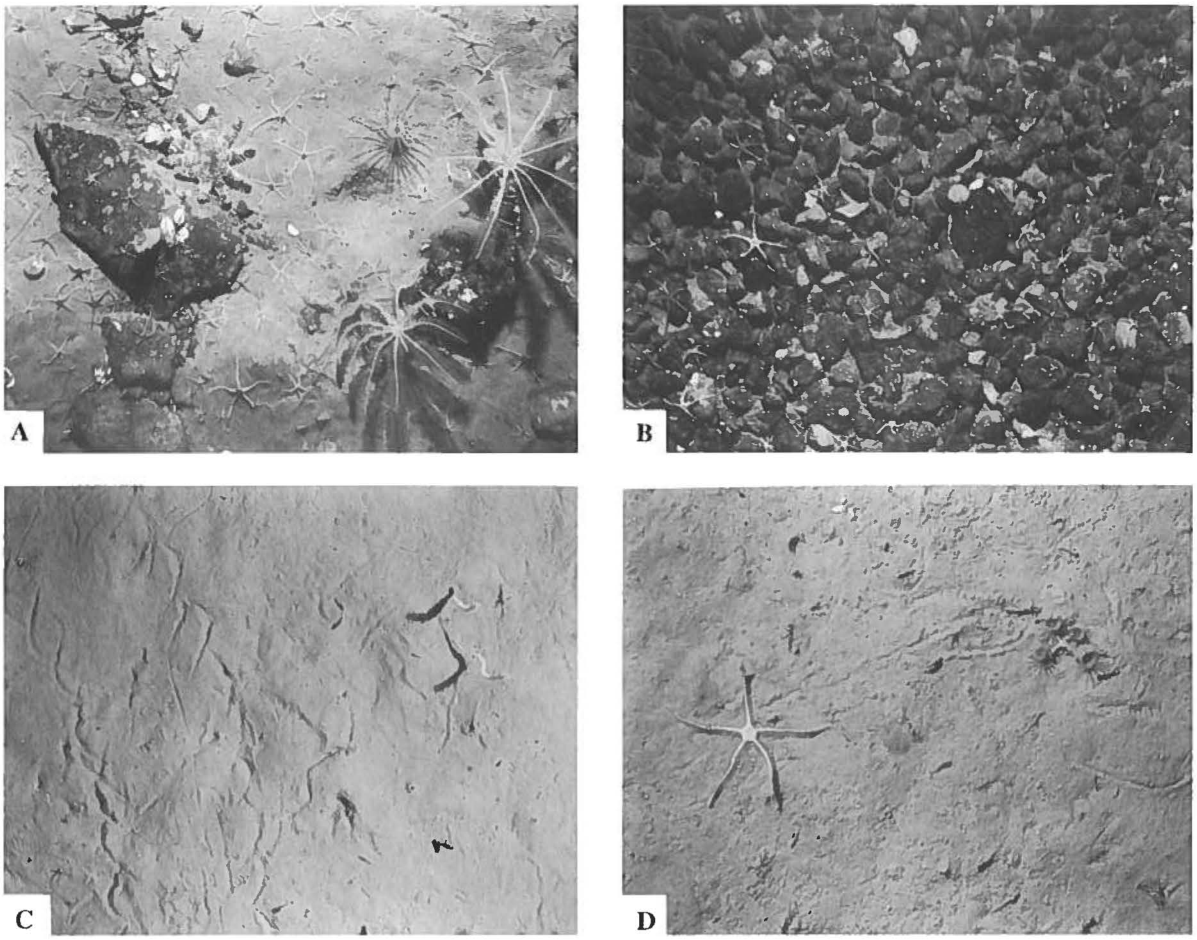

Figure 6. Seabed photographs (taken by Dr. D. Piepenburg) from the NEW Polynya taken in different years. A) Northern Belgica Bank, 80°00'N 14°00'W, 80 m depth (4.8.1995) with feather stars (*Heliometra glacialis*), brittle stars (*Ophiocten serriceum* and *Ophiura robusta*), a starfish (*Solaster sp.*) and a cerianthid sea anemone; B) Northern Belgica Bank, 80°00'N 11°00'W, 100 m depth (21.7.1985) with brittle stars (*Ophiura robusta* and *Ophiocten serriceum*); C) Norske Trough, 80°06'N 15°45'W, 380 m depth (12.6.1993) with "Lebensspuren", probably from brittle stars; D) Belgica Trough, 78°00'N 15°27'W, 500 m depth (31.7.1990) with the brittle star *Ophiacantha bidentata* and zoanthid anthozoans. A and B are typical examples for bank locations characterized my many stones and boulders, C and D are typical trough locations characterized by soft bottom sediments.

Besides a high biodiversity (229 species) another characteristic for the NEW Polynya is the high productivity of this area in the summer months. Many of the amphipod, cumacean and isopod specimens are represented by juveniles (mancas of stage 1-3) and ovigerous females, indicating that spawning during the productive summer time is very favourable (Brandt et al., 1994).

# Conclusion

1. The NEW Polynya supports a highly diverse fauna of Crustacea Peracarida. At least 229 species were shown to occur there, of which 130 (57%) are Amphipoda, 52 (22%) are Isopoda, 31 (14%) are Cumacea, 8 (4%) are Mysidacea, and 8 (4%) Tanaidacea.
2. Based on an examination of over 38000 specimens, Cumacea (31%) were most abundant, followed by Amphipoda (28%), Isopoda (25%), Mysidacea (12%), and Tanaidacea (3%).
3. Overall abundance and diversity were not related to depth. High values of both were found at stations in the Westwind Trough at depths of 180-330 m.
4. Based on occurrences and abundances of 45 significant species, 7 species assemblages were established. These groupings, although not mutually exclusive, were defined by bathymetric, latitudinal and biological factors.
5. Peracarid abundance coincided with availability of organic matter (e.g. chlorophyll equivalents in the upper 10 cm of sediment, unpublished data from Graf).

6. Abundance and diversity of peracarid communities in the NEW Polynya are controlled by hydrography, ice cover and primary productivity, during the summer months, whereas in winter, when the polynya is closed, biological processes (such as competition and predation), are likely to control the composition of the peracarid fauna.

## Acknowledgements

The authors are grateful to the crew of RV "Polarstern" for their help and logistic support during the expedition ARK IX/2-3. We are especially grateful to Dr. A. Norrevang, who invited the first two authors to an amphipod workshop in Frederikshavn, Danmark, where identification of some difficult species could be discussed among specialists. For discussions and help with taxonomic problems we owe thanks to Dr. O. Coleman, Dr. A. Golikov, Dr. G. Krappschickel, Prof. Dr. O. G. Kussakin and Prof. Dr. W. Vader. I. Werner, S. Schlothmann, and Y. Göbel kindly helped to sort the material. We are grateful to Dr. B. Bett for a valuable comments on our analysis. M. Ahrens, Dr. W. Ambrose, Prof. Dr. G. Graf, Dr. R. Herman, Dr. W. Ritzrau, and A. Scheltz kindly discussed their unpublished results with us and provided a major stimulation to our discussion. Furthermore we thank Dr. W. Ambrose, Dr. D. Barthel, and Dr. M. White, who read and commented on an early version of the manuscript. This study was supported by the "Deutsche Forschungsgemeinschaft" (DFG) in the framework of the "Sonderforschungsbereich 313" of the University of Kiel. This is publication no. 274 of the SFB 313.

# References


Ahrens, M. 1994. Benthische Foraminiferen in der Northeastwater-Polynya, Europäisches Nordmeer. Diplomarbeit, Universität Kiel, pp. 1-120.

Ambrose, W.G. & P. E. Renaud 1995. Benthic response to water column productivity patterns: evidence for benthic-pelagic coupling in the Northeast Water Polynya. J. Geophys. Res. 100: 4411-4421.

Barthel, D. 1992. Do hexactinellids structure Antarctic sponge associations? Ophelia 36: 111-118.

Basford, D. J., Eleftheriou, A. & Raffaelli, D. 1989. The epifauna of the northern North Sea (56°-61°N). J. mar. biol. Ass. U.K. 69: 387-407.

Bertelsen, E. 1937. Contributions to the animal ecology of the fjords of Angmagssalik and Kangerdlugssuag in East Greenland. Meddr. Grønland 108 (3), pp.1-58.

Billett, D. S. M., Lampitt, R. S. Rice, A. L. & Mantoura, R. F. C. 1983. Seasonal sedimentation of phytoplankton to the deep-sea benthos. Nature 302: 520-522.

Birgisdottir, L. 1990. Die paläo-ozeanographische Entwicklung der Islandsee in den letzten 550000 Jahren. Ber. Sonderforschungsbereich 313 (34): 1-112.

Bourke, R. H., Newton, J. L., Paquette, P. G. & Tunicliffe, M. D. 1987. Circulation and Water masses of the East Greenland Shelf. J. Geophys. Res. 92 (C7): 6729-6740.

Bousfield, E. L. 1982. Malacostraca. Peracarida. Amphipoda. In: S. P. Parker (ed.), "Synopsis and classification of living organisms". Mc Graw Hill Book Company, New York: 232-293.

Brandt, A. 1993. Composition, abundance, and diversity of peracarid crustaceans on a transect of the Kolbeinsey Ridge, north of Iceland. Polar Biol. 13: 565-576.

- & D. Piepenburg 1994. Peracarid crustacean assemblages of the Kolbeinsey Ridge, north of Iceland. Polar Biol. 14: 97-105.

-, Svavarsson, J. & T. Brattegard 1994. *Eurycope brevirostris* (Isopoda; Asellota) from the deep Atlantic Ocean; redescription, postmarsupial development, and reproductive pattern. Sarsia 79: 127-143.

- 1995. The peracarid fauna (Crustacea, Malacostraca) of the Northeast Water Polynya, off Greenland, documenting close benthic-pelagic coupling. Mar. Ecol. Prog. Ser. 121:39-51.

Brattegard, T. & J. H. Fosså 1991. Replicability of an epibenthic sampler. J. mar. biol. Ass. U. K. 71: 153-166.

Bray, J. R. & J. T. Curtis 1957. An ordination of the upland forest of Southern Wisconsin. Ecol. Monogr. 27: 225-349.

Brey, T., Klages, M., Dahm, C., Gorny, M., Gutt, J., Hain, S., Stiller, M., Arntz, W. E., Wägele, J. W., & Zimmermann, A. 1994. Antarctic benthic diversity. Nature 368: 297.

Budéus, G., Maul, A. A., & Krause, G. 1993. Variability in the Greenland Sea as revealed by a repeated high spatial resolution CTD survey. J. Geophys. Res. 98: 9985-10000.

Buhl-Jensen, L. 1986. The benthic amphipod fauna of the West-Norwegian continental shelf compared with the fauna of five adjacent fjords. Sarsia 71:193-208.

Carey, A. G. 1991. Ecology of the North American Arctic continental shelf benthos: a review. Continent. Shelf. Res. 11 (8-10): 865-883.

Clark, K. J. & W. Threlfall 1993. The geographical distribution, population dynamics, and reproductive biology of *Boreomysis nobilis* in Newfoundland Fjords. J. mar. biol. Ass. U. K. 73: 755-768.

Coleman, O. 1989. On the nutrition of two Antarctic Acanthonotozomatidae (Crustacea: Amphipoda). Polar Biol. 9: 287-294.

- 1991. Comparative fore-gut morphology of Antarctic Amphipoda (Crustacea) adapted to different food sources. Hydrobiol. 223: 1-9.

Dahl, E., Laubier, L., Sibuet, M., & Strømberg, J.-O. 1976. Some quantitative results on benthic communities of the deep Norwegian Sea. Astarte 5: 61-79.

Dayton, P. K. & Hessler, R. R. 1972. Role of biological disturbance in maintaining diversity in the deep sea. Deep-Sea Res. 19: 199-208.

Deming, J.1993. Northeast Water Polynya: Polar Sea cruise results. Eos. Transactions, Am. Geophys. Union 74 (16): 185, 195-196.

Duineveld, G. C. A., Künitzer, A. Niermann, U., De Wilde, P. A. W. J., & Gray, J. S. 1991. The macrobenthos of the North Sea. Netherl. J. Sea Res. 28 (1/2): 53-65.

Dyer, M. F., Fry, W. G., Fry, P. D. & Cranmer, G. J. 1983. Benthic regions within the North Sea. J. Mar. Biol. Ass. U.K. 63: 683-693.

Field, J. G.,Clarke, K. R., & Warwick, R. M. 1982. A practical strategy for analyzing mutispecies distribution patterns. Mar. Ecol. Progr. Ser. 8: 37-52.

Gage, J. D. & May, R. M. 1993. A dip into the deep seas. Nature 365: 609-610.

Gage, J. D. & Tyler, P. A. 1991. Deep-sea biology: a natural history of organisms at the deep-sea floor. Cambridge University Press, 1-504.

Graf, G. 1989. Benthic-pelagic coupling in a deep-sea benthic community. Nature (London) 341: 437-439.

- 1992. Benthic-pelagic coupling: a benthic view. Oceanogr. mar. Biol. annu. Rev. 30: 149-190.

Grassle, J. F. & Maciolek, N. J. 1992. Deep-sea species richness: regional and local diversity estimates from quantitative bottom samples. Am. Nat. 139: 313-341.

- & Morse-Porteous, L. S. 1987. Macrofaunal colonization of disturbed deep-sea environments and the structure of deep-sea communities. Deep-Sea Res. 34: 1911-1950.

- & Sanders, H. L. 1973. Life histories and the role of disturbance. Deep-Sea Res. 20: 643-659.

Gray, J. S. 1994. Is deep-sea species diversity really so high? Species diversity of the Norwegian continental shelf. Mar. Ecol. Prog. Ser. 112: 205-209.

Grebmeier, J. M., McRoy, C. P. & Feder, H. M. 1988. Pelagic-benthic coupling on the shelf of the northern Bering and Chukchi Seas. I. Food supply source and benthic biomass. Mar. Ecol. Progr. Ser. 48: 57-67.

-, Feder, H. M., & McRoy, C. P. 1989. Pelagic-benthic coupling on the shelf of the northern Bering and Chukchi Seas. II. Benthic community structure. Mar. Ecol. Progr. Ser. 51: 253-268.
- & McRoy, C. P. 1989. Pelagic-benthic coupling on the shelf of the northern Bering and Chukchi Seas. III. Benthic food supply and carbon cycling. Mar. Ecol. Progr. Ser. 53: 79-91.
Gurjanova, E. 1930. Beiträge zur Fauna der Crustacea-Malacostraca des arktischen Gebietes. Zool. Anzeiger 86 (9/10): 231-248.
- 1933. Die marinen Isopoden der Arktis. Fauna Arctica 6: 390-470.
- 1946. New species of Isopoda and Amphipoda from the Arctic Ocean. Trans. Drifting Exped. Main Administration of the Northern Sea Route on the Icebraeker „Sedov", 1937-1940, 3: 272-297 (in Russian with English summary).
- 1964. Amphipoda and Isopoda of a depression of the Arctic Basin, the Nansen Basin. Studies Arctic and Antarctic Sci. res. Inst., Moscow, 259: 255-315 (in Russian).
Gutt, J. 1991. On the distribution and ecology of holothurians in the Weddell Sea (Antarctica). Polar Biol. 11: 145-155.
Hansen, H. J. 1916. Crustacea, Malacostraca: The order Isopoda. Danish Ingolf Expedition 3 (5): 1-262.
Hargrave, B. T. 1985. Feeding rates of abyssal scavenging amphipods (*Eurythenes gryllus*) determined in situ by time-lapse photography. Deep-Sea Res. 32: 443-450.
Harrison, K. 1988. Deep-Sea Asellota (Crustacea: Isopoda) of the Rockall-Trough: preliminary faunal analysis. Ophelia 28:169-182.
Hebbeln, D. & Wefer, G. 1991. Effects of ice coverage and ice-rafted material on sedimentation in the Fram Strait. Nature 350 (6317): 409-411.
Hecker, B. 1990. Photographic evidence for the rapid flux of particles to the sea floor and their transport down the continental slope. Deep-Sea Res. 37: 1773-1782.
Heegaard, P. E. 1941. The Zoology of East Greenland: Decapod crustaceans.- Meddr. Grønland 121 (6): 1-72.
Hempel, G. 1985. On the biology of polar seas, particularly the Southern Ocean. In: Gray, J. S., Christiansen, M. E. (eds.): Marine Biology of Polar Regions and the Effects of Stress on Marine Organisms. John Wiley & Son, Chichester: 3-34.
Hessler, R. R. 1970. The Desmosomatidae (Isopoda, Asellota) of the Gay Head-Bermuda Transect. Bull. Scripps Inst. Oceanogr. 15: 1-185.
- & Strömberg, J. O. 1989. Behaviour of Janiroidean isopods (Asellota), with special reference to deep-sea genera. Sarsia 74: 145-159.
- & Sanders, H. L. 1967. Faunal diversity in the deep sea. Deep-Sea Res. 14: 65-78.
Hirche, H. J., Baumann, M., Kattner, G., & Gradinger, R. 1991. Plankton distribution and the impact of copepod grazing on primary production in Fram Strait, Greenland Sea. J. Mar. Sys. 2: 477.
- & Bohrer, R. N. 1987. Reproduction of the Arctic copepod *Calanus glacialis* in Fram Strait. Mar. Biol. 94: 11.
- & G. Kattner (eds.) 1994. The 1993 Northeast Water Expedition scientific cruise report of RV "Polarstern" Arctic cruises ARK IX/2 and 3, USCG "Polar Sea" cruise NEWP and the NEWLand expedition. Ber. Polarforsch. 142: 1-190.
Holme, N. A. & McIntyre, A. D. 1984. Methods for study of the marine benthos. Blackwell Scientific Publications, Oxford.
Hopkins, C. 1991. The GIN sea - A synthesis of its physical oceanography and literature review 1972-1985. Earth-Sci. Rev. 30: 175-318.
Hurlbert, S. H. 1971. The nonconcept of species diversity: a critique and alternative parameters. Ecology 52 (4): 577-586.
Jensen, P., Romohr, J., & Graf, G. 1992. Sedimentological and biological differences across a deep-sea ridge exposed to advection and accumulation of fine-grained particles. Oceanologica Acta 15(3): 287-296.
Jumars, P. A. 1976. Deep-sea species diversity: does it have a characteristic scale? J. Mar. Res. 34: 217-246.
- 1975. Environmental grain and polychaete species' diversity in a bathyal community. Mar. Biol. 30: 253-266.
Klitgaard, A. B. 1991. *Gnathia abyssorum* (G. O. Sars, 1872) (Crustacea, Isopoda) associated with sponges. Sarsia 76: 33-39.
Koch, L. 1945. The east Greenland ice. Meddr. Grönland 130 (3): 1-373.
Kruskal, J. B. & M. Wish 1978. Multidimensional scaling. Sage, London.
Künitzer, A., Basford, D., Craeymeersch, J. A., Dewarumez, J. M., Dörjes, J., Duineveld, G. C. A., Eleftheriou, A., Heip, C., Herman, P., Kingston, P., Niermann, U., Rachor, H. & DeWilde, P. A. J. 1991. The benthic infauna of the North Sea: species distribution and assemblages. ICES J. mar. Sci. 49: 127-143.
Kussakin, O. G. 1962. On the fauna of Janiridae (Isopoda, Asellota) from the seas of the USSR.- Transactions in Zoology from the Institute of the Academy of Science USSR, Leningrad 30: 17-65 (in Russian).
- 1973. Peculiarities of the geographical and vertical distribution of marine isopods and problem of deep-sea fauna origin. Mar. Biol. 23: 19-34.
- 1983. The first new species of isopods from the abyssal depression in the Arctic basin. Marine Biology (Vladivostok). 3: 13-17 (in Russian).
Lara, R. T., Kattner, G., Tillmann, U. & Hirche, H.-J. 1994. The North East Water Polynya (Greenland Sea) II. Mechanisms of nutrient supply and influence on phytoplankton distribution. Polar Biol. 14: 483-490.
Machoczek, D. 1989. Untersuchungen historischer hydrogrphischer Daten des Europäischen Nordmeeres im Hinblick auf moderne Vorstellungen zur Wassermassenbildung und Zirkulation. DHI, Wiss. Tech. Ber. 1-77.
Madsen, H. 1936. Investigations on the shore fauna of East Greenland with a survey of the shores of other Arctic regions. Meddr. Grønland 100 (8): 1-79.

May, R. M. 1992. Bottoms up for the oceans. Nature 357: 278-279.

McCloskey, L. R. 1970. The dynamics of the community associated with a marine scleractinian coral. Int. Revue Ges. Hydrobiol. 55: 13-81.

Mills, E. L. 1969. The community concept in marine zoology, with comments on continua and instability in some marine communities: a review. J. Fish. Res. Bd. Can. 32: 1415-1428.

Parkinson, C. L.,Comiso, J. C., Zwally, H. J., Cavalieri, D. J., Gloersen, P. & Campbell, W. J. 1987. Arctic sea ice, 1973-1976: Satellite passive-microwave observations, NASA, Washington, D. C., Sp-489:1-296.

Piepenburg, D. 1988. Zur Zusammensetzung der Bodenfauna in der westlichen Fram-Straße. Ber. Polarforsch. 52: 1-118.

- Ambrose, W., Brandt, A., Renaud, P., Ahrens, M. & Jensen, P. submitted. Benthic community patterns reflect water column processes in the Northeast Water Polynya (Greenland). J. Mar. Systems.

- & v. Juterzenka, K. 1994. Abundance, biomass, and spatial distribution pattern of brittle stars (Echinodermata: Ophiuroidea) on the Kolbeinsey Ridge north of Iceland. Polar Biol. 14: 185-194.

- & Piatkowski, U. 1992. A program for computer-aided analyses of ecological field data. CABIOS 8(6): 587-590.

Poore, G. C. B. & Wilson, G. D. F. 1993. Marine species richness. Nature 361: 597-598.

- Just, J. & Cohen, B. F. 1994. Composition and diversity of Crustacea Isopoda of the southeastern Australian continental slope. Deep-Sea Research 41: 677-693.

Rex, M. A. 1976. Community structure in the deep-sea benthos. Ann. Rev. Ecol. Syst. 12: 331-353.

- Stuart, C. T., Hessler, R. R., Allen, J. A., Sanders, H. L. & Wilson, G. D. F. 1993. Global-scale latitudinal patterns of species diversity in the deep-sea benthos. Nature 365: 636-639.

Ritzrau, W. 1994. Labor- und Felduntersuchungen zur heterotrophen Aktivität in der Bodennepheloidschicht. Dissertation, Universität Kiel, pp. 1-100.

Romero-Wetzel, M. & Gerlach, S. 1991. Abundance, biomass, size-distribution and bioturbation potential of deep-sea macrozoobenthos on the Vøring Plateau (1200-1500 m, Norwegian Sea). Meeresforsch. 33: 247-265.

Romesburg, C. H. 1984. Cluster Analysis for Researchers. Wadsworth, Belmont, 334 pp.

Rothlishberg, P. C. & W. G. Pearcy 1977. An epibenthic sampler to study the ontogeny of vertical migration of *Pandalus jordani* (Decapoda Caridea). Fish. Bull. 74: 994-997.

Sainte-Marie, B. & G. Lamarche 1985. The diets of six species of the carrion-feeding lysianassid amphipod genus *Anonyx* and their relation with morphology and swimming behavior. Sarsia 70: 119-126.

Sanders, H. L., Hessler, R. R. & Hampson, G. R. 1965. An introduction to the study of deep-sea benthic faunal assemblages along the Gay Head-Bermuda Transect. Deep-Sea Res. 12: 845-876.

- & Hessler, R. R. 1969. Ecology of the deep-sea benthos. Science 163: 1419-1424.

Sars, G. O. 1885. The Norwegian North-Atlantic expedition 1876-1878. Zoology. Crustacea I. Christiania, Groendahl & Son: 1-280.

Schneider, W. & Budéus, G. 1994. The North East Water Polynya (Greenland Sea). I. A physical concept of its generation. Polar Biol. 14: 1-9.

Smith, C. R. & Hamilton, S. C. 1988. Epibenthic megafauna of the bathyal basin off Southern California: patterns of abundance, biomass, and dispersion. Deep-Sea Res. 30: 907-928.

- 1985. Food for the deep sea: utilization, dispersal, and flux of nekton falls at the Santa Catalina Basin floor. Deep-Sea Res. 32: 417-422.

Smith, S. D., Muench, R. D. & Pearse, C. H. 1990. Polynyas and leads: An overview of physical processes and environment. J. Geophys. Res. 95: 9461-9479.

Spärck,R. 1933. Contributions to the animal ecology of the Franz Josef Fjord and adjacent East-Greenland waters: I-II. Meddr. Grønland 100 (1): 1-38.

Stephensen, K. 1943. The Zoology of East Greenland. Leptostraca, Mysidacea, Cumacea, Tanaidacea, Isopoda and Euphausiacea. Meddr. Grønland 121(10): 1-82.

- 1944. The Zoology of East Greenland. Amphipoda. Meddr. Grønland 121(14): 1-165.

Suess, E. 1980. Particulate organic carbon flux in the oceans – surface productivity and oxygen utilization. Nature 288: 260-265.

Svavarsson, J. 1982. *Nannoniscus profundus* sp. n. and *Austroniscus norbi* sp. n. (Isopoda, Asellota, Nannoniscidae) from the deep Norwegian Sea. Sarsia 67: 179-186.

- 1984a. Ischnomesidae (Isopoda, Asellota) from bathyal and abyssal depths in the Norwegian and North Polar Seas. Sarsia 69: 25-36.

- 1984b. Description of the male of *Pseudomesus brevicornis* Hansen, 1916 (Isopoda, Asellota, Desmosomatidae) and rejection of the family Pseudomesidae. Sarsia 69: 37-44.

- 1987a. Reevaluation of *Katianira* in Arctic waters and erection of a new family, Katianiridae (Isopoda: Asellota). J. Crust. Biol. 7: 704-720.

- 1987b. Eurycopidae (Isopoda, Asellota) from bathyal and abyssal depths in the Norwegian, Greenland and North Polar Seas. Sarsia 72: 183-196.

- 1988a. Bathyal and abyssal Asellota (Crustacea, Isopoda) from the Norwegian, Greenland, and North Polar Seas. Sarsia 73: 83-106.

- 1988b. Desmosomatidae (Isopoda, Asellota) from bathyal and abyssal depths in the Norwegian, Greenland and North Polar Seas. Sarsia 72: 1-32.

-, Brattegard, T. & Strömberg, J.-O. 1990. Distribution and diversity pattern of asellote isopods (Crustacea) in the deep Norwegian and Greenland Seas. Prog. Oceanogr. 24: 297-310.

-, Gudmundsson, G. & Brattegard, T. 1993a. Feeding by asellote isopods (Crustacea) on foraminifers (Protozoa) in the deep sea. Deep-Sea Res. 40 (6): 1225-1239.
-, Strömberg, J.-O. & Brattegard, T. 1993b. The deep-sea asellote (Isopoda, Crustacea) fauna of the Northern Seas: species composition, distributional patterns and origin. J. Biogeogr. 20: 537-555.
Thorson, G. 1933. Investigations on shallow water animal communities in the Franz Joseph Fjord (East Greenland) and adjacent waters. Meddr. Grønland 100 (2): 1-70.
- 1934. Contributions to the animal ecology of the Scoresby Sound fjord complex (East Greenland). Meddr. Grønland 100 (3): 1-69.
- 1936. The larval development, growth and metabolism of Arctic marine bottom invertebrates compared with those of other seas. Meddr. Grønland 100 (6): 1-115.
Vader, W. 1972. Associations between gammarid and caprellid amphipods and medusae. Sarsia 50: 51-56.
- 1983. Associations between amphipods (Crustacea: Amphipoda) and sea anemones (Anthozoa, Actiniaria). Mem. Aust. Mus. 18: 141-153.
- & C. L. Beehler 1983. *Metopa glacialis* (Amphipoda, Stenothoidae) in the Barents and Beaufort Seas, and its association with the lamellibrachs *Musculus niger* and *M. discors*. Astarte 12: 57-61.
Vinje, T. E. 1970. Sea ice observations in 1969. Årbok. Nor. Polarinst. 1969: 132-138.
- 1984. The Fram Strait cruise with M/S Lance, 7.31 August 1984, Norsk Polarinstitutt Rapportserie 18.
Wadhams, P. 1981. The ice cover of the Greenland and Norwegian seas. Rev. Geophys. 19: 345-393.
Wainwright, S. C. 1990. Sediment-to-water fluxes of particulate material and microbes by resuspension and their contribution to the planktonic food web. Mar. Ecol. Progr. Ser. 62: 271-281.
Wesenberg-Lund, E. 1950. The Polychaeta of West Greenland. Meddr. Grønland 151 (2): 1-171.
Wilkinson, G. N., Eckert, S. R., Hancock, T. W. & O. Mayo 1983. Nearest neighbour (NN) analysis of field experiments (with discussion). J. R. Stat. Soc. B 45: 151-211.
Wilson, G. D. F. & Thistle, D. 1985. *Amuletta*, a new genus for *Ilyarachna abyssorum* Richardson, 1911 (Isopoda: Asellota: Eurycopidae). J. Crust. Biol. 5: 350-360.
Zenkewitch, L. A. 1954. Erforschungen der Tiefseefauna im nordwestlichen Teil des Stillen Ozeans. Union Ant. Science Biol. Ser. B 16: 72-85.

# Instructions to authors

Two copies of the manuscript, each complete with illustrations, tables, captions, etc. should be sent to the Secretary, Kommissionen for videnskabelige Undersøgelser i Grønland. Manuscripts will be forwarded to referees for evaluation. Authors will be notified as quickly as possible about acceptance, rejection, or desired alterations. The final decision on these matters rests with the editor.

Manuscripts corresponding to less than 16 printed pages (of 6100 type units) including illustrations are not accepted, unless they are part of a special theme issue. Manuscripts that are long in relation to their content will not be accepted without abridgement.

## Manuscript

Language. – Manuscripts should be in English (preferred language), French, or German. Authors who are not writing in their native language must have the language of their manuscript corrected before submission.

Place names. – All Greenland place names used in the text and in illustrations must be names authorised by The Greenlandic Language Committee. Authors are advised to submit sketchmaps with all required names to the Secretary for checking before the manuscript is submitted. Names of Greenland localities outside the area with which the paper is concerned should be accompanied by coordinates (longitude and latitude).

Title. – Titles should be as short as possible, with emphasis on words useful for indexing and information retrieval.

Abstract. – An abstract in English must accompany all papers. It should be short (no longer than 250 words), factual, and stress new information and conclusions.

Typescript. – Typescripts must be clean and free of handwritten corrections. Use double spacing throughout, and leave a 4 cm wide margin on the left hand side. Avoid as far as possible dividing words at the right-hand end of a line. Consult a recent issue for general lay-out.

Page I should contain 1) title, 2) name(s) of author(s), 3) abstract, 4) key words (max. 10), 5) author's full postal address(es). Manuscripts should be accompanied by a table of contents, typed on separate sheet(s).

Underlining should only be used in generic and species names. The use of italics in other connections can be indicated by wavy line in pencil under the appropriate words.

Use at most three grades of headings, but do not underline. The grade of heading can be indicated in soft pencil in the left hand margin of one copy of the typescript. Avoid long headings.

Floppy disc. – It may be helpful in the printing procedure if, in addition to the hard copies, the manuscript is also submitted on a DOS-formatted floppy disc. However, editing will be made on the hard copy, and the text file on the disc must be identical to the final version of the manuscript.

References. – References to figures and tables in the text should have the form: Fig. 1, Figs 2-4, Table 3. Bibliographic references in the text are given thus: Shergold (1975: 16) ... (Jago & Daily 1974b).

In the list of references the following style is used:

Boucot, A. J. 1975. Evolution and extinction rate controls. – Elsevier, Amsterdam: 427 pp.

Sweet, W. C. & Bergström, S. M. 1976. Conodont bio-stratigraphy of the Middle and Upper Ordovician of the United States midcontinent. – In: Bassett, M. G. (ed). The Ordovician System: Proceedings of a Palaeontological Association symposium, Birmingham, September 1974: 121-151. University of Wales Press.

Tarling, D. H. 1967. The palaeomagnetic properties of some Tertiary lavas from East Greenland. – Earth and Planetary Science Letters 3: 81-88.

*Meddelelser om Grønland, Bioscience (Geoscience, Man & Society)* should be abbreviated thus: *Meddr Grønland, Biosci. (Geosci., Man & Soc.)*

## Illustrations

General. – Submit two copies of all diagrams, maps, photographs, etc., all marked with number and author's name. Normally all illustrations will be placed in the text.

All figures (including line drawings) must be submitted as glossy photographic prints suitable for direct reproduction, and preferably have the dimensions of the final figure. Do not submit original artwork. Where appropriate the scale should be indicated on the illustration or in the caption.

The size of the smallest letters in illustrations should not be less than 1.3 mm. Intricate tables are often more easily reproduced as text figures than by type-setting; when lettering such tables use "Letraset" or a typewriter with carbon ribbon.

Colour plates may be included at the author's expense, but the editor must be consulted before such illustrations are submitted.

Size. – The width of figures must be that of a column (76.5 mm), 1 1/2 columns (117 mm), or a page (157 mm). The maximum height of a figure (including caption) is 217 mm. Horizontal figures are preferred. If at all possible, fold-out figures and tables should be avoided.

Caption. – Captions to figures must be typed on a separate sheet and submitted, like everything else, in duplicate.

## Proofs

Authors receive two page proofs. Prompt return to the editor is requested. Only typographic errors should be corrected in proof; the cost of making alterations to the text and figures at this stage will be charged to the author(s).

Twenty-five copies of the publication are supplied free, fifty if there are two or more authors. Additional copies can be supplied at 55% of the retail price. Manuscripts (including illustrations) are not returned to the author after printing unless specifically requested.

## Copyright

Copyright for all papers published by Kommissionen for videnskabelige Undersøgelser i Grønland is vested in the Commission. Those who ask for permission to reproduce material from the Commission's publications are, however, informed that the author's permission must also be obtained if the person is still alive.

Meddelelser om Grønland

Bioscience
Geoscience
Man & Society

Published by
The Commission
for Scientific
Research
in Greenland

Printed in Denmark by Special-Trykkeriet Viborg a-s