

# Diversity and species composition of peracarids (Crustacea: Malacostraca) on the South Greenland shelf: spatial and temporal variation

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**Abstract** The interannual variability in peracarid (Crustacea: Malacostraca; Amphipoda, Isopoda, Cumacea, Tanaidacea) species composition and diversity on the South Greenland shelf was studied at four stations over a sampling period of 3 years (2001, 2002 and 2004), using a Rauschert sled at depths of about 160 m. The South Greenland peracarids were relatively stable over the 3 years with respect to evenness and diversity. Moderate changes in temperature and salinity had negligible effects on the species composition, while sediment structure was found to be the most important environmental variable shaping the peracarid fauna.

**Keywords** Peracarida · Greenland · Shelf · Species distribution · Spatial and temporal variation

## Introduction

Changes in the distribution and species composition of benthic communities may be the major ecological consequences resulting from a change in the climate (Walther et al. 2002; Macdonald et al. 2005; Harley et al. 2006; Barber et al. 2008). The waters of the northernmost North Atlantic, i.e. at the border of the North Atlantic proper (i.e. Irminger Sea)

and the Nordic Seas (Iceland, Greenland and Norwegian Seas) may be particularly affected, as in these waters steep gradients in temperature exist, e.g. declining temperatures clock-wise around Iceland, north along Norway, south along Southeast Greenland and north along West Greenland. This is partly due to cooling of the Modified North Atlantic waters (MNAW, 5–10.5°C) entering the Nordic Seas or when MNAW mixes with colder waters (e.g. Arctic/Polar Water; A/PW; 0–2°C) flowing from the north (Malmberg and Valdimarsson 2003; Hansen and Østerhus 2000).

There are reports of increase in the temperature in Arctic and subarctic waters during the last 10 years, such as in shallow waters off Iceland (Astthorsson et al. 2007), as well as in West Greenland (Yashayaev 2007; Holland et al. 2008). Various changes in the physical environment of the Arctic have been observed, and these have led to ecosystem changes as well as changes in species distribution (Moline et al. 2008; Holland et al. 2008). Most of the reported changes have affected planktonic organisms and fish, while fewer have been reported among the benthic invertebrates. Benthic invertebrates may be influenced not only by higher temperatures, but also by changes in the particulate matter reaching the bottom and thus in food availability. The pelagic–benthic coupling of the Arctic is highly variable (Morata et al. 2008), and the sedimentation may depend upon the ice cover (e.g. Tamelander et al. 2008).

Peracarid crustaceans, i.e. amphipods, isopods, cumaceans and tanaidaceans, often form a major part of the macrobenthic communities in Arctic and subarctic waters (e.g. Conlan et al. 2008) and can be quite diverse on the shelf and the continental slope of the Nordic Seas (Hansen 1916; Just 1980; Bousfield 1982; Svavarsson et al. 1990, 1993a; Brandt 1995; Brandt et al. 1996; Brandt and Berge 2007). Most peracarids are bottom-dwelling animals, either infaunal or epifaunal, lacking a larval stage, and some of the

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**Table 1** Station data of cruises WH233, WH244 and WH268 of RV “*Walther Herwig III*”, showing sample location (haul start positions), haul length, bottom temperature and salinity, depth and sediment type

Cruise	Station	Date	Latitude N	Longitude W	Haul length (m)	Temperature bottom (°C)	Salinity bottom	Depth (m)	Sediment type
WH233	2001-1	23.10.01	64°25.22′	37°12.73′	266	5.00	34.81	158	1
	2001-2	27.10.01	61°18.75′	41°40.88′	309	6.34	34.90	161	2
	2001-3	29.10.01	59°59.99′	46°30.83′	186	5.88	34.87	161	3
	2001-4	06.11.01	63°07.44′	52°17.50′	365	5.74	34.53	162	3
WH244	2002-1	25.10.02	64°25.34′	37°12.60′	186	4.74	34.83	159	2
	2002-2	30.10.02	61°18.76′	41°40.90′	214	3.62	33.91	165	2
	2002-3	01.11.02	60°00.18′	46°31.02′	314	4.44	34.03	167	3
	2002-4	06.11.02	63°07.63′	52°17.72′	224	5.98	34.85	163	3
WH268	2004-1	16.10.04	64°25.17′	37°12.57′	301	5.68	34.95	150	2
	2004-2	21.10.04	61°18.66′	41°40.91′	170	5.92	34.70	157	2
	2004-3	23.10.04	59°59.94′	46°31.05′	282	6.22	34.67	160	3
	2004-4	28.10.04	63°07.22′	52°16.84′	244	4.48	33.96	152	3

The sediment type was classified by visual inspection (Type 1 was coarse gravel, type 2 consisted of mostly sand, and type 3 was sandy with few small stones and rich in macroinvertebrates such as corals, crinoids, ophiuroids and pieces of sponges)

amphipods, isopods and probably most cumaceans have good swimming capabilities (e.g. Forsman 1938; Enequist 1949; Hessler and Strömberg 1989; Dauvin and Zouhiri 1996). The peracarids have a variety of feeding habits, i.e. surface deposit feeding, filter feeding, carnivory, omnivory and even foraminiferivory (e.g. Dennell 1934; Gudmundsson et al. 2000; De Broyer et al. 2004; Riisgard and Schotge 2007; Krapp et al. 2008) and changes in food supply may influence the distribution of the species and the diversity patterns in the benthic environment. Some of the peracarids have shown to be good indicators of environmental changes (e.g. Dauvin and Ruellet 2007).

Here, we evaluate the spatial and temporal variation in species composition, diversity and community patterns at four stations distributed evenly around South Greenland revisited during the three sampling years (2001, 2002 and 2004) and hypothesise that the species composition will show slight differences between sampling areas and years. Furthermore, we hypothesise that the species composition is driven by discriminator species which show good adaptations to the given living conditions and finally that the species composition is driven by abiotic factors.

## Materials and methods

### Study area

The hydrography of the South Greenland shelf is characterised by a mixture of water masses that differ considerably in temperature, salinity and current velocity (e.g. Stein 1988; Lavender et al. 2000; Stein 2005; Holliday et al. 2007). Off

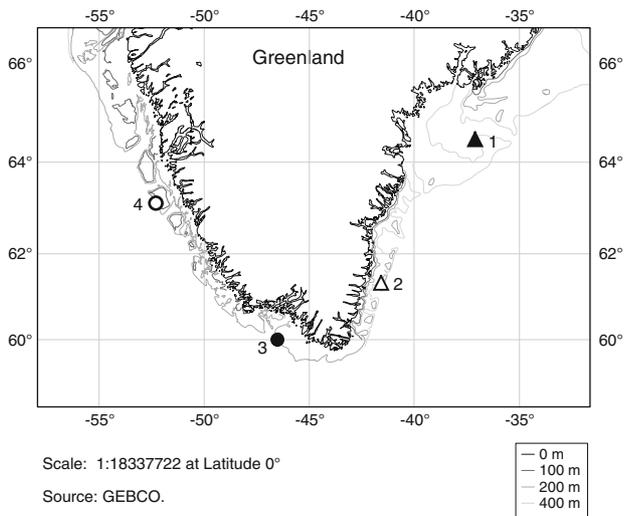
East Greenland the cold East Greenland Current (EGC) transports polar water (temperature  $\leq 1^{\circ}\text{C}$ , salinity  $\leq 34.00$ ) southwards (Stein 1988, 2005; NOAA 2004) and interferes at the shelf break with the warm Irminger Current (IC) (temperature  $>4^{\circ}\text{C}$ , salinity  $>34.95$ ), producing a mixture of water masses of the EGC and the IC. At Cape Farewell, the currents turn westwards and flow along the continental slope northwards as West Greenland Current (WGC) (Pedersen et al. 2004). Branches of the WGC flow along the shelf break and transport intermediate water masses, while on the shelf, however, another branch of the WGC, which transports cold polar water originating from the EGC, flows northwards (Stein 2005).

### Sampling

Samples were taken with the epibenthic Rauschert sled (Stransky 2008) during cruises WH233, WH244 and WH268 with the German RV *Walther Herwig III* in 2001, 2002 and 2004.

During each cruise, samples were taken at four stations: two located off Southeast Greenland and two off Southwest Greenland (Table 1; Fig. 1). All samples were taken in approximately the same water depth (around 160 m) to exclude the effect of sampling depth on the data.

The sled is a semi-quantitative sampling device with a high replicability (Stransky 2008). To ensure best possible comparability between stations, a standardised sampling procedure was applied for each haul. The sled was towed over the bottom for 5 min at a speed of 1 knot over ground. The mesh size of the cod end was always 0.5 mm. On board, the samples were decanted and preserved in 96% ethanol.



**Fig. 1** Map of the study area and the four stations sampled during cruises WH233, WH244 and WH268 of RV “*Walther Herwig III*”. Each symbol represents a station, at which sled samples were taken in the three years of investigation (2001, 2002 and 2004)

Temperature and salinity were recorded at each station with a CTD probe. During sampling, sediment structure was qualitatively described using the contents of the sled. Sediment structure was divided into three different sediment types, which were characteristic for each site (Table 1). Type 1 was coarse gravel, type 2 consisted of mostly sand, and type 3 was sandy with few small stones and rich in larger invertebrates such as soft corals, crinoids, ophiuroids and sponges.

### Analysis

Peracarids (amphipods, isopods, cumaceans and tanai-da-ceans) were determined to species. Univariate analyses were applied to characterise the community in terms of relative abundance and diversity. Multivariate analyses were applied to compare the community structures between areas and sampling years, and to link abiotic factors with species composition. All peracarid species which were not too damaged for identification were considered in the analyses. Species diversity was calculated using the Shannon index (Shannon and Weaver 1963) and Hurlbert’s rarefaction method (Hurlbert 1971).

For further analyses, the relative abundance values were transformed by the fourth root to diminish the influence of extremely dominant species (Field et al. 1982). All species occurring at only one station were not used in the analyses since their appearance might be random (Clarke and Warwick 2001). All community analyses were performed using the PRIMER v. 6.0 software package (Clarke and Warwick 2001). Similarities in species composition between stations were calculated using the Bray–Curtis coefficient (Bray and

Curtis 1957), while differences in environmental data were investigated using the Euclidean distance (Clifford and Stephenson 1975), based on normalised data (Clarke and Warwick 2001). Differences between station groups (defined a priori containing the three sampling years each) and between sampling years, using permutation/randomisation methods on the similarity matrix, were tested with two-one-way designed “analysis of similarities” (ANOSIM) (Clarke and Warwick 2001).

Temperature and salinity data were normalised by subtracting their mean values from the individual values and dividing by their standard deviation.

The similarity matrices were analysed by ordination (multi-dimensional scaling, MDS; Kruskal and Wish 1978). Dissimilarity values between environmental data were used for ordination (MDS) and for linking community analyses to environmental variables (BIO-ENV; Clarke and Ainsworth 1993). The identification of discriminator species being responsible for station groupings was carried out by the SIMPER analysis (Clarke 1993). The relationship between species distribution patterns and environmental data were analysed using the BIO-ENV approach (Clarke and Ainsworth 1993). In this analysis, a Spearman-rank correlation is used to compare the resemblance matrix of the biotic data with the resemblance matrix of the abiotic data, allowing for the identification of either a single abiotic factor or a combination of factors, which correlate best with the species patterns, and may thus be presumed to be a major driver of assemblage composition and distribution.

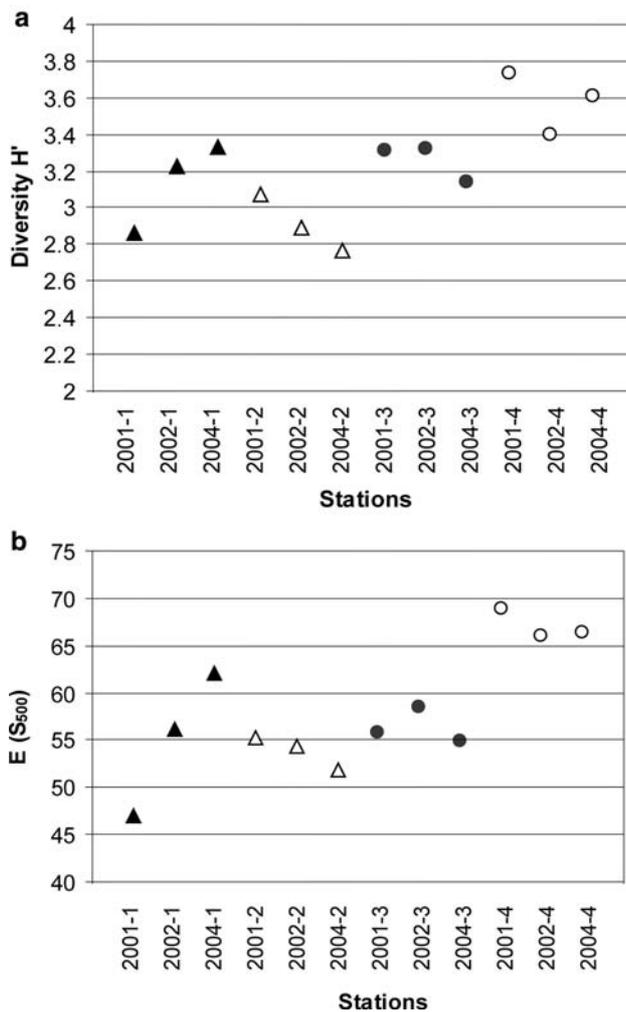
### Results

#### Diversity and relative abundance

A total of 94,440 individual peracarid crustaceans were collected from the four sites studied (Appendix). In all, 83,894 individuals were identified to species level (the remaining 10,546 specimens were too damaged for further determination and almost equally distributed on the three sampling years). The similar numbers of individuals collected each year (29,444 individuals in 2001; 28,943 in 2002; 25,507 in 2004) indicate comparable sampling efficiency.

In all, 205 peracarid species were identified, belonging to 54 families and 111 genera. Amphipods were most species-rich (134 species; 52% of the individuals), while 34 species of isopods were found (30% of the individuals), 20 species of cumaceans (11% of the individuals) and 17 species of tanai-da-cean (7% of individuals). Mysidacea were not found in the sled samples.

The regional diversity ( $\gamma$ -diversity) varied somewhat between sites. At the northwestern site 117 species were found, while 122 species were found in the Southeast, and



**Fig. 2** Diversity indices per station group over the three sampling years. **a** Shannon index  $H'$ ; **b** Hurlbert's expected number of species [ $E(S_{500})$ ]. Filled triangles represent the northeastern station, outlined triangles represent the southeastern, while filled circles represent the southwestern and outlined circles represent the northwestern station

the highest regional diversity was found in the Southwest (135 species) and in the Northwest (136 species). The  $\alpha$ -diversity differs slightly between sites, with the northwesternmost site being more diverse than the other ones. Sample 2001-1 differs considerably from the corresponding samples taken in 2002 and 2004 at the same site, probably due to different habitat being sampled from.

Considering the diversity patterns within each station over the three sampling years (Fig. 2a, b), the two (non-related) diversity indices Shannon ( $H'$ ) and Hurlbert's expected number of species  $E(S_{500})$  coincide well.  $H'$  values ranged from 2.76 to 3.73, while  $E(S_{500})$  values were between 47.0 and 68.8.

Most specimens (74%) belonged to the 27 most common species, i.e. species comprising more than 1% each of the total number of specimens (Table 2). *Janira maculosa* was

the most common species. *Tmetonyx cicada* was the only common species of which considerably more specimens were found in Southeastern Greenland than in Southwestern Greenland in all the three years. Some species occurred mainly at the southwesternmost stations, such as *Photis reinhardi*, *Aeginella spinosa*, *Munna* cf. *groenlandica*, *M.* cf. *fabricii*, *Ansphyrapus tudes*, *Gitanopsis bispinosa* and most phoxocephalid species. Around 10% of the species were present at all 12 stations, such as the most common species *Janira maculosa*, but also *Leucon* cf. *nathorsti* and *Campylaspis rubicunda*, which had a fairly low percentage (0.54 and 0.23%, respectively) of the overall number of specimens. More than half of the specimens were found in only five or fewer samples.

There were only modest changes in the total number of species over all four sites, being 174 in 2001, 172 in 2002 and 166 species in 2004. Of 205 species in total, about 10% decreased in their relative abundance from the first to the third year (e.g. *Leucon* cf. *nasicoides*, *Spectrarcturus multispinatus*, *Munna* cf. *groenlandica*, *Phoxocephalus holbolli* or *Ischyrocerus anguipes*) (see "Appendix"). About 8% showed the reverse trend (e.g. *Baeonectes muticus*, *Echinozone coronata* and some oedicerotids). At the northeastern station, most species increased in number of specimens from the first to the second year, and then decreased in numbers from the second to the third year.

#### Multivariate community patterns

In the MDS plot (Fig. 3), eastern and western stations were consistently separated in all the three sampling years. Samples from the same sites but taken in different years were clustered together with an average similarity level of almost 80%, except for the northeasternmost site taken in the first year (sample 2001-1), which was clearly separated from all other eastern samples.

The ANOSIM analysis revealed that the four station groups (consisting of the three sampling years each) are significantly different from each other (Global  $R = 0.923$ ,  $P < 0.001$ ) and that the three sampling years do not differ significantly from each other (Global  $R = -0.243$ ,  $P = 0.985$ ).

Separate multivariate analyses of the single orders showed very similar clustering of stations as in the overall view, and are therefore not shown in detail.

#### Discriminator species

For the SIMPER analysis (full results not shown), station groups have been established according to the clear similarity structure visible in the MDS plot. The separation of an eastern and western fauna (namely the eastern and western

**Table 2** Relative abundance of the most common species (>1% of the total abundance) and their percentage of abundance

	NE-station			SE-station			SW-station			NW-station			Total abundance (%)
	2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004	
	-1			-2			-3			-4			
<i>Janira maculosa</i> (I)	245	1,211	521	1,065	703	534	492	989	811	364	104	429	8.90
<i>Photis reinhardi</i> (A)	0	0	0	8	2	0	1,371	2,929	2,281	246	33	149	8.37
<i>Leucon cf. nasicooides</i> (C)	0	0	0	1,233	1,118	1,078	1,260	931	352	166	26	39	7.39
<i>Amphilocheus manudens</i> (A)	269	630	610	458	248	191	983	759	683	5	2	2	5.77
<i>Munna cf. minuta</i> (I)	0	125	60	57	13	7	67	391	66	1,350	574	1,092	4.53
<i>Aeginella spinosa</i> (A)	8	19	13	16	23	9	912	1,397	914	72	15	84	4.15
<i>Ansphyrapus tudes</i> (T)	0	0	1	1	0	0	819	1,303	1,052	0	0	0	3.79
<i>Munna cf. groenlandica</i> (I)	55	261	98	67	45	10	575	536	316	515	103	312	3.45
<i>Hardametopa nasuta</i> (A)	0	0	0	0	0	0	347	742	201	499	303	427	3.00
<i>Spectrarcturus multispinatus</i> (I)	0	0	0	0	0	0	841	754	355	2	0	12	2.34
<i>Syrrhoe crenulata</i> (A)	31	105	123	214	134	104	25	20	12	486	192	192	1.95
<i>Odius carinatus</i> (A)	15	34	23	59	44	20	234	215	181	373	61	358	1.93
<i>Munna cf. fabricii</i> (I)	0	3	25	27	11	6	216	364	271	367	82	138	1.80
<i>Typhlotanais sp. 2</i> (T)	17	101	32	59	21	22	109	858	197	7	6	12	1.72
<i>Baeonectes muticus</i> (I)	0	2	9	2	8	11	1	46	22	60	246	839	1.49
<i>Caprella rinki</i> (A)	0	0	5	2	8	0	496	392	204	0	2	0	1.32
<i>Ischyrocerus anguipes</i> (A)	0	0	0	254	0	0	0	313	11	373	56	49	1.26
<i>Gammaropsis cf. melanops</i> (A)	16	123	64	18	7	2	57	94	101	267	36	227	1.21
<i>Echinozone coronata</i> (I)	4	29	26	17	20	28	194	230	255	53	24	107	1.18
<i>Tmetonyx cicada</i> (A)	5	18	1	327	331	27	6	52	72	64	51	25	1.17
<i>Amphilocheus tenuimanus</i> (A)	62	172	180	63	11	19	102	127	56	66	19	89	1.15
<i>Campylaspis horrida</i> (C)	62	212	197	88	54	67	52	110	105	3	0	1	1.13
<i>Eugerdia cf. globiceps</i> (I)	0	52	41	90	91	149	48	2	5	132	24	301	1.11
<i>Rhachotropis inflata</i> (A)	14	134	7	43	57	26	46	4	8	400	29	166	1.11
<i>Pleurogonium spinosissimum</i> (I)	0	0	0	17	17	22	74	131	151	126	55	313	1.08
<i>Monoculodes cf. latimanus</i> (A)	0	0	0	12	24	9	3	10	1	444	24	337	1.03
<i>Gitanopsis bispinosa</i> (A)	0	11	20	5	7	8	264	121	87	163	40	117	1.00

A amphipod, I isopod, C cumacean, T tanaid species

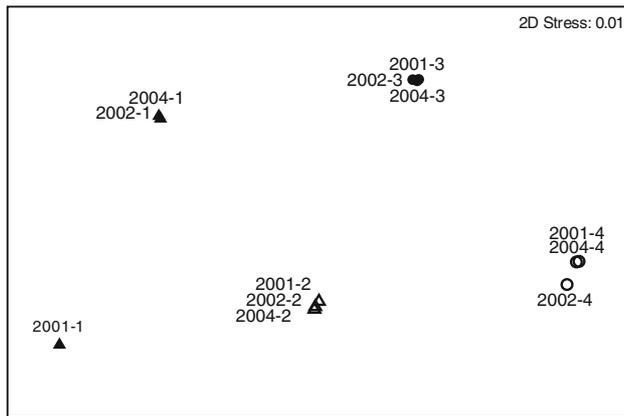
station groups) is mainly explained by the occurrences of *Photis reinhardi* and *Hardametopa nasuta* (both amphipods), *Spectrarcturus multispinatus* (isopod), *Ansphyrapus tudes* (tanaid) and *Leucon cf. nasicooides* (cumacean). Due to the high number of species found in this study, however, the contribution of the above-mentioned species to the distribution pattern is low, with 1.45% (*Ansphyrapus tudes*), 1.56% (*Spectrarcturus multispinatus*), 2.26% (*Hardametopa nasuta*) and 2.42% (*Photis reinhardi*) on average. The east–west separation is also confirmed in a comparison for every year.

A comparison of only the eastern stations between the years showed that these stations show only minor variation in the species composition. Thus, the single species contribution to this variation is rather low (with a maximum of 2.97%). Species responsible for this result are *Leucon cf.*

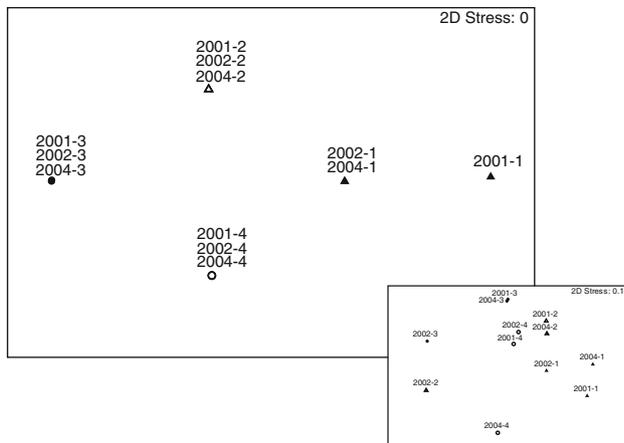
*nasicooides* (cumacean), *Eurycope producta* and *Austroniscus norbi* (both isopods) and *Tmetonyx cicada* (amphipod). The western stations between the years also showed only slight variation, mainly explained by *Ansphyrapus tudes* (tanaid), *Spectrarcturus multispinatus* (isopod), *Caprella rinki* and *Amphilocheus manudens* (both amphipods). The maximum contribution was again low with 2.14%.

#### Linkage of environmental data to species composition

Temperature and salinity values in 2002 differed slightly from those in 2001 and 2004 by being colder and less saline (except station 2002-4) (Table 1). Latitude and depth in the interannual comparison documented that almost the same stations were revisited. The sediment type was also very similar in all the three years; only station 2001-1 differed.



**Fig. 3** Multivariate analyses of the species composition of all the 12 stations. Two-dimensional MDS configuration based on fourth root-transformed abundances and Bray–Curtis similarities (stress = 0.01). *Filled triangles* represent the northeastern station, *outlined triangles* represent the southeastern, while *filled circles* represent the southwestern and *outlined circles* represent the northwestern station



**Fig. 4** Two-dimensional MDS configuration of the interannual comparison of three years and four stations, based on fourth root-transformed environmental values and Euclidean distances between stations. Large plot: only latitude and sediment type as environmental factors (stress <0.01); small plot: all environmental factors (stress = 0.1). *Filled triangles* represent the northeastern station, *outlined triangles* represent the southeastern, while *filled circles* represent the southwestern and *outlined circles* represent the northwestern station

The ordination of stations using biotic (Fig. 3) and abiotic data (Fig. 4) differed considerably. The consideration of only latitude and sediment type produced an MDS plot (Fig. 4, large plot) that agreed best with the biotic plot (Fig. 3) and thus with the species distribution. The BIO-ENV analysis corroborated the correlations between the biotic data and abiotic variables measured, with an especially strong indication of sediment as the decisive factor for the species distribution (Spearman rank correlation  $r = 0.805$ ).

## Discussion

The South Greenland shelf has a fairly diverse peracarid crustacean fauna, with amphipods as the species richest group. The amphipods also had the highest relative abundance. The relative abundances may vary within the Arctic and the subarctic regions, and isopods (Brandt 1993, 1997) or even cumaceans (Brandt 1995; Brandt and Berge 2007) may be the most abundant organisms in some areas instead of the amphipods. Nickel (2004) found amphipods to be the most common in an East Greenland fjord, while isopods were uncommon there. Also the diversity of the Arctic benthos shows a great variation between regions (Piepenburg 2005), but a strong pattern is seen in changes of diversity with depth (Svavarsson et al. 1990).

The temperature on the South Greenland shelf has been increasing in recent years (Stein 2006, 2007). Furthermore, the hydrographic conditions in the sampling area vary on geographic and temporal scales, affected by climatic variability related to changes in the NAO (Buch et al. 2005). Thermal fronts are variable on the Greenland shelf and can change fairly quickly, as seen in the fairly high temperature and salinity variability between years (Table 1). The sites differ further in their water mass characteristics. Warm water of the Irminger Current (IC) characterises the general area, although quick and major changes in the mixture of water masses cause variations, which could be the reason for deviating temperature and salinity values in the second sampling year. Despite these differences and the variability, the temperature and the salinity were not among the abiotic factors influencing the peracarid species composition, and the sediments were the most important. Sediment characteristics have been identified as the most important factors influencing faunal patterns in sub-Arctic and Arctic waters (e.g. Grebmeier et al. 1989). In contrast, Conlan et al. (2008) observed a low correlation between the sediments and the biota. Mayer and Piepenburg (1996) and Weissappel and Svavarsson (1998) found that salinity (being indicative of water mass) and temperature had a major influence on the community structure of East Greenland and Iceland, respectively.

The southeastern shelf of Greenland and the southwestern shelf north to Julianehaab Bight is covered with multi-year sea ice for 8–9 months every year (Buch et al. 2005), while most of the southwestern Greenland shelf is largely free of ice during the year due to the influence of warm water from the IC (Pedersen et al. 2004). Macrobenthos abundances are low in ice-covered areas, such as in northeastern Greenland (Brandt 1995), but are especially high in ice-free areas, as in the Polynyas in North East Greenland (Brandt et al. 1996; Piepenburg and Schmid 1996), North Canada (Conlan et al. 2008) or in Southwest Greenland (present study). It can be assumed that these latter regions

receive higher import of food supply reaching the bottom than regions being ice-covered (Suess 1980; Grebmeier et al. 1988; Graf 1989, 1992; Carey 1991; Tamelander et al. 2008). However, the diversity was highest in the area with high ice-cover, i.e. the northwesternmost station. High abundances may not be directly linked to a high diversity. The diversity patterns may be dependent upon a variety of factors, such as habitat heterogeneity (sediment complexity and presence of microhabitats), while the density may be more related to available energy and/or food sources.

Many peracarid species show substrate and feeding preference (e.g. Enequist 1949; Meadows 1964a, b; Oakden 1984; Dauvin and Bellan-Santini 1990; Klitgaard 1997; Dauby et al. 2001; Myers and Lowry 2003). The differences in the frequency of the most common species in South Greenland indicate considerable differences in feeding conditions at the sites. The southwesternmost station is characterised by several species gathering their food from the water column, i.e. the caprellid amphipods *Caprella rinki*, *Aeginella spinosa* and the filter feeding isopod *Spectrarcturus multispinatus*. Species of the munnopsid isopods can swim easily using their natatory legs (Hessler and Strömberg 1989). No specific pattern is seen in their distribution which might indicate fairly active dispersal. Munnopsid species within the isopod genera *Echinozone*, *Ilyarachna* and *Eurycope* have been shown to feed actively on a variety of foraminifer species (Svavarsson et al. 1993b; Gudmundsson et al. 2000). Foraminifers were common at all stations (personal observation). While the food from the upper water column (phytodetritus) is seasonally not available, the foraminifers are available during all times of the year, which might be an advantage (Brandt et al. 1994).

Tanaids and cumacans are mostly detritus feeders (Dennell 1934; Błazewicz-Paszkowycz and Ligowski 2002; Błazewicz-Paszkowycz and Sekulska-Nalewajko 2004), the tanaids live in tubes, built with sand and detritus particles (Holdich and Jones 1983), while the cumaceans are infaunal within the soft sediment (Zimmer 1941; Vasilenko 2002). Tanaids and cumaceans represent most often a fairly small proportion of the northern benthos (e.g. Brandt 1997; Brandt and Berge 2007). They can, however, dominate in terms of individual numbers (e.g. *Ansphyrapus tudes* in the Southwest; *Leucon* cf. *nasicooides* in the South), as has been demonstrated, e.g. in the Northeast Water Polynya (Northeast Greenland) (Brandt and Berge 2007).

Many of the amphipod species are probably detritus feeders, while filter feeding is common among some families (Barnard and Karaman 1991). Despite the fact that seven ampeliscid amphipod species were recorded in this study, these filter feeders were poorly represented in the area, especially in comparison to other filter-feeding species such as the isopod *Spectrarcturus multispinatus*. Conlan et al. (2008) and Bellan-Santini and Dauvin (1997)

found the ampeliscid amphipods to be common on the Canadian Beaufort Shelf and around Iceland, but generally on muddy bottoms. In contrast with these findings, the amphipod *Photis reinhardi* was found to be common in the region, especially at the southern stations. Conlan et al. (2008) also reported *Photis* sp. from one site between the Beaufort shelf and the Amundsen Gulf. Enequist (1949) assumed that at least *Haploops* and *Photis* have a similar method of gathering food due to the similar structure of their legs and antennae. The occurrence of *Haploops* and *Photis* in this study does not corroborate this assumption. Corophiidean amphipods are primarily detritivores or specialised filter feeders (Myers and Lowry 2003). While *Photis reinhardi* and *Ischyrocerus anguipes* exploit detritus from the sediment, the caprellids (another group within the corophiideans) get their food from the water column (Myers and Lowry 2003). *Aeginella spinosa* and *Caprella rinki* are two common representatives in the present study with this feeding strategy, which requires moderate to strong water currents (Myers and Lowry 2003) as are present on the southwestern Greenland shelf (Anonymous 2002).

While peracarids and other invertebrates were in low abundances at the northeastern station, the pattern was different for the lysianassid amphipods, generally known to be mainly predators or symbionts (e.g. De Broyer and Vader 1990; De Broyer et al. 2004; Horton 2004; Lörz and De Broyer 2004; Arndt and Beuchel 2005; Kaim-Malka 2005). The lysianassid *Tmetonyx cicada* was one of the most common species and found mainly in the eastern and southern sampling areas. The species is a scavenger (e.g. Steele 1979) and can survive long starvation periods (Christiansen and Diel-Christiansen 1993). This probably enables *Tmetonyx cicada* to find convenient habitat both in the species poor northeastern area as well in the species rich southern area. The unclear distribution patterns found for many species in the present study are, however, difficult to explain.

Interestingly, diversity and community patterns were relatively stable over the three sampling years 2001, 2002 and 2004, despite substantial fluctuations in the temperature between sampling years. Relative abundance decreased only slightly each year, indicating minor temporal changes in the species distribution, possibly due to natural differences in population dynamics. Lack of any trend observed may, however, simply be due to the short time-span of the study.

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## Appendix

Species list of all 12 stations in taxonomic order and relative abundance of all identified species

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
Amphipoda													
Aoridae	<i>Autonoe borealis</i> (Myers, 1976)	2	9	9	0	0	1	23	14	2	113	17	117
Caprellidae	<i>Aeginella spinosa</i> Boeck, 1861	8	19	13	16	23	9	912	1,397	914	72	15	84
	<i>Aeginina longicornis</i> (Krøyer, 1843)	0	3	0	2	4	2	28	83	17	9	10	4
	<i>Caprella ciliata</i> Sars, 1895	0	0	0	0	0	0	0	0	0	8	0	2
	<i>Caprella dubia</i> Hansen, 1887	4	8	10	9	2	0	183	52	6	183	6	117
	<i>Caprella rinki</i> Stephensen, 1916	0	0	5	2	8	0	496	392	204	0	2	0
	<i>Cercops holboelli</i> Krøyer, 1843	0	0	0	0	0	0	0	42	0	14	0	0
	<i>Proaeginina norvegica</i> (Stephensen, 1931)	2	108	31	1	4	0	0	0	0	0	0	0
	Caprellidae spp.	0	11	5	18	23	0	481	504	124	40	26	46
Corophiidae	<i>Protomedea fasciata</i> Krøyer, 1842	0	0	0	10	0	0	0	0	0	0	0	0
Dulichidae	<i>Dulichia cf. falcata</i> (Bate, 1857)	0	10	18	4	0	2	38	23	5	82	20	61
	<i>Dulichia spinosissima</i> Krøyer, 1845	0	0	0	0	0	0	16	25	8	2	1	0
	<i>Dyopedos porrectus</i> Bate, 1857	0	0	0	2	0	0	116	53	0	7	0	0
	<i>Paradulichia typica</i> Boeck, 1871	0	21	47	0	0	0	0	0	0	2	0	1
	<i>Erichthonius megalops</i> (Sars, 1879)	0	0	0	1	0	0	0	0	0	0	0	0
Ischyroceridae	<i>Ischyrocerus anguipes</i> Krøyer, 1838	0	0	0	254	0	0	0	313	11	373	56	49
	<i>Ischyrocerus latipes</i> Krøyer, 1842	0	29	0	0	0	0	0	1	0	0	0	0
	<i>Ischyrocerus megacheir</i> (Boeck, 1871)	11	28	5	0	1	0	277	256	33	36	4	7
	<i>Ischyrocerus megalops</i> Sars, 1895	0	0	0	8	1	0	0	2	6	41	4	7
	<i>Ischyrocerus</i> T1 Just, 1980	0	0	0	0	0	0	0	1	0	1	0	0
	<i>Ischyrocerus</i> sp. 1	0	74	13	0	0	0	0	0	0	0	0	0
	<i>Ischyrocerus</i> sp. 2	0	4	0	0	0	0	0	0	0	0	0	0
Photidae	<i>Siphonocetes typicus</i> Krøyer, 1845	0	0	0	0	0	0	1	9	2	0	0	0
	<i>Photis reinhardi</i> Krøyer, 1842	0	0	0	8	2	0	1,371	2,929	2,281	246	33	149
	<i>Gammaropsis cf. melanops</i> Sars, 1879	16	123	64	18	7	2	57	94	101	267	36	227
Podoceridae	<i>Gammaropsis</i> sp. 2	0	1	0	0	0	0	0	0	1	0	0	0
	<i>Laetmatophilus tuberculatus</i> Bruzelius, 1859	4	40	37	2	0	0	0	0	0	0	0	0
Unciolidae	<i>Unciola laticornis</i> Hansen, 1887	18	88	23	63	33	9	82	172	162	7	0	0
	<i>Unciola leucopsis</i> (Krøyer, 1845)	5	0	0	2	0	0	21	25	10	13	9	9
	Corophiidea spp.	1	0	0	2	0	0	12	1,150	10	26	0	23
Amphilochidae	<i>Amphilochus manudens</i> Bate, 1862	269	630	610	458	248	191	983	759	683	5	2	2
	<i>Amphilochus tenuimanus</i> Boeck, 1872	62	172	180	63	11	19	102	127	56	66	19	89
	<i>Gitanopsis cf. arctica</i> Sars, 1892	25	0	0	0	0	0	107	67	5	336	37	118
	<i>Gitanopsis bispinosa</i> (Boeck, 1871)	0	11	20	5	7	8	264	121	87	163	40	117
	Amphilochidae spp.	6	33	20	4	11	22	23	52	34	26	9	51
Ampeliscidae	<i>Ampelisca aequicornis</i> Bruzelius, 1859	1	4	2	0	0	0	0	2	1	0	0	0
	<i>Ampelisca eschrichtii</i> Krøyer, 1842	2	0	0	0	0	0	0	0	0	0	0	0
	<i>Ampelisca macrocephala</i> Lilljeborg, 1852	3	2	0	0	0	0	0	23	17	13	0	1
	<i>Ampelisca spinipes</i> Boeck, 1861	0	0	0	0	0	0	0	1	0	0	0	0
	<i>Byblis gaimardi</i> (Krøyer, 1846)	9	9	15	3	8	2	5	6	11	6	0	0
	<i>Haploops setosa</i> Boeck, 1871	0	0	0	0	0	0	0	0	0	4	2	0

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
	<i>Haploops</i> sp. 1	0	0	0	1	0	0	0	0	0	0	0	0
	Ampeliscidae spp.	0	0	0	0	0	0	0	5	2	3	0	0
Argissidae	<i>Argissa hamatipes</i> (Norman, 1869)	0	0	7	0	0	0	0	0	0	2	1	0
	<i>Astyra abyssii</i> Boeck, 1871	0	6	7	0	0	2	0	0	1	0	0	0
Atylidae	<i>Atylus smitti</i> Goës, 1866	0	0	0	2	2	0	2	3	0	4	2	1
Dexaminiidae	<i>Guernea</i> sp. 1	0	0	0	0	0	0	0	0	0	132	10	16
Epimeriidae	<i>Paramphithoe hystrix</i> (Ross, 1835)	1	5	2	0	0	0	1	0	1	2	0	1
Eusiridae	<i>Eusirus propinquus</i> Sars, 1893	0	1	0	1	2	0	0	0	0	0	1	15
	<i>Rhachotropis aculeata</i> (Lepechin, 1780)	0	1	0	5	2	0	0	0	0	3	2	0
	<i>Rhachotropis inflata</i> (Sars, 1882)	14	134	7	43	57	26	46	4	8	400	29	166
	<i>Rhachotropis</i> spp.	0	8	0	0	0	0	0	0	0	0	0	0
Calliopiidae	<i>Apherusa bispinosa</i> (Bate, 1856)	0	0	0	0	0	0	0	0	0	0	1	0
	<i>Apherusa sarsi</i> Shoemaker, 1930	0	0	0	0	0	0	0	0	0	62	125	160
	<i>Cleippides tricuspis</i> (Krøyer, 1846)	0	0	0	0	0	0	0	6	4	6	3	20
	<i>Laothoes meinerti</i> Boeck, 1871	3	41	14	1	18	11	0	0	0	0	0	0
Iphimediidae	<i>Acanthonotozoma cristatum</i> (Ross, 1835)	0	3	4	0	0	0	1	2	3	0	0	0
	<i>Acanthonotozoma serratum</i> (Fabricius, 1780)	1	5	8	31	31	17	53	86	41	20	4	29
Leucothoidae	<i>Leucothoe spinicarpa</i> (Abildgaard, 1789) group	6	55	40	22	17	4	31	82	98	7	2	39
Liljeborgiidae	<i>Liljeborgia fissicornis</i> (Sars, M., 1858)	1	1	3	0	0	0	0	1	0	0	0	0
	<i>Liljeborgia pallida</i> (Bate, 1857)	6	44	38	310	193	229	7	2	2	3	0	0
Melitidae	<i>Melita dentata</i> (Krøyer, 1842)	0	0	0	3	9	4	0	0	0	0	0	0
	<i>Melita gladiosa</i> Bate, 1862	0	32	6	44	22	12	8	35	40	26	8	28
	<i>Melita obtusata</i> (Montagu, 1813)	0	0	1	0	0	0	51	90	46	1	0	0
	<i>Melitidae</i> spp.	0	0	0	7	0	0	0	0	0	0	0	0
Melphidippidae	<i>Melphidippida goesi</i> Stebbing, 1899	1	14	8	0	0	0	1	2	7	11	5	17
	Melphidippidae sp. 1	0	0	0	0	0	0	87	0	0	0	0	0
Ochlesidae	<i>Odius carinatus</i> (Bate, 1862)	15	34	23	59	44	20	234	215	181	373	61	358
Oedicerotidae	<i>Bathymedon saussurei</i> Boeck, 1871	0	5	11	12	2	2	0	0	0	0	0	0
	<i>Monoculodes borealis</i> Boeck, 1871	0	0	7	8	11	2	5	15	5	3	3	39
	<i>Monoculodes</i> cf. <i>latimanus</i> (Goës, 1866)	0	0	0	12	24	9	3	10	1	444	24	337
	<i>Monoculodes</i> cf. <i>norvegicus</i> (Boeck, 1861)	0	25	44	69	51	73	2	3	0	0	0	0
	<i>Monoculodes</i> cf. <i>packardi</i> Boeck, 1871	0	9	19	0	0	0	0	0	0	1	0	0
	<i>Monoculodes</i> cf. <i>pallidus</i> Sars, 1892	0	0	3	0	0	0	0	0	0	0	0	0
	<i>Monoculodes</i> cf. <i>subnudus</i> Norman, 1889	0	0	1	0	0	0	3	10	1	81	0	91
	<i>Monoculodes</i> cf. <i>tesselatus</i> Schneider, 1883	0	0	0	0	0	0	0	0	0	39	5	12
	<i>Monoculodes tuberculatus</i> Boeck, 1871	0	2	3	14	10	10	9	8	3	119	35	133
	<i>Monoculodes</i> spp.	1	0	0	68	0	25	4	0	6	0	18	0
	<i>Oediceros</i> cf. <i>borealis</i> Boeck, 1871	0	0	0	0	0	0	0	5	0	13	0	1
	<i>Oediceros</i> sp. 1	0	0	0	0	0	0	0	0	0	3	0	0
	<i>Oediceros</i> sp. 2	0	0	0	0	0	0	0	3	0	0	0	0
	<i>Paroediceros lynceus</i> (Sars, M., 1858)	28	115	62	50	16	9	57	123	90	4	4	8
	<i>Paroediceros</i> spp.	7	0	0	0	0	1	0	0	0	0	0	0
	<i>Pontocrates</i> spp.	0	108	55	0	0	0	0	0	0	0	0	0
	<i>Westwoodilla</i> cf. <i>brevicalcar</i> (Goës, 1866)	0	0	0	0	0	4	0	0	0	40	13	10
	<i>Westwoodilla</i> cf. <i>caecula</i> (Bate, 1856)	0	0	0	0	0	0	0	0	4	269	61	28
	<i>Westwoodilla</i> cf. <i>megalops</i> (Sars, 1882)	0	0	0	1	0	2	4	9	0	148	18	27
	Oedicerotidae juveniles	0	0	0	0	0	0	0	0	0	0	0	147
	Oedicerotidae spp.	9	17	11	50	5	6	20	4	6	25	12	39
Pardaliscidae	<i>Pardalisca cuspidata</i> Krøyer, 1842	0	1	0	23	5	17	1	1	3	0	0	0

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
Pleustidae	<i>Neopleustes boeckii</i> (Hansen, 1888)	0	0	0	0	0	0	61	38	27	37	0	0
	<i>Parapleustes biscuspis</i> (Krøyer, 1838)	0	0	0	0	0	0	3	5	0	1	0	0
	<i>Pleustes tuberculatus</i> Bate, 1858	0	0	4	0	0	0	14	16	7	0	0	1
	<i>Stenopleustes cf. nodifer</i> Sars, 1883	0	0	0	0	0	0	4	0	1	22	6	12
	<i>Stenopleustes</i> sp. 1	0	17	48	2	1	2	33	37	11	46	31	58
	Pleustidae juveniles	0	23	83	3	0	0	0	0	0	279	81	241
Stegocephalidae	<i>Andaniopsis pectinata</i> Sars, 1882	0	1	0	80	76	9	23	7	36	16	4	28
	<i>Phippsia roemeri</i> Schellenberg, 1925	0	0	0	0	0	0	5	13	7	1	0	0
	<i>Stegocephalus inflatus</i> Krøyer, 1842	0	0	0	0	1	0	2	27	8	3	4	2
Stenothoidae	<i>Hardametopa nasuta</i> (Boeck, 1871)	0	0	0	0	0	0	347	742	201	499	303	427
	<i>Metopa norvegica</i> (Lilljeborg, 1851)	0	7	0	2	0	4	5	8	0	29	0	9
	<i>Metopa cf. propinqua</i> Sars, 1892	10	14	3	25	8	9	1	19	21	140	13	41
	Stenothoidae spp.	45	293	285	303	138	94	243	306	210	1,510	316	1,084
Synopiidae	<i>Bruzelia tuberculata</i> Sars, 1882	2	9	4	87	36	48	22	46	37	0	0	0
	<i>Syrrhoë crenulata</i> Goës, 1866	31	105	123	214	134	104	25	20	12	486	192	192
	<i>Syrrhoëides serrata</i> (Sars, 1879)	0	4	2	0	0	0	0	0	1	0	0	0
	<i>Tiron spiniferum</i> (Stimpson, 1853)	64	143	42	125	36	19	27	31	16	89	12	44
	Synopiidae spp.	0	0	0	0	0	0	0	0	0	7	0	0
Urothoidae	<i>Urothoe elegans</i> (Bate, 1856)	32	111	58	30	10	9	45	38	17	19	7	9
Lysianassidae	<i>Ambasia atlantica</i> (Milne-Edwards, 1830)	0	2	0	3	9	7	0	0	0	0	0	0
	<i>Ambasiella murmanica</i> (Brüggen, 1905)	0	0	0	0	0	0	0	1	0	1	1	7
	<i>Anonyx debruyni</i> Hoek, 1882	1	0	0	0	0	0	0	8	0	23	13	11
	<i>Anonyx cf. nugax</i> (Phipps, 1774)	2	1	3	2	8	1	0	0	5	0	0	12
	<i>Anonyx</i> sp. 1	0	0	0	0	0	0	1	0	0	0	2	0
	<i>Anonyx</i> sp. 3	0	0	0	1	0	0	0	0	0	0	0	0
	<i>Anonyx</i> sp. 4	0	1	0	0	0	0	0	0	0	0	0	0
	<i>Aristias topsenti</i> Chevreux, 1900	0	6	3	0	0	0	0	0	0	0	0	0
	<i>Gronella groenlandica</i> (Hansen, 1887)	0	0	0	1	0	0	0	0	0	0	0	0
	<i>Hippomedon denticulatus</i> (Bate, 1857)	0	1	0	0	0	0	0	0	0	0	0	0
	<i>Hippomedon gorbunovi</i> Gurjanova, 1930	2	0	4	3	1	3	5	18	5	5	4	9
	<i>Hippomedon propinquus cf. sibiricus</i> Gurjanova, 1962	4	28	22	0	1	0	0	0	0	0	0	0
	<i>Hippomedon robustus</i> Sars, 1895	0	0	0	0	1	0	0	0	1	0	0	0
	<i>Kerguelenia borealis cf. japonica</i> Gurjanova, 1962	2	2	0	0	0	0	0	1	1	0	0	0
	<i>Lysianella petalocera</i> Sars, 1882	4	17	32	20	24	21	1	6	1	2	2	0
	<i>Onisimus plautus</i> (Krøyer, 1845)	1	0	0	0	0	0	0	0	0	0	0	0
	<i>Orchomene cf. lepidula</i> Gurjanova, 1962	0	0	0	0	0	0	0	0	0	3	0	25
	<i>Orchomene macroserrata</i> Shoemaker, 1930	1	2	2	18	5	2	78	84	64	19	4	27
	<i>Orchomene pectinata</i> Sars, 1882	1	1	2	2	0	2	4	12	0	1	1	3
	<i>Opisa eschrichtii</i> (Krøyer, 1842)	0	1	1	0	1	2	0	0	1	7	3	4
	<i>Socarnes bidenticulatus</i> (Bate, 1858)	0	0	0	1	0	1	0	0	1	1	0	5
	<i>Socarnes vahli</i> (Krøyer, 1838)	0	0	0	7	6	2	160	136	121	0	0	1
	<i>Tmetonyx cicada</i> (Fabricius, 1780)	5	18	1	327	331	27	6	52	72	64	51	25
	<i>Tmetonyx</i> sp. 1	0	0	0	0	4	0	0	0	0	0	0	0
	<i>Tmetonyx</i> sp. 2	0	0	0	0	1	0	0	0	0	0	0	0
	<i>Tryphosella schneideri</i> (Stephensen, 1925)	1	0	3	2	2	0	43	88	26	3	7	1
	<i>Tryphosella</i> sp. 1	0	0	0	1	0	0	0	0	0	0	0	0
	Lysianassidae sp. 1	0	0	0	1	0	0	0	0	0	0	0	0

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
	Lysianassidae sp. 2	0	0	0	0	0	0	0	0	0	0	0	3
	Lysianassidae sp. 3	0	0	0	0	0	1	0	0	0	0	0	0
	Lysianassidae sp. 4	0	0	0	0	0	0	0	0	0	0	0	3
	Lysianassidae spp.	0	1	0	30	0	0	15	0	0	0	0	0
Phoxocephalidae	<i>Harpinia crenulata</i> (Boeck, 1871)	0	5	1	44	16	18	29	48	76	0	0	0
	<i>Harpinia</i> cf. <i>plumosa</i> (Krøyer, 1842)	0	0	0	0	0	0	0	0	0	2	0	1
	<i>Harpinia</i> sp. 1	0	0	0	1	0	0	0	0	0	0	0	0
	<i>Harpinia</i> spp. 1	0	0	2	8	1	3	9	6	4	0	0	2
	<i>Harpinia</i> spp. 2	0	0	0	6	6	2	9	15	4	0	0	2
	<i>Phoxocephalus holboelli</i> (Krøyer, 1842)	0	0	0	0	0	0	39	78	40	155	17	26
	Phoxocephalidae spp.	1	0	0	10	7	2	19	26	12	36	3	12
	<i>Themisto abyssorum</i> Boeck, 1871	0	0	0	0	0	0	0	0	0	0	0	3
	<i>Themisto gaudichaudi</i> Guérin, 1828	1	0	6	0	0	7	1	7	1	3	0	0
	Amphipoda spp.	0	0	3	3	0	1	26	0	0	78	0	1
Amphipoda sp. 1	0	0	0	0	0	0	0	3	0	4	5	17	
Isopoda													
Anthuridae	<i>Calathura brachiata</i> Stimpson, 1853	0	1	6	17	12	5	1	9	7	109	11	39
Desmosomatidae	<i>Eugerda</i> cf. <i>globiceps</i> (Meinert, 1890)	0	52	41	90	91	149	48	2	5	132	24	301
Nannoniscidae	<i>Nannoniscus oblongus</i> Sars, 1869	27	136	109	134	76	59	1	6	8	0	0	0
	<i>Austroniscus</i> cf. <i>norbi</i> Svararsson, 1982	0	0	37	0	146	280	0	0	0	32	63	0
	<i>Austroniscus</i> sp. 1	0	43	0	180	0	0	26	50	47	0	0	47
Janiridae	<i>Austroniscus</i> sp. 3	0	0	0	0	0	0	0	4	0	0	0	0
	<i>Iolella laciniata</i> (Sars, 1872)	31	64	21	2	0	4	21	18	14	0	0	0
	<i>Iolella spinosa</i> (Harger, 1879)	0	0	0	0	0	0	4	0	0	10	9	29
	<i>Janira maculosa</i> Leach, 1814	245	1,211	521	1,065	703	534	492	989	811	364	104	429
Katianiridae	<i>Katianira bilobata</i> Gurjanova, 1930	0	0	0	7	1	1	0	2	1	0	0	0
Munnidae	<i>Munna</i> cf. <i>boeckii</i> Krøyer, 1839	0	0	0	1	0	0	0	0	0	0	0	0
	<i>Munna</i> cf. <i>fabricii</i> Krøyer, 1846	0	3	25	27	11	6	216	364	271	367	82	138
	<i>Munna</i> cf. <i>groenlandica</i> Hansen, 1916	55	261	98	67	45	10	575	536	316	515	103	312
	<i>Munna</i> cf. <i>hanseni</i> Stappers, 1911	2	0	0	0	0	0	0	0	0	0	0	0
	<i>Munna</i> cf. <i>minuta</i> Hansen, 1910	0	125	60	57	13	7	67	391	66	1,350	574	1,092
Paramunnidae	<i>Munna</i> spp.	1	8	9	0	8	0	25	25	18	18	13	37
	<i>Pleurogonium inerme</i> Sars, 1883	0	0	0	0	24	4	27	114	41	0	67	178
	<i>Pleurogonium intermedium</i> Hansen, 1916	0	0	0	5	0	0	0	0	0	206	0	0
	<i>Pleurogonium pulchra</i> Hansen, 1916	0	0	1	0	0	0	0	0	0	0	0	0
Munnopsidae	<i>Pleurogonium spinosissimum</i> (Sars, 1866)	0	0	0	17	17	22	74	131	151	126	55	313
	<i>Baeonectes muticus</i> (Sars, 1864)	0	2	9	2	8	11	1	46	22	60	246	839
	<i>Disconectes furcatus</i> (Sars, 1870)	0	6	6	36	2	1	0	0	0	0	0	0
	<i>Disconectes latirostris</i> (Sars, 1882)	0	0	0	0	0	0	0	2	3	0	0	0
	<i>Disconectes phallangium</i> (Sars, 1864)	0	0	0	0	1	0	0	0	0	0	0	0
	<i>Eurycope producta</i> Sars, 1869	0	289	173	5	6	26	2	33	23	0	3	5
	Eurycopinae spp.	0	26	8	0	1	2	0	1	1	0	0	0
	<i>Echinozone arctica</i> Hansen, 1916	0	0	2	0	2	7	14	33	16	7	0	9
	<i>Echinozone coronata</i> (Sars, 1870)	4	29	26	17	20	28	194	230	255	53	24	107
	<i>Echinozone</i> spp.	0	0	0	0	0	1	4	6	0	0	0	0
<i>Ilyarachna hirticeps</i> Sars 1870 group	0	14	10	33	16	29	2	0	6	18	4	109	
Gnathiidae	Asellota spp.	0	0	0	1	0	0	23	64	16	1	0	0
	<i>Caecognathia abyssorum</i> Sars, 1872	2	4	2	11	2	0	1	0	0	0	0	0
	<i>Caecognathia elongata</i> Krøyer, 1846	0	0	0	8	2	7	0	0	0	22	4	16
	<i>Caecognathia</i> females and juveniles	4	9	13	110	41	15	0	2	0	150	27	162

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
Aegidae	<i>Aega psora</i> (Linnaeus, 1758)	1	0	0	0	0	0	0	0	1	0	0	
Cirolanidae	<i>Politolana microphalma</i> (Hoek, 1882)	0	0	0	0	0	0	1	0	0	0	0	
Arcturidae	<i>Astacilla granulata</i> (Sars, 1877)	0	0	0	0	0	0	19	12	18	0	0	
	<i>Astacilla pusilla</i> (Sars, 1873)	1	5	0	0	0	0	0	0	0	0	0	
	<i>Astacilla juveniles</i>	0	0	0	0	0	0	18	2	8	0	0	
	<i>Spectrarturus multispinatus</i> Schultz, 1981	0	0	0	0	0	0	841	754	355	2	0	
Arcturidae sp. nov.	0	0	0	0	0	0	1	0	0	0	0		
Cumacea													
Diastylidae	<i>Brachydiastylis resima</i> Krøyer, 1846	0	0	0	0	0	0	7	0	0	25	3	
	<i>Diastylis cf. edwardsi</i> Krøyer, 1841	0	0	0	2	0	0	3	0	2	26	6	
	<i>Diastylis lucifera</i> (Krøyer, 1841)	0	0	0	0	0	0	0	0	0	6	1	
	<i>Diastylis spinulosa</i> Heller, 1875	1	0	0	0	0	0	0	0	0	27	6	
	<i>Leptostylis ampullacea</i> (Lilljeborg, 1855)	0	0	1	0	0	0	0	0	0	0	0	
	<i>Leptostylis macrura</i> Sars, 1870	1	1	0	3	3	3	5	8	3	362	37	
	<i>Leptostylis villosa</i> Sars, 1869	0	0	0	0	0	0	0	0	0	25	1	
<i>Leptostylis</i> spp.	0	0	0	0	0	0	0	0	0	19	0		
Lampropiidae	<i>Hemilamprops cf. assimilis</i> Sars, 1883	0	49	65	0	0	0	0	0	0	0	0	
	<i>Hemilamprops cf. uniplicata</i> (Sars, 1872)	4	15	5	0	0	0	0	0	0	1	0	
	<i>Platyaspis typica</i> (Sars, 1870)	0	0	0	0	0	0	0	0	0	0	1	
Lamprobiidae spp.	6	14	11	0	0	0	0	0	0	0	0		
Leuconidae	<i>Leucon cf. nasica</i> Krøyer, 1841	0	0	0	4	0	1	1	1	0	1	0	
	<i>Leucon cf. nasicooides</i> Lilljeborg, 1855	0	0	0	1,233	1,118	1,078	1,260	931	352	166	26	
	<i>Leucon cf. nathorsti</i> Ohlin, 1901	32	97	60	40	33	40	59	25	28	25	6	
	<i>Leucon</i> spp.	0	0	0	17	5	0	47	5	4	7	1	
Nannastacidae	<i>Eudorellopsis deformis</i> (Krøyer, 1846)	0	0	0	0	0	0	3	0	0	23	5	
	<i>Campylaspis horrida</i> Sars, 1870	62	212	197	88	54	67	52	110	105	3	0	
	<i>Campylaspis rubicunda</i> (Lilljeborg, 1855)	14	46	55	11	1	1	17	9	23	5	5	
	<i>Campylaspis undata</i> Sars, 1865	5	15	13	2	0	2	0	3	5	0	0	
	<i>Campylaspis verrucosa</i> Sars, 1865	0	0	0	10	0	7	15	4	6	0	0	
<i>Cumella carinata</i> (Hansen, 1887)	0	0	0	0	0	0	0	0	0	28	3		
Nannastacidae spp.	0	0	0	4	1	0	0	0	0	0	0		
Pseudocumatidae	<i>Petalosarsia declivis</i> (Sars, 1865)	0	0	0	0	10	0	0	0	0	33	0	
Tanaidacea													
Sphyrapodidae	<i>Ansphyrapus tudes</i> (Norman & Stebbing, 1886)	0	0	1	1	0	0	819	1,303	1,052	0	0	
	<i>Pseudosphyrapus anomalus</i> (Sars, 1869)	0	0	0	3	1	1	0	0	0	0	0	
Leptocheliidae	<i>Heterotanaeis groenlandicus</i> Hansen, 1913; sensu Vanhöffen, 1914	0	0	0	0	0	0	1	1	0	75	18	
Leptognathiidae	<i>Leptognathia breviremis</i> (Lilljeborg, 1864)	0	0	0	1	0	0	0	0	0	0	0	
	<i>Leptognathia crassa</i> Hansen, 1913	0	4	0	0	1	0	0	0	1	0	0	
	<i>Leptognathia subaequalis</i> (Hansen, 1913)	0	0	0	3	0	2	0	0	1	0	0	
	<i>Leptognathia</i> sp. 1	0	4	4	0	0	0	0	0	0	0	0	
	<i>Leptognathia</i> sp. 2	0	0	0	0	0	0	2	17	3	0	0	
<i>Leptognathia</i> spp.	0	9	2	0	1	1	1	54	50	14	13		
Pseudotanaididae	<i>Tanaissus lilljeborgi</i> (Stebbing, 1891)	0	0	0	0	2	3	0	0	0	0	3	
	<i>Pseudotanaeis oculatus</i> Hansen, 1913	0	1	0	0	1	0	0	0	0	44	12	
	<i>Pseudotanaeis</i> sp. 1	0	0	0	0	0	0	0	0	0	2	0	
	<i>Pseudotanaeis</i> spp.	0	0	0	0	0	0	2	0	0	0	0	
Typhlotanaididae	<i>Typhlotanaeis</i> sp. 1	0	0	4	2	8	4	39	229	96	146	19	

Family	Species	NE-station			SE-station			SW-station			NW-station		
		2001	2002	2004	2001	2002	2004	2001	2002	2004	2001	2002	2004
		-1			-2			-3			-4		
	<i>Typhlotanais</i> sp. 2	17	101	32	59	21	22	109	858	197	7	6	12
Paratanaoidea	<i>Paraleptognathia gracilis</i> (Krøyer, 1842)	0	0	0	4	5	6	4	4	1	9	4	4
	<i>Paraleptognathia inermis</i> (Hansen, 1913)	0	0	2	0	3	0	0	0	0	0	0	0
	<i>Paraleptognathia multiserrata</i> (Hansen, 1913)	0	1	1	0	0	0	0	0	0	5	0	0
	<i>Paraleptognathia</i> sp. 1	0	0	0	0	0	0	1	0	0	0	0	0

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