Miljøverndepartementet
Ministry of Environment - Norway

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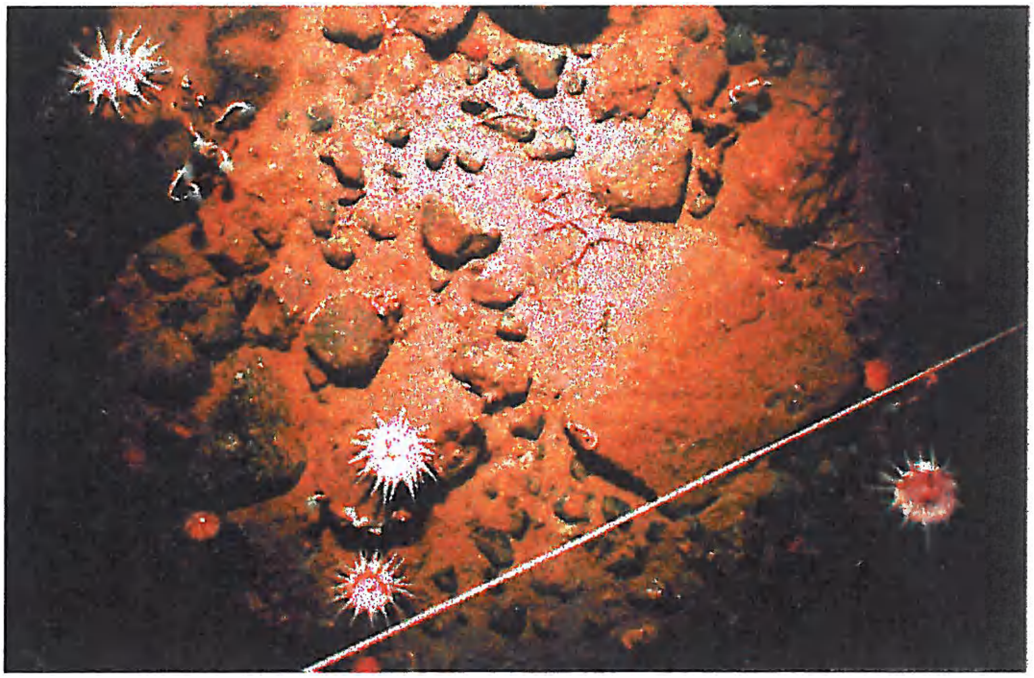
Benthic Fauna in the northern Barents Sea



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Sammendrag / Summary

Data on benthic macrofauna in the Northern Barents Sea, collected during a joint expedition between the University of Tromsø, Akvaplan-niva and Geogruppen are presented, against a background of the oceanographic and physical characteristics of the sampling area. Data on biomass of the major animal groups, together with species abundance and faunal diversity at each of the sampling stations, are given. Relationships between overall faunal composition and environmental variables, examined using Canonical Correspondence Analyses (CCA) are discussed.

Emneord:	*Key words:*
Barentshavet	Barents Sea
Bentos	Benthos
Makrofauna	Macrofauna
Samfunn	Community

Prosjektleder/ Project manager	*Avdelingsleder/ Head of Marine Department*	*Kvalitetskontroll / Quality control*
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TABLE OF CONTENTS

Foreword and acknowledgements

This study is based on data from samples collected during a cruise in August 1992 to Svalbard and the Northern Barents Sea, carried out as a joint venture between the University of Tromsø, Akvaplan-niva and Geogruppen (see Fredriksen & Dahle 1992). The data gathered on contaminants is published in a technical report to the Arctic Monitoring and Assessment Programme (AMAP) (dos Santos & al. 1996). Data on macrobenthic fauna from six sampling stations is reported and analysed as a part of a more general report to the "working group for environmental impact analyses of petroleum activities" (AKUP) on geographical distribution of benthic fauna in the Barents Sea (Dahle & al. 1995a). An assessment of the equipment used is given in Dahle & al. (1995b).

The present report provides a more detailed analysis of the benthic fauna at ten of the stations sampled, and forms the basis for a future scientific publication dealing with benthic communities in the Barents Sea. The data presented in this report are intended to contribute to the AMAP database, and this present work has been largely financed by the Norwegian Ministry of Environment (MD) and AKUP, with additional support from the Norwegian Research Council during the final stages of the work.

We wish to thank the cruise participants for their co-operation, particularly Kurt-Roger Fredriksen[3], John Costelloe[2] and Morten Frogh[6]. Other cruise participants were Per Ivar Steinsund[7], Stanislav Denisenko[4] and Yelena Frolova[4]. We also wish to thank the captain and crew of RV *Johan Ruud*, of the University of Tromsø for their help with sample collection.

For this investigation of the benthic fauna, sorting was carried out by Sigurd Jakobsen[1], Ursula Lundahl[1] and Nina Denisenko[4]. Thanks go to Nina Denisenko[4], Natalia Anisimova[4], Rune Palerud[1], Andrey Sikorski[1] and Roger Velvin[1] for assistance with species identification. Data processing was carried out by Trond Henriksen[1] and Lena Ringstad Olsen[1]. Unless otherwise stated, Harvey Goodwin[1] and Jan Huizinga[1] compiled the maps. Last, but by no means least, we thank Tom Pearson[1] for information and much helpful criticism and JoLynn Carroll[1] for discussions on sediment-biota interactions.

Unless otherwise indicated, the term 'benthic fauna' applies to macrozoobenthos throughout this report.

Key to affiliation (at time of contribution, arranged alphabetically):
[1]Akvaplan-niva
[2]Aqua-Fact International Services Ltd
[3]Geogruppen
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[5]NIVA
[6]Nordland Research Centre
[7]University of Tromsø

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1. Introduction and rationale

During the Soviet period and also afterwards, most expeditions carrying out quantitative sampling of benthic fauna in the Barents Sea have been carried out by Russian institutes. Due to communication difficulties, much of this information has remained unavailable to non-Russian scientists. The increase in international co-operation between the Russian and the international scientific community at large, which has occurred over the last decade, has allowed exchange of information to take place. However, two main obstacles still remain. Firstly, much of the Russian literature is still in need of translation and, as such, is difficult to access for non-Russian readers. Secondly, it has become clear that there is a tendency for different institutes to use different methodologies, leading to non-comparable results (Dahle & al. 1998). It is clear, therefore, that international co-operation and standardisation of methods is a matter of prime concern.

At least two international expeditions involving quantitative sampling of benthic macrofauna have been carried out in the northern Barents Sea in recent years. In July-August 1980, a cruise run by the Norwegian Polar Institute was carried out in the Barents Sea, using m/s *Norvarg* (Siggerud & Kristoffersen 1981). The 1980 cruise aimed to provide a multidiciplinary investigation of the marine ecosystem in the area, and the sampling stations visited have formed the basis for station positioning in the two subsequent cruises mentioned below. Some of the results of the benthic macrofauna are presented in Dahle & al. (1995a).
In 1991, a cruise to the northern Barents Sea was organised by the German Alfred Wegener Institute for Polar and Marine Research, using the vessel RV *Polarstern*. Samples for benthic macrofauna were collected during the Arctic expedition ARK-VIII/2 (Kendall & al. 1992 and published in Kendall & Aschan 1993; Piepenburg & al. 1995; Kendall 1996; Kendall & al. 1997).

The specific aims of the present report may be summaried in two groups:

a) Evaluation of sampling methodology

The first main aim was to compare and contrast different sampling and analytical techniques and methodologies and assess their utility in Arctic waters. Three main techniques were used:
analysis of soft-bottom macrobenthos for assessment of biodiversity and environmental conditions.
sediment Profile Imagery (SPI) techniques for direct photographic documentation of the sediment profile (Aqua-Fact 1993).
analysis of benthic Foraminifera as an indicator of environmental disturbance.

A summary of results and assessment of performance of the different approaches is given in Dahle & al. (1995b). The overall conclusion was that none of the methods in isolation were sufficient to give adequate documentation of the environmental conditions on the sea floor at all the stations sampled. Since there is a great deal of heterogeneity in sedimentology and bottom topography throughout the Barents Sea, a suitable combination of methods should be selected according to local conditions. Thus many standard sampling strategies adopted, for example for monitoring in the North Sea, cannot directly be applied to the Barents Sea, without certain modifications. It has been suggested that increased use of photographic techniques should be used, particularly in areas of coarse or mixed sediments (Dahle & al. 1995b).

b) Baseline information and effect studies - benthic faunal communities

The second main aim was to obtain baseline information on pristine benthic fauna, as a basis for mapping and effect studies in the Barents Sea. Benthic faunal analyses are an integral part of overall biodiversity mapping in the Arctic, as in any other marine system. Mapping of benthic fauna is of particular interest, since several recent studies indicate that, contrary to previous assumptions, benthic biodiversity in the Arctic does not appear to be reduced with respect to more southern latitudes (see Kendall & Aschan 1993; Kendall 1996). This lingering controversy over Arctic benthic biodiversity implies that the nature and dynamics of the benthic environment in the Arctic is not yet fully understood, and it is therefore imperative that more data is obtained and published. The information in the present report is therefore an important contribution. A preliminary account of the benthic fauna at six of the stations sampled is given in Dahle & al. (1995a).

Benthic faunal analyses at the community level also play an indispensable role in effect studies and assessments of environmental impact. Due to the complexity of the various processes which occur in the sediment and at the water-sediment boundary layer, direct monitoring of contaminants and other anthropogenic discharges is often obscured by 'noise'. One of the causes of 'noise' in benthic systems is the benthic fauna itself. Since the sediments support a considerable biomass of organisms, which feed and rework the sediment in a variety of ways, the fate of contaminants in the sediments is likely to depend to a large extent on the type and amount of organisms present. Faunal analyses therefore support and help to interpret direct sediment contaminant measurements. However, in their own right, the structure and composition of the faunal communities give reliable and often extremely detailed information on the environmental conditions in a given area. In this way, benthic faunal analyses at the community level are an important and indispensable tool for measuring, mapping and monitoring the effects of contaminants and other anthropogenic effects in the marine environment. Such analyses are also of infinite value in assessing long-term changes, both in terms of response and recovery from anthropogenic effects, as well as changes in pristine areas which may be attributed to a more global change, such as changes in the relative influence of different water masses, or sea-water temperature.

In order to document trends and changes in the benthic communities, and to separate these from natural variation, it is necessary to employ a range of statistical techniques. In recent years, correspondence analyses and, in particular, canonical correspondence analyses, have allowed the relationship between biotic and abiotic parameters to be revealed quantitatively. Armed with these tools, it is possible to deduce how much of the faunal variance is attributable to the different environmental variables incorporated in the analyses. However, the strength of these analyses largely depends on the reliability and scope of the environmental data collected. In the past, benthic analyses have been carried out without consideration of such sedimentary processes as sedimentation rate, which may affect colonisation by benthic organisms, quite independant of anthropogenic effects. Another factor which merits further consideration is the extent and intensity of sedimentary bioturbation, or reworking. Although this is caused by the animals themselves, the resulting physical changes in the sediment in turn affect the structure and composition of the inhabitant communities. The significance of these and other dynamic interactions are further discussed in Chapter 5.

In recent years, there is increasing interest in petroleum exploitation in the Barents and Pechora Seas. Since these areas also contain valuable resources, such as hatching grounds for commercial fish species, the potential consequences of environmental impact from petroleum activities is high. Analyses of benthic fauna, therefore, should be incorporated into both baseline and monitoring surveys in this context.

2. Study area

2.1 Oceanography

Further information on the oceanography of the Barents Sea is given in Loeng (1991) and WGMEBR (1997). Figure 1 shows the general bathymetry of the Barents Sea.

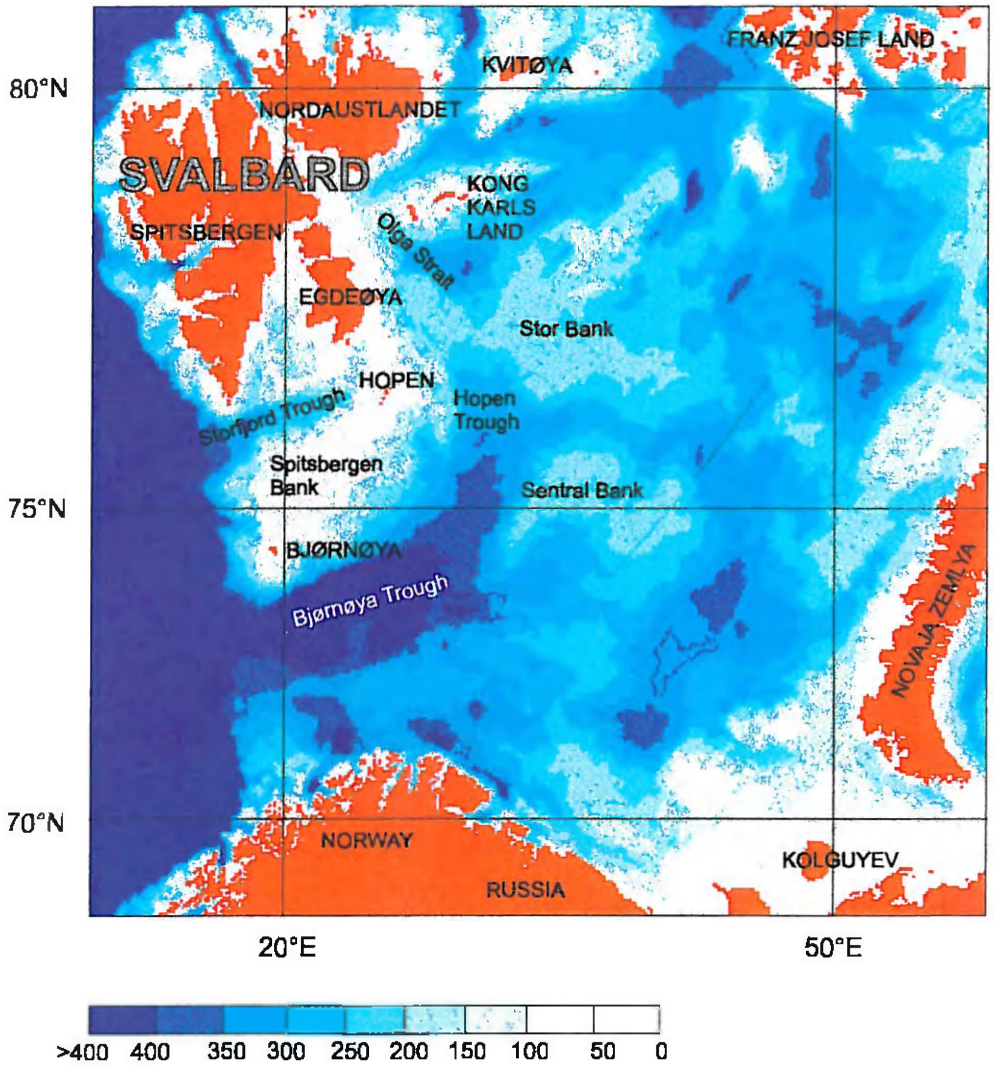


Figure 1. Bathymetry of the Barents Sea. Bathymetry digitised from 'Bathymetry of the Arctic Ocean', Naval Research Laboratory, Acoustic Division, 1985.

The Barents Sea is a relatively shallow continental shelf sea with an average depth of 230 m. The maximum depth of 500 m is found in the western part of the Bjørnøya Trough. Some of the shallowest areas are found on the Spitsbergen Bank, where the depths are less than 50 m.

There are three main water masses in the Barents Sea; Atlantic water, Coastal water and Arctic water, each of which is linked to one of the main current systems. Figure 2 shows the approximate extent of these water masses, as well as two other water bodies, Spitsbergen Bank water and Barents Sea water, the latter located west of Novaya Zemlya.

Atlantic Water is defined by a salinity higher than 35 ‰ (Helland-Hansen & Nansen 1909). Between Norway and Bjørnøya the temperature varies from 3.5 to 6.5°C, depending on both seasonal and interannual variations. Temperature and salinity tend to decrease towards the north and east.

Coastal water has almost the same temperature as Atlantic Water, but the salinity is less than 35 ‰. Unlike the other main water masses in the Barents Sea, the coastal water is vertically stratified during the entire year, at least along the coast of Norway. Further east, in the shallow areas south to south-west of Novaya Zemlya, the stratification is almost broken down during winter.

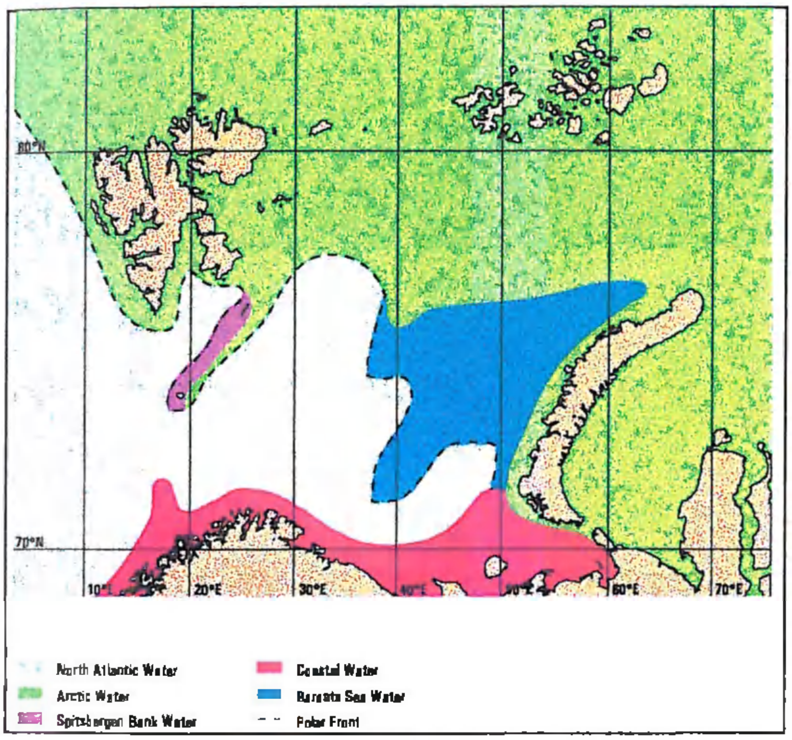


Figure 2. Distribution of the main water-masses in the Barents Sea (from Loeng 1991)

Arctic Water also generally has a lower salinity than Atlantic water, but is most easily characterised by its sub-zero temperature. The core of the Arctic Water mass generally has a temperature of around -1.5°C or less and a salinity between 34.4 ‰ and 34.7 ‰. During winter in the northern Barents Sea, the upper 150 m of the water column is occupied by Arctic water, while during summer, there is an overlying layer of melt water with a thickness of 5-20 m. The melt water has a low salinity, varying from below 31.0 ‰ and up to 34.2 ‰, and is usually found north of the Polar Front.

The influx of Arctic Water to the Barents Sea takes place along two main routes: firstly, between Svalbard and Franz Josef Land, and, more importantly, through the opening between Franz Josef Land and Novaya Zemlya (see Dickson & al. 1970). A small inflow of Arctic water from the Kara Sea also occurs south of Novaya Zemlya.

2.2 Sedimentology

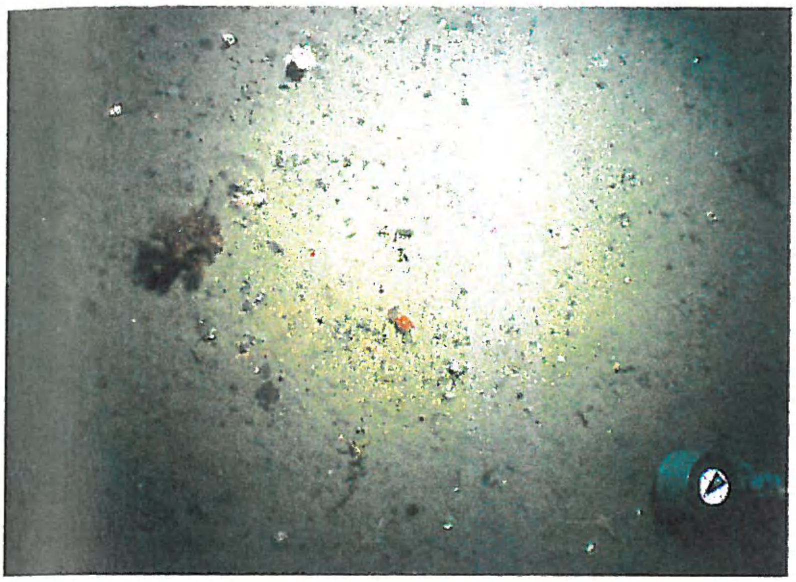


Figure 3. Still photograph of the sediment surface in the Barents Sea, at approximately 76°N, between the Hopen Trough and the Sentral Bank, at a depth of 298 m (Photo: Anders Solheim, Norwegian Polar Institute, 1987).

The bottom topography in the Barents Sea is very heterogeneous, ranging from fine muds in accumulation areas, to rocks and stones in erosion areas (Elverhøi & al. 1989).

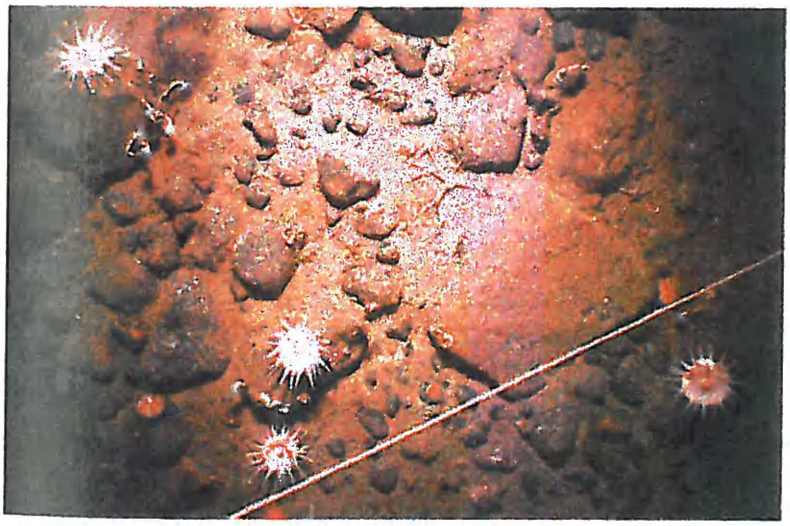


Figure 4. Still photograph of the sediment surface in the Barents Sea east of Spitsbergen, at a depth of 269 m (Photo: Anders Solheim, Norwegian Polar Institute, 1980).

Figure 3 and Figure 4 illustrate areas of soft and mixed bottom sediments, respectively, in the Barents Sea. A schematic map of the geographic distribution of different bottom sediment types across the area at large is presented in Figure 5.

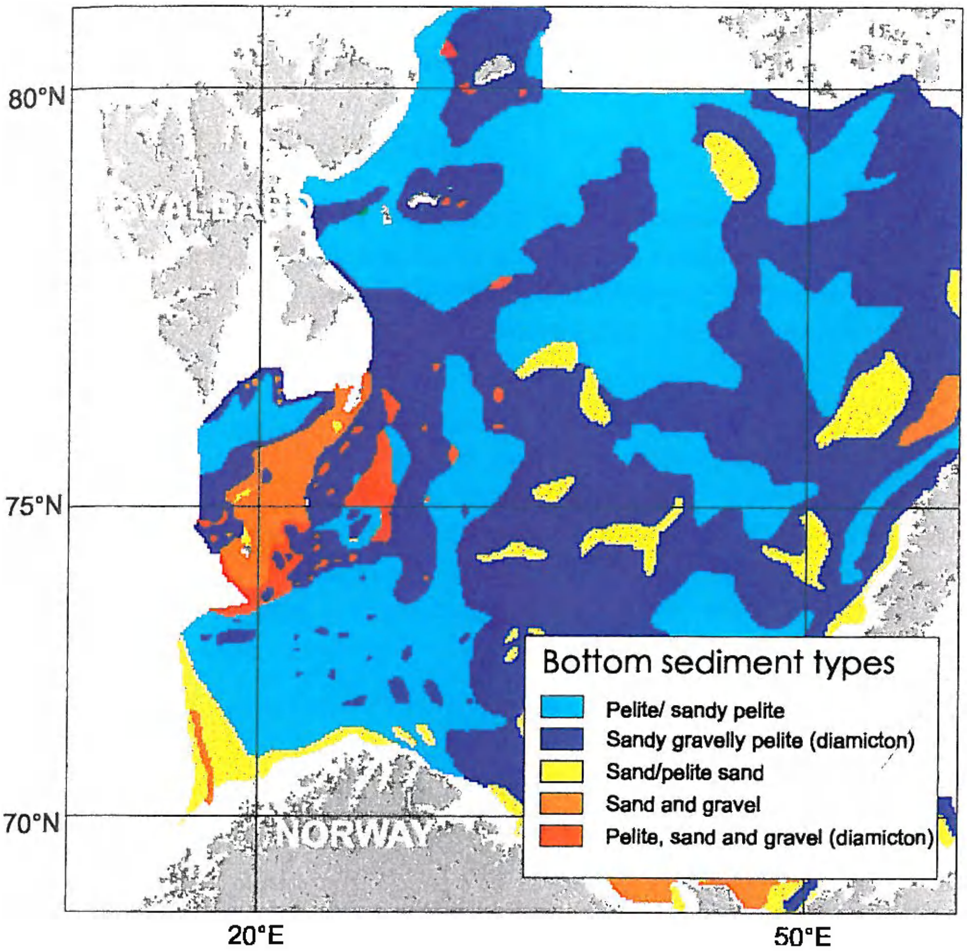


Figure 5. Surface sediments in the Barents Sea (from Fredriksen &. al. 1994).

As can be seen, there is a large area of mixed sediments south to south-east of Svalbard, while the remainder generally comprises fine grained pelite material, with an admixture of sand. However, since this is a very generalised map, some local variations are to be expected.

2.3 Benthic Fauna

There is currently relatively little internationally available literature concerning benthic fauna in the northern parts of the Barents Sea, although several studies have aimed to tackle this (see Zenkewich 1963; Herman 1989; Dahle & al. 1995a; Piepenburg & al. 1995; Kendall 1996; Kendall & al. 1997). Much information is available in the Russian literature, but the translation and compilation of this is beyond the scope of the current study. Recent studies carried out in adjacent areas, such as the Pechora Sea (Dahle & al. 1998) and the Kara Sea (Jørgensen & al. 1997, Evenset & al. 1998) indicate that the biodiversity in these Arctic/ Atlantic and high-Arctic areas is high, and that there is a great deal of heterogeneity in the structure of the faunal communities. In the case of the Pechora Sea, this appears mainly to be related to water depth and sediment type. However, the situation appears to be somewhat more complex in the Kara Sea, and more extensive studies are required to reveal the major structuring influences in this area.

3. Materials and methods

3.1 Station positioning

The sampling stations were positioned to encompass as wide a range of environmental conditions as possible, with respect to water depth and bottom types. Thus samples were taken in trough areas, where there is a relatively low degree of water movement, resulting in fine muddy sediments, as well as along continental slope areas where the current is stronger and the sediments are generally coarser.

Sampling was carried out between August 3rd-16th, 1992, from the research vessel RV *Johan Ruud*, of the University of Tromsø. A total of 16 stations were sampled, 10 of which have been used for benthic faunal analyses. Station positioning was carried out using GPS (Global Positioning System), supported by the ship's radar. Figure 6 shows the position of the stations analysed for benthic fauna in this report. A complete list of all stations sampled during the 1992 expedition is given in Fredriksen & Dahle (1992) and Dahle & al. (1995a).

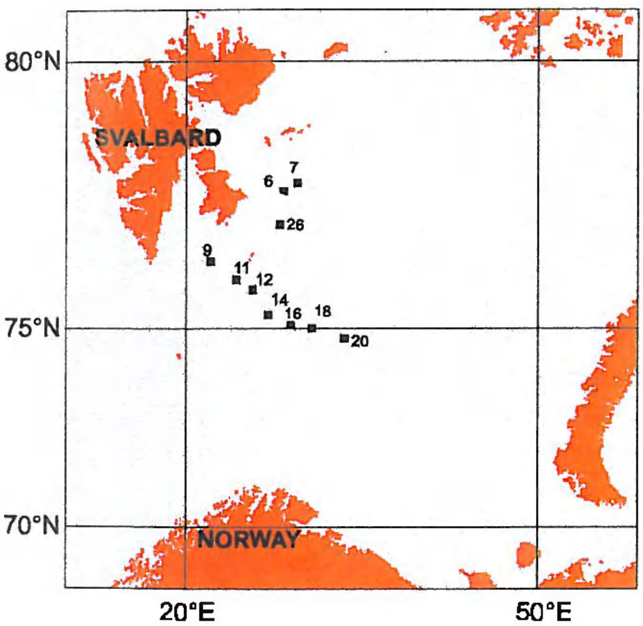


Figure 6. Location of the sampling stations analysed for benthic fauna. See Dahle & al. (1995a) for complete map of all stations sampled.

Stations 9-20 are located along an (as far as possible) identical transect to that sampled during the Norwegian Polar Institute's 1980 expedition aboard the m/s *Norvarg*. Similarly, Stations 6 and 7 are in the vicinity of previously sampled stations.

This offers a unique opportunity for comparison of the benthic faunal communities in these areas, between 1980 and 1992 conditions. Once a complete set of data from the 1980 expedition is available, a statistical comparison is planned.

3.2 Sampling and laboratory procedures.

Five replicates were taken at each station for faunal samples and one replicate per station was taken for analysis of physical parameters of the sediment. Samples were processed in accordance with the standard procedures required for offshore monitoring (SFT 1990). A 0.1 m^2 lead weighted van Veen grab with hinged, lockable, rubber-covered inspection flaps of 0.5 mm mesh was used. Samples showing inadequate or uneven penetration, or a disturbed sediment/water interface were rejected. The samples were gently washed through a circular 1 mm diameter round-mesh screen immersed in running sea water, and fixed in 15-20 % borax-buffered formalin. For glacio-marine clay sediments, the fine surface sediment was first gently washed from the clay, which was then processed separately.

Samples for analysis of granulometry and total organic carbon (TOC) were taken by draining the bottom water from the grab and using a plastic spoon to scoop material from the top 5 cm of the sediment surface. The samples were placed in plastic containers and frozen to -20 °C until transfer to the analytical laboratory.

Once in the laboratory, faunal samples were rinsed using 1 mm round mesh sieves immersed in running fresh-water to remove formalin. Animals were sorted from the sediment into phyla and subsequently identified to species or lowest taxonomic level possible. A reference collection was kept of all species identified. Wet weights of the major constituent animal groups (Annelida, Crustacea, Echinodermata and Mollusca) were recorded using a digital scale. The remaining animal groups were weighed together, and recorded as 'Varia'.

3.3 Numerical analyses.

The replicate sample data were compiled and then summed for each taxon to give faunal densities for each station (0.5 m²). The community analyses were based on a 2-way station by species data base. Samples within the dissimilarity matrices generated by the Bray-Curtis index (Chekanowsky 1909; Bray & Curtis 1957) were grouped together on the basis of their resemblances, using the unweighted pair-group average method (Rohlf 1989). Multi-dimensional scaling (MDS) ordination was used to scale the dissimilarity of the station data in three-dimensional space, placing the most similar stations closest together. The above analyses were also carried out for individual replicates, but are not discussed further, since the replicate analyses showed similar trends to the station data. A preliminary Principal Co-ordinate (PCoA) ordination using double-centred eigenvector calculations and a Principal Component Analysis (PCA) was carried out to achieve an optimised and more effective MDS outcome (Rohlf 1989).

Canonical correspondence analysis (CCA) was used to assess the relationship between species abundance and the physical and chemical characteristics of the sediment. The principles of CCA are explained in Fieler & al. (1994). Considered geometrically (Greenacre 1984; 1993) each species can be thought of as a point in the multidimensional space defined by the stations, and each species is given a weight, or 'mass' proportional to the overall abundance of the species. Similarly, each station represents a point in the multidimensional space defined by the species and receives a mass proportional to the number of individuals counted at that station. Dispersion is defined as the weighted sum-of-squared distances of the species points (or, equivalently, of the station points) to their average. This dispersion is termed inertia, which is a measure of variance. Species with most inertia explained by the first two or three axes are considered to be most influenced in their distribution by the selected environmental variables. Using one of the environmental variables as a co-variable removes all inertia attributed to that variable. Examination of the remaining inertia gives information on the relationship between species distribution and the other environmental variables.

Based on a preliminary PCA, the following parameters were designated as environmental variables and chosen for CCA: depth, % pelite (fine sediment < 63µm in diameter), hereafter termed 'mud', % sand and total organic carbon (TOC). The selected log-transformed environmental variables, together with the untransformed faunal data were directly entered into the CCA, and those linear combinations of environmental variables that maximise the dispersion of the species scores (i.e. those which explain most of the species variance) were selected on the basis of multiple regression analyses ('forward selection'). The CANOCO software package used was that of ter Braak (1987-1992). The results from the ordinations were plotted using the software package CANODRAW (Smilaur 1992).

4. Results

4.1 Background and physical characteristics of the sediments

Table 1 presents some background and physical characteristics of the sediments at the sampling stations. In addition to station positions and water depths, the sediment content of total organic carbon (TOC) and basic sediment grain size information. For simplicity, latter are only presented as percent fine material (pelite) and sand. Full granulometric analyses are presented in the Appendix.

Table 1. Background characteristics of the stations sampled in the Northern Barents Sea, 1992.

St.	Area	Latitude (N)	Longitude (E)	Depth (m)	TOC (g/kg)	% mud (<63 μm)	% sand (63 μm-2 mm)
6	Slope south of Kong Karls Land	77°50.0'	28°00.0'	201	1.78	91.7	8.19
7	Depression south of Kong Karls Land	78°00.0'	29°04.0'	314	1.50	85.8	13.27
9	Storfjord trough	76°30.3'	21°45.1'	253	2.33	91.8	7.96
11	Spitsbergen bank	76°07.0'	23°51.8'	59	n/a *	n/a *	n/a *
12	Spitsbergen bank	75°55.3'	25°20.5'	114	n/a *	n/a *	n/a *
14	Slope between Spitsbergen bank and Hopen Trough	75°22.0'	26°37.0'	189	1.46	32.7	15.30
16	Hopen Trough	75°09.0'	28°35.0'	335	2.31	87.8	12.16
18	Hopen Trough	75°03.4'	30°28.1'	379	2.26	69.0	30.61
20	East of Hopen Trough	74°51.0'	33°13.0'	171	1.13	27.8	54.22
26	Depression south-east of Edgeøya	77°14.0'	27°37.0'	229	2.13	96.2	3.73

* not carried out (gravel and stones in samples)

Stations 6, 9 and 26 all comprise a high amount of fine sediments (over 90% pelite) and have a relatively high total organic carbon (TOC) content. Station 20 comprises the coarsest sediments, and has a low TOC content. TOC data are not available for Stations 11 and 12, and granulometric data are also missing there, due to sampling difficulties experienced in the field. At the former station, this was due to the coarse, stony nature of the sediment.

4.2 Biomass of selected phyla

Approximate biomass of the major animal groups is presented in Figure 7. In some of the samples, there was a dominance of encrusting epifauna, mainly belonging to the Bryozoa, which were not weighed, as they were attached to stones.

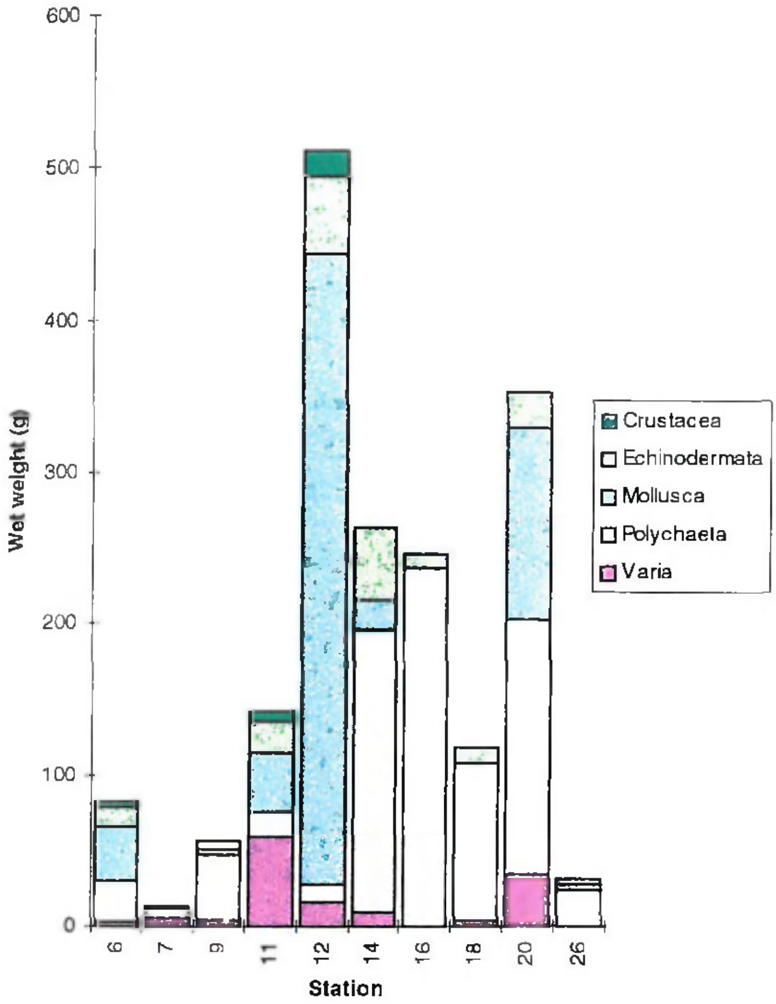


Figure 7 Biomass of selected phyla at the stations sampled in the Northern Barents Sea, August 1992, expressed as wet weights (g) per 0.5m² sampling area.

Table 2. Raw biomass data used in Figure 7.

St.	**Total biomass (g wet weight/0.5m²)**
6	130.64
7	11.72
9	56.68
11	141.53
12	510.25
14	262.37
16	245.43
18	117.39
20	351.6
26	31.67

It is interesting to note the low biomass at Station 7, the most northerly station located west of Edgeøya. In terms of biomass, there were mainly small individuals of Polychaeta present. Station 26, located in a muddy depression was also relatively low in biomass, again mainly represented by the Polychaeta.

The highest biomass was found at Station 12, located in the coarse sediments on the slope between the Spitsbergen Bank and the Hopen Trough. Here there was a dominance of Mollusca, mainly large bivalves, as well as a considerable biomass of Echinodermata. Interestingly, the biomass of the Polychaeta was very low at this station.

In terms of biomass, Station 12 was dominated by the Mollusca (including shells), while Stations 9, 14, 16 and 18 were dominated by the Polychaeta. Stations 6, 11 and 12 contained a high biomass of Crustacea, relative to the remaining stations. The biomass of the Echinodermata was highest at Stations 11, 12, 14 and 20.

4.3 Numbers of taxa, individuals and diversity indices

A total of 14 112 individuals, representing 461 taxa were found across the sampling area as a whole. The numbers of individuals and taxa found at each of the stations is presented in Table 3.

Numerically, the best represented animal group was the Polychaeta, with 6 901 individuals, comprising 136 taxa and 13 orders. The Bryozoa were represented by 2 049 colonies of 122 taxa and 3 orders. The Mollusca comprised 1 693 individuals of 68 taxa and 14 orders. The Crustacea were represented by 1 472 individuals, of 80 taxa, within 7 orders, while the Echinodermata comprised only 780 individuals of 21 taxa, within 9 orders.

Table 3. Numbers of individuals and taxa at the stations sampled in the northern Barents Sea, 1992.

Station	**no. ind. (A)**	**no. taxa. (S)**	**A/S**
6	2551	134	19
7	561	70	8
9	1673	87	19
11	2876	180	16
12	2581	145	18
14	959	123	8
16	563	49	11
18	762	64	12
20	1360	125	11
26	226	25	9
Total	**14 112**	**461**	**n/a**

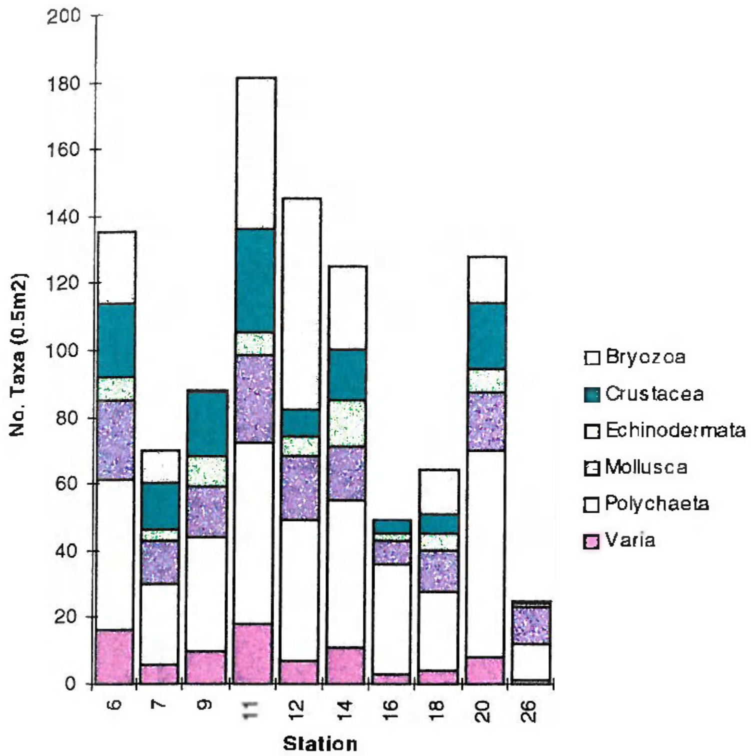
Stations 6, 9, 11 and 12 contained the highest number of individuals per 0.5 m^2, while Station 26 contained the least. The highest numbers of taxa were found at Station 11, followed by Stations 12, 6, 20 and 14, respectively. The abundance: species ratio (number of individuals divided by number of taxa, a simple index of faunal diversity) was highest at Stations 6, 9, 11 and 12 and lowest at stations 7, 14 and 26.

Table 4. Shannon-Wiener index (H'), Pielou J and Simpson (D) coefficients, indicating faunal diversity, evenness and dominance, respectively, together with the expected number of species in a hypothetical sample of 100 individuals (ES_{100}).

ST.	SH.-WIENER (H')	PIELOU (J')	SIMPSON (D)	ES_{100}
6	4.53	0.64	0.91	30.1
7	4.64	0.76	0.93	30.8
9	3.43	0.53	0.75	24.1
11	5.82	0.78	0.96	46.3
12	4.84	0.67	0.91	34.5
14	5.26	0.76	0.94	40.5
16	3.15	0.56	0.71	22.2
18	3.25	0.54	0.75	22.1
20	4.72	0.68	0.87	37.1
26	3.40	0.73	0.86	17.8

The Shannon-Wiener diversity index H' ranged from 3.15 at sampling Station 9 to a value of 5.82 at Station 11, indicating a highly diverse faunal community at this latter station. Stations 9, 16, 18 and 26 all had relatively low values, indicating a moderate faunal diversity, with values of 3.43, 3.15, 3.25 and 3.40, respectively.

The Pielou J' coefficient of evenness compares actual and maximum theoretical diversity. High values of J', (as a general 'rule of thumb, values of J' over 0.8), indicate an even faunal community, with a low extent of faunal dominance. No such values were found in this study. High values of the Simpson D coefficient, (e.g. over 0.8), indicates a high degree of faunal dominance by one or a few species. Such values were found at Stations 6, 7, 11, 12, 14, 20 and 26.



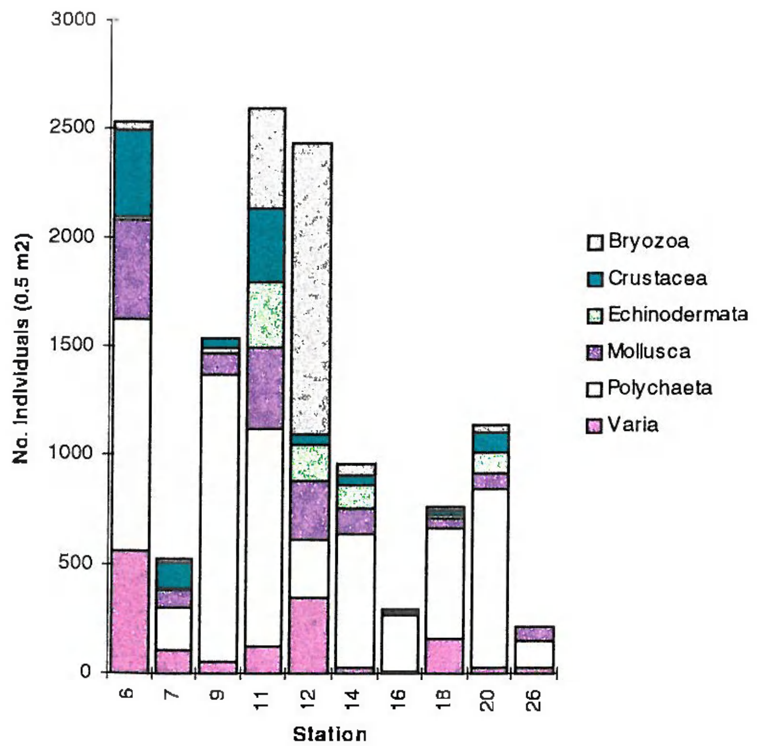


Figure 8 Numbers of taxa (top) and individuals (bottom) of the major groups represented at the stations sampled. The category 'Varia' includes the following groups: Protozoa, Porifera, Cnidaria, Nemertini, Nematoda, Sipunculida, Priapulida, Oligochaeta, Chelicerata, Brachiopoda and Chordata.

The numbers of individuals and taxa within the major groups at each of the stations sampled are shown in Figure 8. The number of taxa present at the different stations generally followed the same trends as the number of individuals, with the highest numbers of taxa being found at stations with the highest density of individuals. Stations 7 and 14, however, contained high numbers of taxa relative to the number of individuals present (see also Table 2).

Some interesting divergences were also evident in the distribution of groups across the sampling field. At Station 9, while there was a relatively even representation of all the major groups in terms of taxa, the vast majority of individuals present belonged to the Polychaeta. A similar trend was seen at Station 20. Conversely, at Station 12, while more than 30% of the taxa present were represented by the Polychaeta, this group comprised only around 12 % of the total number of individuals present. Although the Bryozoa were present at most of the stations, the majority of individuals were concentrated at Stations 11 and 12.

Table 4 also shows the expected number of species from a hypothetical sample of 100 individuals (ES_{100}), where the theoretical maximum value is 100. High

ES_{100} values indicate a species rich faunal community, whereas low values indicate low species representation at the sampling station. See Appendix for ES values for other hypothetical sample sizes (Hurlbert's index). As might be expected from the diversity indices, the ES_{100} was highest at Station 11, with a value of 46.3 The lowest ES_{100} value of 17.8 was found at Station 26

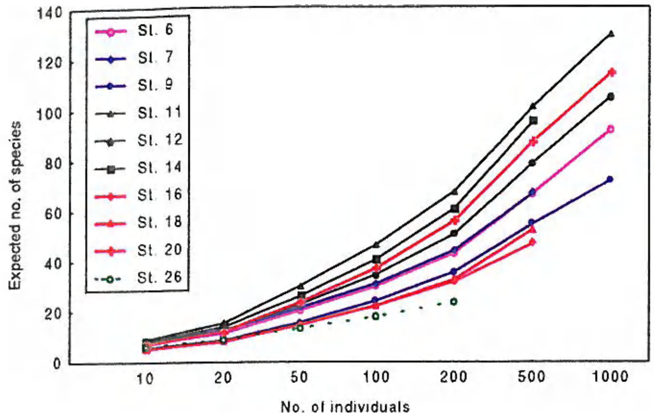


Figure 9. Plot of Hurlberts index results at the sampling stations.

The results of the Hurlbert's rarifaction are plotted in Figure 9. The start and endpoints of the individual curves are of importance in interpretation of the plots, as are the slope angles (or steepness) of the curves. High start and endpoints indicate a high number of species within the faunal community. Similarly, the steeper the slope, the more species rich the fauna is at the station concerned.

The curve for Station 26 has a very low end-point and shallow curve, relative to the remaining stations, indicating a species-poor fauna. Conversely, the curve for Station 11 is both steep and has a high end-point, indicating a species-rich fauna. The remaining stations have intermediate curves, ranging from Stations 14 and 20 at the species-rich end to Stations 16 and 18 at the species-poor end. Interestingly, the slopes for Stations 6 and 7 are very similar, although the curve for Station 7 is truncated due to a lower number of individuals present.

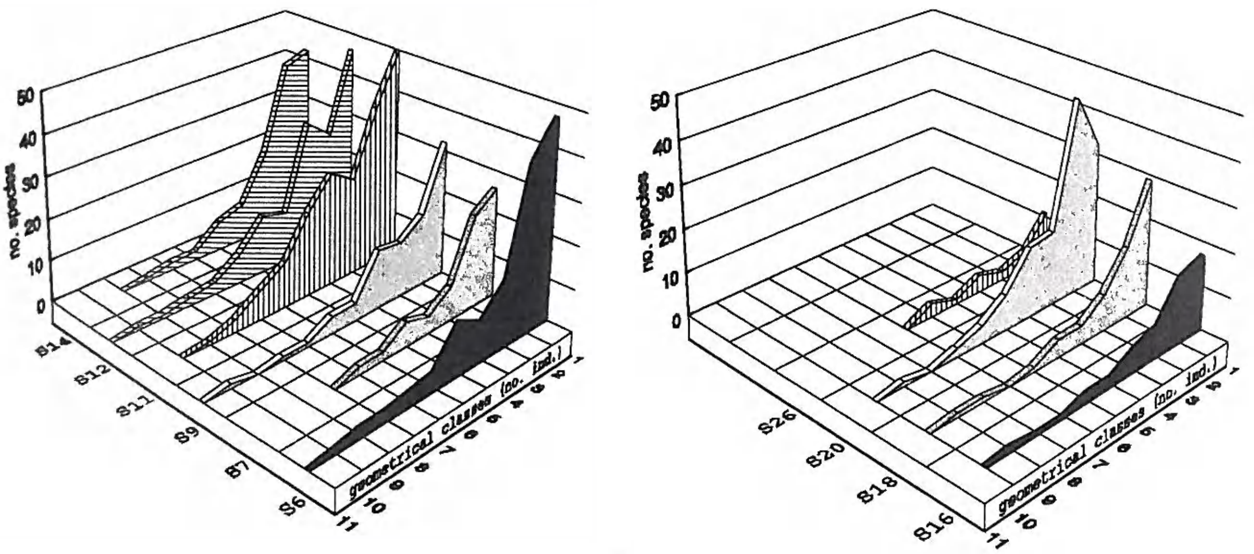


Figure 10. Plots of the distribution of species among geometrical abundance classes.

The distribution of species among geometrical abundance classes is presented in Figure 10. Data used to compile the plots are given in the Appendix. None of the stations sampled contained species in abundance class 11, and only Stations 6, 9 and 12 contained species in abundance class 10. This indicates that, although the latter 3 stations show a considerable degree of dominance by a few species, the majority of the stations do not show notably high dominance values. With a few minor exceptions, such as Station 12 which was somewhat jagged, the curves correspond reasonably well to the expected log-normal species distribution, with the majority of taxa being represented by only few individuals (low geometric class) and only a few species being present in higher numbers (high geometric class). Station 26, however, shows a rather unusual pattern, with a low species representation in all of the 6 abundance classes present. This indicates some degree of disturbance to the faunal community as a whole, the cause of which will be discussed further against a background of species analysis.

4.4 Station groupings

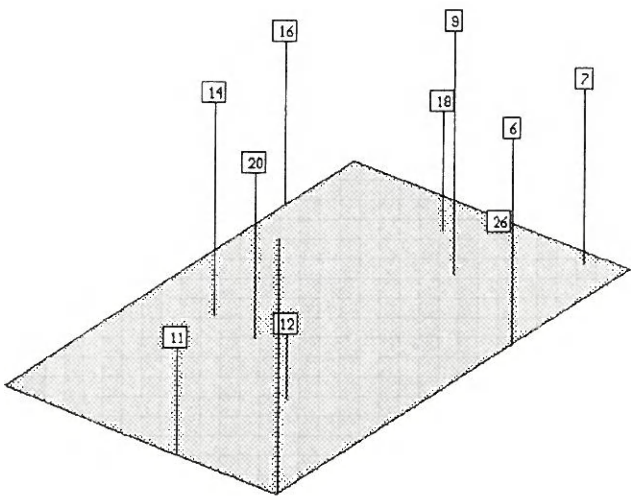


Figure 11. Three dimensional MDS plot, showing the sampling stations aligned according to maximum dispersion (faunal dissimilarity).

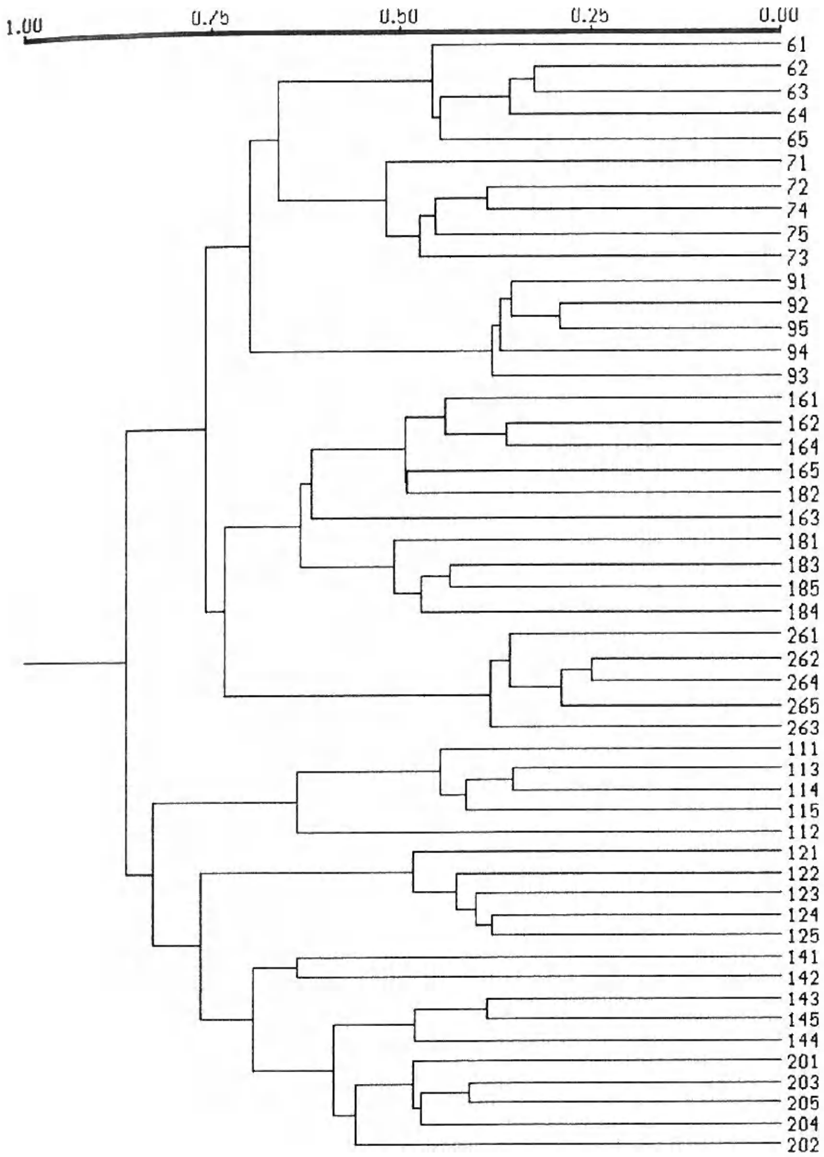
Figure 11 shows the plot of the three-dimensional MDS analysis. Full details of the tests applied are given in the appendix. The final stress value obtained was 0.06, which is considered a good fit to the data.

It is evident that there is a considerable degree of dissimilarity between all the stations, but there appears to be some separation at a general level. Stations 11, 12, 14 and 20 group loosely together, as do Stations 6, 7, 9, 18 and 26.

Using the Bray-Curtis index, cluster grouping of individual replicates was carried out on the faunal data. On the whole, there was a high degree of inter-replicate variation at the stations sampled, ranging from 25% dissimilarity (replicates 2 and 4 from Station 26) to more than 60% (replicate 3, Station 16). However, the replicates generally clustered according to sampling station, indicating higher inter-station dissimilarity than that between replicates. The exceptions to this were Stations 16 and 18, the replicates of which did not fully cluster according to station. Similarly, three replicates of Station 14 showed a closer affinity with Station 20 as a whole than with the remaining two replicates of Station 14. This suggests a certain degree of faunal similarity between the replicates of the stations involved.

The dendrogram obtained using replicate data is shown in Figure 12. The matrix correlation value r obtained indicates a good fit to the data. The full data matrix is given in the Appendix.

Figure 12. Bray-Curtis cluster analysis using whole-station data. Values along the x-axis represent dissimilarity. Note: a value of 0.75 represents 75 % dissimilarity.



Tests for association:
Matrix correlation:
r = 0.84711
(= normalised Mantel statistic Z)

Two main station groups can be discerned. Stations 11, 12, 14 and 20 separated from the remaining stations at more than 80 % dissimilarity. However, between the stations in this loose group, there was between 50 and 70 % dissimilarity, indicating that the faunal communities differ markedly between the stations. An even greater extent of dissimilarity was evident between the stations in the remaining group. Thus, no attempt will be made to assign the stations into faunal groups. However, it is interesting to note that, although differing in bathymetry, the stations comprising the lower cluster (Stations 11, 12, 14 and 20) are those with the coarsest sediment type.

The observed high inter-station dissimilarity, together with the wide range of physical and oceanographic conditions suggest that the stations sampled represent discrete faunal assemblages, although with some similarities in dominant species. A more detailed sampling programme, covering a wider range of sampling locations is required before any firmer conclusions can be drawn as to the nature of the faunal assemblages in the Northern Barents Sea.

4.5 Dominant species

Table 5 shows the ten most numerically dominant taxa at the stations sampled. It is immediately evident that, although some species are common to most stations, there are some marked differences in the dominant species across the sampling area.

Table 5. Listing of the ten most dominant taxa recorded at each of the 10 sampling stations (per 0.5 m^2). Phylum affiliation is as follows: A: Annelida, B: Bryozoa, C: Crustacea, E: Echinodermata, M: Mollusca, P: Protozoa, S: Sipunculida.

Station 6	Phy.	No.	Station 7	Phy.	No.	Station 9	Phy.	No.
Chone paucibranchiata	A	593	*Hyperammina subnodosa*	P	77	*Maldane sarsi*	A	798
Hyperammina subnodosa	P	314	*Onisimus* sp.	C	66	*Lumbriclymene minor*	A	221
Ostracoda indet.	C	285	*Maldane sarsi*	A	62	*Myriochele oculata*	A	107
Astroriza limicola	P	169	*Myriochele heeri*	A	46	*Lumbrineris* sp.	A	62
Thyasira ferruginea	M	132	*Spiochaetopterus typicus*	A	31	*Spiochaetopterus typicus**	A	45
Maldane sarsi	A	99	*Spiophanes kroeyeri*	A	30	*Golfingia minuta*	S	34
Myriochele heeri	A	73	*Thyasira ferruginea*	M	28	*Chaetozone* sp.	A	34
Astarte crenata	M	68	*Harpinia mucronata*	C	26	*Thyasira ferruginea*	M	22
Yoldiella solidula	M	59	*Astroriza limicola*	P	22	*Rhodine gracilior*	A	21
Maldanidae indet.	A	55	*Astarte crenata*	M	16	*Yoldiella solidula*	M	20

Station 11	Phy.	No.	Station 12	Phy-	No.	Station 14	Phy.	No.
Ophiura robusta	E	292	*Reussina impressa*	B	587	*Spiochaetopterus typicus*	A	152
Spirorbidae indet.	A	236	*Hyperammina subnodosa*	P	332	*Myriochele oculata*	A	116
Escharella ventricosa	B	228	*Electra arctica*	B	198	*Lumbrineris* sp.	A	76
Harmothoe imbricata	A	135	*Macoma calcarea*	M	142	*Nothria conchylega*	A	54
Pholoe synopthalmica	A	117	*Ophiura robusta*	E	123	*Ophiura robusta*	A	48
Spio armata	A	100	*Hippothoa divaricata*	B	102	*Maldane sarsi*	A	29
Munna sp.	C	72	*Escharella ventricosa*	B	72	*Terebellides stroemi*	A	28
Leucon nasicoides	C	70	*Microporella ciliata*	B	61	*Astarte crenata*	M	24
Chone paucibranchiata	A	69	*Lumbrineris* sp.	A	57	*Lepeta caeca*	M	23
Lysianassidae indet.	C	69	*Thyasira gouldi*	M	53	Cirratulidae indet.	A	22

Station 16	Phy.	No.	Station 18	Phy.	No.	Station 20	Phy.	No.
Spiochaetopterus typicus	A	290	*Spiochaetopterus typicus*	A	339	*Spiochaetopterus typicus*	A	457
Spiophanes kroeyeri	A	58	*Hyperammina subnodosa*	P	153	*Lumbrineris* sp.	A	110
Maldane sarsi	A	35	*Spiophanes kroeyeri*	A	46	*Ophiura robusta*	E	71
Paramphinome jeffreysii	A	25	*Lumbriclymene minor*	A	22	*Hyperammina subnodosa*	P	50
Myriochele oculata	A	16	*Thyasira ferruginea*	M	19	*Myriochele oculata*	A	47
Aglaophamus malmgreni	A	13	*Aglaophamus malmgreni*	A	18	*Heteromastus filiformis*	A	40
Praxillura longissima	A	10	*Maldane sarsi*	A	16	Cirratulidae indet.	A	32
Lumbrineris sp.	A	9	*Lumbrineris* sp.	A	12	*Pholoe synopthalmica*	A	29
Cirratulidae indet.	A	9	*Ctenodiscus crispatus*	E	12	*Leitoscoloplos* sp.	A	25
Ctenodiscus crispatus	E	8	*Paramphinome jeffreysii*	A	9	*Ophiocten sericeum*	E	20

Station 26	Phy-	No.
Spiochaetopterus typicus	A	59
Thyasira ferruginea	M	38
Cirratulidae indet.	A	32
Hyperammina subnodosa	P	26
Thyasira equalis	M	12
Yoldiella lenticula	M	10
Aglaophamus malmgreni	A	9
Heteromastus filiformis	A	8
Artacama proboscidea	A	7
Alvania cruenta	M	4

* Note: This genus is under revision. *Spiochaetopterus typicus*, originally described from southern latitudes, is recorded world-wide, and from a very wide range of habitats. There is also a great deal of morphological variation in specimens from different areas, such that it would be prudent to refer to the specimens as *Spiochaetopterus* sp. However, the species name is retained here, in keeping with earlier analyses of this data (Dahle & al 1995a).

Among the numerically most dominant taxa was *Maldane sarsi* (Polychaeta), a tubiferous sub-surface deposit feeder reputed to adopt an upside-down position in the sediment. *Spiochaetopterus typicus* (Polychaeta), inhabiting a horny self-secreted tube and feeding from deposited, or near-bottom deposited material, is also among the dominants. *Lumbrineris* spp. (Polychaeta) was also consistently abundant at most of the stations. These three taxa were also among the top dominants in the Pechora Sea (Dahle & al. 1998). Station 6, and, to a lesser degree, Station 11 contained large numbers of the suspensivore *Chone paucibranchiata* (Polychaeta). The deeper stations contained large numbers of *Hyperammina subnodosa* (macrofaunal Foraminifera), but the precise role of these animals in the community is still unclear.

The dominant taxa at Stations 11 and 12 were notably different than those at the other stations. The fauna at Station 11 on the Spitsbergen Bank, was numerically dominated by *Ophiura robusta* (Echinodermata), which was also found in the mixed sediments around the entrance to the Kara Strait (Dahle & al. 1998) and unidentified members of the encrusting suspensivorous Spirorbidae (Polychaeta). The next dominants at this station were *Escharella ventricosa* (Bryozoa), *Harmothoe imbricata* and *Pholoe synopthalmica* (both Polychaeta), all of which are typical of hard or mixed bottom sediments. In addition to *Hyperammina subnodosa, Ophiura robusta* and *Escharella ventricosa*, Station 12 was numerically dominated by Bryozoa and Bivalvia.

4.6 Relationship with environmental variables

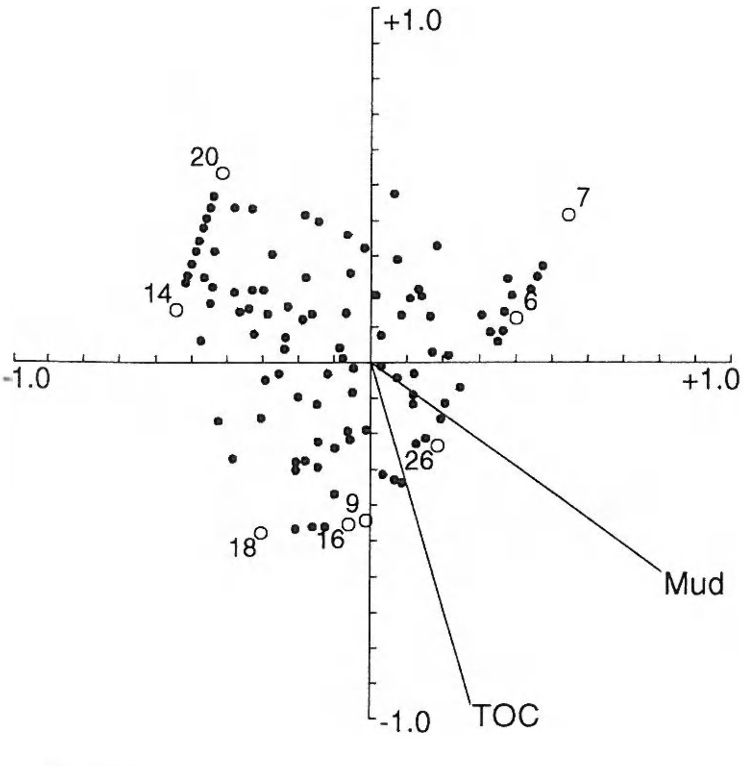


Figure 13. CCA plot of all species (solid circles) and stations (open circles). Stations 11 and 12 are excluded due to missing environmental data).

To test the relationship between biological and physical characteristics of the sediments sampled, and therefore aid the interpretation of the data, Canonical Correspondence Analysis (CCA) was carried out, using the faunal frequency data, together with the following environmental variables: depth, % mud, % sand and TOC. Stations 11 and 12 were omitted due to missing environmental data. The CCA plot obtained for all species and all included stations is shown in Figure 13.

However, there was a very low correlation between the environmental variables and the species distribution. Using a fairly low level of significance (7 %) mud was the only significant environmental variable ($p=0.066$). As a result, only the first axis of the CCA plot may be used in interpretation. The variable TOC was added to the plot in order to create a second dimension, for visual ease of interpretation.

As expected from the granulometric data, Stations 7, 6, 26, 9 and 16 are most strongly associated with the Mud axis, while Stations 20 and 14 show the least affinity with this variable. In general, the distribution of species appears relatively scattered, but there are some species strongly associated with some stations, particularly Stations 14, 20 and 6. Species whose inertia explain more than 1 % of the first axis are shown in Figure 14.

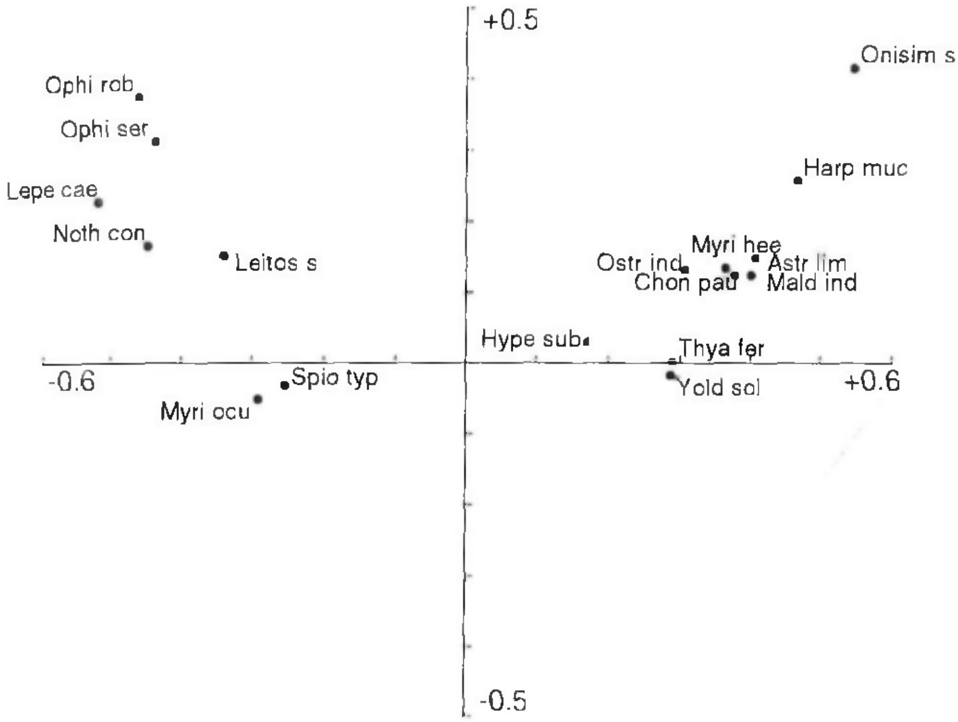


Figure 14. Detail of Figure 13, showing species whose inertia explain more than 1 % of the first canonical axis. Key to species names: Ast lim: Astroriza limnicola, *Chon pau:* Chone paucibranchiata, *Harp muc:* Harpinia mucronata, *Hype sub:* Hyperammina subnodosa, *Leitos s:* Leitoscoloplos *sp., Lepe cae:* Lepeta caeca, *Mald ind: Maldanidae indet., Myri hee:* Myriochele heeri, *Myri ocu:* Myriochele oculata, *Noth con:* Nothria conchylega, *Onisim s:* Onismus *sp.Ophi rob:* Ophiura robusta, *Ophi ser:* Ophiocten sericeum, *Ostr ind: Ostracoda indet., Spio typ:* Spiochaetopterus typicus, *Thya fer:* Thyasira ferruginosa, *Yold sol:* Yoldiella solidula. *Phylum/ class affiliation is given in Table 5.*

It should be noted that *Ophiura robusta, Ophiocten sericeum, Lepeta caeca* and *Nothria conchylega* are negatively associated with mud. This reflects the habitat preference of these species, which are known to favour coarser sediments. There were no species which showed a strong affinity for mud.

5. Discussion

5.1 Faunal composition and environmental conditions

5.1.1 South of Kong Karl's Land

Station 6, located on the slope south of Kong Karl's land has a depth of 201 m and comprises over 90 % fine silt-clay, muddy sediments. The biomass was relatively low, but the A/S value was among the highest of all the sampling stations. The fact that the H' diversity index was only of average value may reflect the presence of a few species which were present in very high numbers. Examination of geometrical abundance classes shows the presence of species in almost all abundance classes, i.e. the population contains rare, relatively abundant as well as numerically dominant species. The top three numerically abundant taxa were present in such high numbers that a degree of opportunism is suggested. However, since all the major phyla were represented in the populations sampled, and there were no other signs of disturbance to the population, this is considered to represent natural conditions in the area. The suspensivore *Chone paucibranchiata* (Polychaeta) was numerically dominant at Station 6, followed by *Hyperammina subnodosa* (macrofaunal Foraminifera), although the role this species plays in the benthic community is not clear. The Ostracoda (Crustacea) were also numerically well represented at this station. Observation of benthic samples kept live in aquaria suggest that at least some species of Ostracoda move actively in the upper flocculent sediment layers, feeding from deposited detritus (personal observation). In common with large areas in the Pechora Sea, the tubiforous *Maldane sarsi* (Polychaeta) was amongst the dominant organisms present.

Slightly further east, at Station 7, in the muddy depression of 320 m depth south of Kong Karl's Land, the numerically dominant species were generally similar to those found at Station 6. However, there was a striking decrease in numbers of individuals present. Whereas the numerically dominant species at the former station comprised almost 600 individuals per 0.5 m^2, the dominant species at Station 7 comprised only 77 individuals for the same sampling area. The biomass at this station was also very low, despite a relatively high TOC content in the sediment. The Echinodermata were poorly represented at this station, which can often indicate a certain degree of faunal disturbance. Selected environmental contaminant data are available for this sampling station, but only arsenic levels were found to be significantly elevated (dos Santos & al. 1996), with respect to standard levels developed for Norwegian coastal waters (Molvær & al. 1997). It is considered that the paucity of animals at this sampling station reflects natural conditions in the area, most likely a function of water depth, since the other two deep stations (>300 m), Stations 16 and 18, also contained low numbers of taxa and individuals, although the biomass was not notably low at the latter stations.

5.1.2 Transect from Storfjord Trough through the Hopen Trough

Station 9, located in 253 m depth in the Storfjord Trough, was numerically dominated by polychaete worms, the most numerous being *Maldane sarsi*. This species is believed to feed well below the sediment surface, and often inhabits the underlying glacio-marine sediments which are present in large areas of the arctic ocean (Dahle & al. 1998). However, these individuals were generally of a relatively small body size, as supported by the relatively low biomass at this station. The next dominant is *Lumbriclymene minor* (Polychaeta), which belongs to the same family, and is believed to adopt a similar life-style as *Maldane*. It is interesting that, while Stations 6 and 7 contained high numbers of *Myriochele heeri* (Polychaeta), *Myriochele oculata* was the third dominant at Station 9. The feeding mode(s) of this genus is not clear, but these may be utilising a combination of suspension and surface deposit feeding. All the major phyla were well represented at this station.

The fauna present at Stations 11, 12 and, to a certain extent 14, reflect the stony nature of the sediments in the areas, with an abundance of suspensivorous Bryozoa, such as *Reussina impressa*, as well as the exclusively suspensivorous polychaete family Spirorbidae. In addition, the echinoderm *Ophiura robusta*, known to move actively over hard substrates (Kuznetzov 1970) was amongst the dominant taxa. The polychaete *Spiochaetopterus typicus*, which was amongst the numerically dominant taxa at Stations 14 and 20, appears to burrow within the glacio-marine clay which underlies the flocculent surface sediment in large parts of the Arctic ocean (see also Dahle & al. 1998). The species is reputed to feed from deposits at the sediment surface, but also appears capable of suspension feeding.

Stations 16 and 18, located in or near the Hopen Trough, contained an abundance of *Spiochaetopterus typicus*, as well as the macrofaunal foraminiferan *Hyperammina nodosa*, which has also been found in abundance in certain areas of the Pechora and Kara Seas (Dahle & al. 1998; Evenset & al. 1998), although the ecological niche occupied by this species is not yet clear. It is clear, however, that this species is widespread in certain areas of the Arctic, and evidently plays a major role in the benthic community. The polychaete *Spiophanes kroyeri*, which feeds from the sediment surface, may inhabit the flocculent sediment overlying the glacio-marine clay.

Station 26, located in the deep depression south-east of Edgeøya, contains a notably less diverse fauna than the remaining stations, with a low numerical dominance of *Spiochaetopterus typicus* and *Hyperammina subnodosa*, both species appearing to have a widespread distribution in the Barents Sea. The two next numerically dominant species were the bivalve mollusc *Thyasira ferruginea* and unidentified members of the polychaete family Cirratulidae, both of which inhabit the fine flocculent surface sediments. Interestingly, these two species were found to be amongst the dominants in the poorly oxygenated sediments in Chernaya Bay, in the Pechora Sea (Dahle & al. 1998). By analogy with the known habitats of other Lucinacea (Dando & al. 1985), *Thyasira ferruginea* may inhabit the redox interface between oxic and anoxic sedimentary conditions, utilising symbiotic sulphate reducing bacteria. At Station 26, this is likely to reflect a low bottom water exchange rate in the deep topographical depression.

5.2 CCA and sampling design

The fact that only one weakly significant environmental variable was found is somewhat surprising initially, but on reflection, this indicates that we do not yet fully understand the factors which structure the benthic communities in the sampling area. By way of comparison, similar analyses carried out on data from the Pechora Sea indicate that water depth and sediment granulometry play a major role in structuring the benthic fauna (Dahle & al. 1998). The high inter-replicate and inter-station variability in the faunal data from the northern Barents Sea indicates high patchiness in faunal distribution. In pristine areas, the distribution of benthic fauna is largely influenced by physical conditions in the area, thus it is likely that there also is a high extent of patchiness in the environmental variables investigated. It should also be borne in mind that even small-scale spatial variation in environmental conditions can lead to high inter-replicate dissimilarity. In this context, it should again be noted that, although the faunal sampling is based on 5 replicates per sampling station, the TOC, granulometric (and also sediment chemistry where available) results are obtained from only a single replicate per station. It is possible that the CCA results might have been different had either more replicates been taken for physical analyses, or if environmental variables had been analysed from a sub-sample from each of the faunal replicates.

This issue requires careful consideration when planning future sampling programmes in such heterogeneous conditions. At present, it is standard practice in offshore monitoring to analyse physical and chemical variables from a total of three replicates (Molvær & al. 1997), while the issue is still under discussion in the Norwegian standard for faunal sampling (NAS *in prep*). It is likely that spatial variation in bottom topography in the sampling area in question will be taken into account when planning the number of replicates to be taken for physical analyses of the sediment.

5.3 Sediment-biota interactions

Faunal analyses often are carried out without a comprehensive knowledge of the sedimentary processes in the areas concerned. This shortcoming also applies to the present study. Although the main environmental trends are revealed, it is difficult to separate natural variation from anthropogenic impact, without an understanding of the sedimentary processes operative in the study area. This is particularly important in Arctic areas, which are exposed to marked seasonality, ice-edge effects (and their impact on production and benthic-pelagic coupling), meltwater effects as well as the physical impact of ice-scouring. In addition, polar front processes, and the influence of the different water masses which cover the Arctic Basin, should not be ignored. However, the following information is restricted to three environmental parameters which are measurable, and as such, can easily be incorporated into statistical analyses of benthic fauna, to discern environmental trends and changes therein. An understanding of these three parameters is expected significantly to improve the value of the faunal analyses.

5.3.1 Sedimentation rate

There exists a complex and dynamic interaction between the physical sedimentation processes and the benthic fauna. Perhaps the most obvious effect is the purely physical impact of sedimentation on marine benthic communities. It may be the case that areas with a higher sedimentation rate are favoured by a different type of fauna, both in terms of species representation as well as longevity, than areas of low sedimentation.

However, perhaps the most influential is the manner in which sedimentation affects food availability in the marine benthos. Recent studies indicate that benthic infaunal organisms feeding at the water-sediment interface are more likely to utilize immediately seasonal pulses of sedimentation by phytoplankton to the bottom than deeper burrowing subsurface deposit feeders. In this regard, surface deposit feeders would be more likely to exhibit seasonality in their reproduction and recruitment than subsurface deposit feeders (Blake 1993). Therefore the degree to which a single, or even annual, faunal sampling programme represents the community structure also is likely to be area dependent.

In general, the larger, fast-settling particles (which may be individual grains or agglomerates thereof) contain more bioavailable (sorbed) food material than their slow-settling counterparts. This is largely due to the fact that the faster a particle settles, the less time there is for the sorbed material to break down in the water column. Thus, the sedimentation rate, and the type of particles which settle, can have a profound effect on sedimentary food availability, which in turn is a major determining factor in benthic community structure.

The influence of depth on sedimentation rates, as a function of food availability, also should be considered. The deeper the sea bottom, the longer it will take for an individual particle to make its journey through the water column to the point of settling. This allows for a greater extent of decomposition of organic material in the water column, such that any individual particle will have a lesser 'food-value' by the time it reaches the deep sea, relative to the value it might have had, had it settled on a shallower area of the sea floor. Sediment accumulation rate indeed has been shown strongly to be correlated with organic carbon preservation in marine sediments (Kuehl & al. 1993; DeMaster & al. 1996).

Although traditional faunal analyses take into account sediment grain size composition, organic content and water depth, information on bioavailable food material often is lost, since many analyses measure the level of total organic carbon (TOC), rather than the 'bio-available' organic material which is readily available as a food source to the benthos.

A further aspect of the dynamic, 2-way interaction between the fauna and sedimentation warrants consideration. The sedimentation regime in a particular area may affect the type of organisms inhabiting the sediments, for example by influencing the proportion of burrowing vs. surface-dwelling or detritivorous vs. suspensivorous organisms. On the other hand, a dense carpet of suspensivorous organisms (such as carpets of soft-bottom corals or suspensivorous worms) will reduce the proportion of settling particles which reach the bottom. The community structure is therefore determined by a large variety of inter-related factors.

In addition to these biological implications of sedimentation, a high sedimentation rate gives a higher potential for contaminant deposition than in areas of low sedimentation. In such high sedimentation areas, not only will the actual quantity of contaminants in the sediments be higher than in low-sedimentation areas, but the depth of effects also will be greater. Whereas in areas with low sedimentation rates, contaminants deposited over the past decade may be confined to the top few millimetres of sediment, in areas of high sedimentation, these contaminants may be present in several centimetres of sediment. This, in turn, affects the exposure of benthic organisms, which live and feed in different depths of the sediment.

It is thus evident that the sedimentation rate is a major controller of benthic conditions, and must be taken into account in order to give more meaning to interpretations of benthic faunal community structure. An added bonus of this technique is that it provides an assessment of the rate at which contaminants accumulate in the sediments over time, and whether the net levels stay constant or fluctuate over the long term.

5.3.2 Bioturbation

Another major impact on sedimentary processes, which both affects and is affected by benthic fauna is the extent and intensity of bioturbation, often referred to as sedimentary reworking.

Bioturbation increases the amount and depth of oxygenation in the sediments, which in turn affects the amount and type of inhabitant organisms present (see Harkantra 1989). However, bioturbation also has a profound effect on the behaviour of contaminants, since it affects the dynamics of pore water exchange. Contaminated sediments settling at the sediment surface (in a manner dependent on the sedimentation rate) will diffuse down into the sediments until they reach the zone of anoxia, or the redox layer. Below this level, sediment pore-water exchange reactions occur in the absence of oxygen, releasing previously sorbed contaminants into the porewater (Santschi & al. 1990). Bioturbation loosens the sediment, depresses the redox layer and facilitates pore-water diffusion (Aller 1982; 1984). Contaminated particles below the redox boundary can therefore be a source of contaminants to pore-waters, which are re-introduced in the oxygenated sediment layers by organisms reworking the sediments.

Organisms can, therefore, a) depress the redox boundary, such that contaminants remain sorbed to particles or b) facilitate porewater exchange from below the redox boundary, such that desorbed contaminants are efficiently transported back into the oxygenated layers. In this way, the organisms themselves, as a result of their bioturbation activities, influence the behaviour of the deposited contaminants and thereby affect their own exposure. In turn, this has implications for contaminant entry into the food web, particularly since, for some contaminants such as some PCBs, bioturbation-driven transport may be several orders of magnitude more rapid than molecular-driven processes (Bosworth & Thibodeaux 1990).

It is clear, therefore, that sediment mixing depth (with its implication for sediment oxygenation and pore-water properties), in addition to the sedimentation rate, should be included in any investigation which uses benthic faunal communities as a tool for assessment of environmental conditions.

5.3.3 Bio-availability

Traditionally, marine environmental monitoring programmes have assessed the levels of a range of contaminants, usually in the sediments, but also in the water column and in the tissues of organisms (see Evenset & al. *in prep*). However, in the present study, only the surface sediments themselves were analysed for a range of heavy metals, hydrocarbons and total organic carbon (TOC). As seen above, none of these variables significantly explained the biological variance in CCA.

In pristine areas, it is expected that food and habitat availability (including competition) are the major factors which structure the benthic communities. Contaminants may cause habitat destruction or fragmentation, or act directly on the organisms themselves after injestion, for example by depressing metabolism or respiration. Thus it is important to distinguish biological and non-biological effects of the various contaminants. Organisms can accumulate or degrade compounds only when they are bio-available. Non bio-available compounds either may alter the physical environment, or have no effect on the biota.

In the present study, which was carried out according to standardised monitoring methodology (SFT 1990), there is no consideration of bio-availability of any of the compounds analysed. Of most concern in the context of interpreting trends in faunal community structure is the lack of data on bio-available carbon. Thus, although the principle applies to all contaminants, the following discussion focuses on organic carbon.

The total organic carbon (TOC) value includes particle-bound material which is not available to the benthos as a food source. Since the level of particle-bound organic carbon generally is higher in fine relative to course sediments, it is likely that the overall TOC value will strongly be influenced by the sediment type. Thus, if silty sediments in a particular area show a high TOC value, this does not necessarily reflect food availability and, as such, cannot meaningfully be used in interpretation of faunal trends.

Similarly, organic carbon levels also are related to sediment particle surface area and pore size, the hypothesis being that organic matter can become protected by its location inside pores too small to allow functioning of the hydrolytic enzymes necessary for organic matter decay (Mayer 1994a, b). This might go some way towards explaining the marked spatial heterogeneity which often is apparent in TOC content between locations. In many ways, therefore, simple consideration of TOC levels in a given sediment can be extremely misleading. The unreliability of TOC in faunal interpretation is supported by Schaff & al. (1992), who found that trends in macrofaunal abundance did not follow those of sediment TOC, but agreed well with estimates of sediment flux.

Studies of carbon flux are perhaps by necessity limited to larger-scale, multi-diciplinary approaches to understanding a particular ecosystem. However, a measure of bio-available carbon in sediments would provide more meaningful information than TOC, and will explain the observed trends in the benthic fauna to a far greater extent than is possible with the current choice of background variables. An enzymatic method is available, and has been used to determine the amount of bio-available organic carbon in marine sediments (see Taghon & Greene 1992). It is considered essential to incorporate this parameter into further benthic monitoring programmes.

6. Conclusions

From the results of this study, the following conclusions may be drawn:

- Much information on the environmental conditions in the study area has been obtained through the analyses of benthic fauna in the present report. As such, benthic faunal analyses can be recommended as an integral part of environmental monitoring in the Arctic, after certain modifications, as outlined in Dahle & al. (1995b). In addition, benthic faunal analyses represent an invaluable tool, at the species level for biodiversity mapping and, at the community level, for environmental effect studies.
- This study has made clear the need to combine different environmental parameters with the faunal analyses, in order to minimise the risk of misinterpretation of the data. This is particularly important in areas with heterogeneous bottom sediments or oceanographic regimes. Future faunal sampling expeditions to the Barents Sea should incorporate a wider range of background variables, such as sedimentation rate, bioturbation and bio-available carbon.
- In areas with heterogeneous sedimentary conditions, such as the Northern Barents Sea, the question of how many replicates should be taken for environmental parameters such as granulometry and organic content should be addressed. Also, the question of whether these

should be sub-sampled from the main faunal sample, or taken from separate samples should be re-assessed. These questions are currently under consideration for Norwegian standards of sampling procedures (NAS *in prep*).

- There is a large spatial variation in bottom conditions throughout the sampling field as a whole, and this is reflected in a very heterogeneous faunal composition across the area.
- The high between-sample dissimilarity in both the species present and their relative abundances indicate that the biodiversity in the northern Barents Sea, in common with other relatively shallow Arctic areas, is high. The areas noted to contain a high faunal diversity and abundance should be the subject of future investigations. Similarly, areas containing a low biodiversity should be investigated further, in order to understand the underlying causes for this. Also, as noted in previous studies, taxa which have been shown to play a major role in Arctic communities, such as the Foraminifera, should also be investigated more thoroughly, from an ecological point of view.

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APPENDIX I

- ***Overview of faunal data for all replicates***

PHYLUM	CLASS	ORDER	NAME	Total Sum	Max. no. pr Repl.	No.Repl. with Species
FORAMINIFERA						
			Hyperammina sp.	366	88	7
			Astrorisa limicola	194	49	11
			Foraminifera indet.	609	215	18
PORIFERA						
			Porifera indet.	19	6	7
CNIDARIA						
	Hydrozoa					
			Halecium muricatum	11	6	2
			Monobrachium parasitum	6	3	3
			Laomedea sp.	2	2	1
			Sertulariidae indet.	1	1	1
	Anthozoa					
			Anthozoa indet.	9	3	5
			Edwardsiidae indet.	13	3	7
			Gersemia glomerata	2	1	2
			Gersemia rubiformis	3	2	2
			Alcyonacea indet.	5	2	3
			Actinia sp.	1	1	1
			Limnactinia laevis	1	1	1
NEMERTINI						
			Nemertini indet.	56	15	20
NEMATODA						
			Nematoda indet.	25	18	6
PRIAPULIDA						
			Priapulus caudatus	4	1	4
SIPUNCULIDA						
			Phascolion strombus	16	3	10
			Golfingia glacialis	8	4	3
			Golfingia margaritacea	13	4	6
			Golfingia sp.	20	15	5
			Nephasoma minutum	50	13	13
			Sipunculida indet.	12	5	7

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
ANNELIDA						
	Polychaeta					
		Orbiniida				
			Leitoscoloplos sp.	94	12	28
			Aricidea hartmanni	4	1	4
			Cirrophorus branchiatus	2	1	2
			Paraonella sp.	2	2	1
			Paraonis gracilis	15	3	8
			Paraonis sp.	1	1	1
			Paradoneis lyra	3	2	2
			Paradoneis eliasoni	1	1	1
		Cossurida				
			Cossura longocirrata	2	1	2
		Spionida				
			Apistobranchus sp.	7	2	5
			Laonice cirrata	6	2	5
			Laonice sarsi	1	1	1
			Marenzelleria sp.	3	1	3
			Polydora caulleryi	17	7	4
			Polydora ciliata	1	1	1
			Polydora sp.	18	7	6
			Pygospio elegans	1	1	1
			Spio armata	100	30	4
			Spio decoratus	4	4	1
			Spio filicornis	1	1	1
			Spio martinensis	10	7	3
			Spiophanes kroyeri	172	35	29
			Spiochaetopterus typicus	1403	129	41
			Chaetozone sp.	85	13	22
			Cirratulus cirratus	3	2	2
			Cirratulidae indet.	180	15	38
		Capitellida				
			Capitella capitata	12	5	5
			Heteromastus filiformis	64	15	17
			Notomastus latericeus	2	1	2
			Rhodine gracilior	21	9	5
			Lumbriclymene minor	247	78	13
			Notoproctus oculatus	3	2	2
			Praxillura longissima	22	7	8
			Nicomache lumbricalis	2	1	2
			Nicomache sp.	42	20	10
			Petaloproctus sp.	1	1	1
			Maldane sarsi	1049	232	35
			Maldane sp.	3	3	1
			Clymenura polaris	10	3	7
			Praxillella gracilis	2	1	2
			Praxillella praetermissa	42	14	7
			Euclymeninae indet.	16	3	11
			Maldanidae indet. juv.	55	30	4
		Opheliida				
			Ophelina abranchiata	7	2	4
			Ophelina acuminata	2	1	2
			Scalibregma inflatum	85	17	19
		Phyllodocida				
			Eteone sp.	27	7	14
			Phyllodoce groenlandica	12	2	11
			Antinoella sp.	2	1	2
			Eunoe sp.	4	2	2
			Gattyana sp.	7	3	5
			Harmothoe fragilis	1	1	1
			Harmothoe imbricata	135	43	4
			Harmothoe impar	10	7	3
			Harmothoe sp.	14	4	7
			Nemidia torelli	1	1	1
			Polynoidae indet.	14	6	6
			Pholoe synopthalmica	201	47	20
			Pilargidae indet.	2	1	2

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
			Autolytus sp.	4	1	4
			Eusyllis blomstrandi	1	1	1
			Pionosyllis sp.	13	5	4
			Proceraea sp.	24	12	5
			Sphaerosyllis erinaceus	8	4	4
			Syllis sp.	43	17	4
			Langerhansia cornuta	22	11	9
			Typosyllis sp.	2	1	2
			Nereis zonata	8	4	4
			Glycera capitata	11	5	6
			Aglaophamus malmgreni	51	7	21
			Nephtys ciliata	15	2	13
			Nephtys paradoxa	18	3	10
			Nephtys pente	10	5	4
			Nephtys sp. juv.	1	1	1
			Sphaerodorum gracilis	6	4	3
		Amphinomida				
			Paramphinome jeffreysii	34	10	9
		Eunicida				
			Nothria conchylega	64	34	9
			Abyssoninoe hibernica	1	1	1
			Lumbrineris sp.	346	39	34
			Scoletoma fragilis	1	1	1
			Lumbrineridae indet.	2	1	2
			Ophryotrocha sp.	3	2	2
		Owenlida				
			Myriochele fragilis	57	19	11
			Myriochele heeri	143	26	19
			Myriochele oculata	307	31	27
			Owenia fusiformis	9	5	4
		Flabelligerida				
			Brada inhabilis	2	1	2
			Brada villosa	4	2	3
			Diplocirrus hirsutus	7	1	7
			Flabelligera sp.	1	1	1
			Pherusa plumosa	9	2	7
			Pherusa arctica	1	1	1
			Flabelligeridae indet.	3	3	1
		Terebellida				
			Pectinaria hyperborea	16	4	8
			Ampharete finmarchica	14	2	9
			Ampharete goesi	6	3	3
			Ampharete lindstroemi	1	1	1
			Ampharete sp.	2	2	1
			Amphicteis gunneri	1	1	1
			Eclysippe vanelli	1	1	1
			Glyphanostomum pallescens	13	7	5
			Lysippe labiata	31	8	11
			Melinna cristata	11	2	9
			Melythasides laubieri	2	1	2
			Sosane gracilis	6	1	6
			Sosanopsis wireni	1	1	1
			Amphitrite cirrata	13	3	7
			Artacama proboscidea	7	4	3
			Lanassa nordenskioeldi	1	1	1
			Lanassa venusta	3	1	3
			Laphania boecki	61	19	10
			Leaena ebranchiata	1	1	1
			Lanassa/Leaena sp.	4	1	4
			Paramphitrite birulai	3	2	2
			Phisidia aurea	3	2	2
			Pista sp.	1	1	1
			Polycirrus arcticus	2	1	2
			Polycirrus medusa	38	10	8
			Proclea graffi	22	9	4
			Thelepus cincinnatus	8	4	4
			Terebellidae indet.	6	2	4
			Terebellides stroemi	107	14	27
			Trichobranchus glacialis	13	4	7

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
		Sabellida				
			Chone cf. duneri	2	1	2
			Chone infundibuliformis	4	3	2
			Chone paucibranchiata	690	191	20
			Chone sp.	15	3	8
			Euchone elegans	3	2	2
			Euchone papillosa	5	1	5
			Euchone sp.	2	1	2
			Myxicola infundibulum	3	2	2
			Sabella sp.	1	1	1
			Chitinopoma serrula	21	9	4
			Protula sp.	1	1	1
			Serpula sp.	3	3	1
			Spirorbis sp.	12	12	1
			Spirorbidae indet.	242	110	7
			Polychaeta indet.	15	5	5
CHELICERATA						
	Pycnogonida					
		Pantopoda				
			Pantopoda indet.	3	1	3
			Pycnogonida indet.	3	1	3
CRUSTACEA						
	Ostracoda					
			Ostracoda indet.	334	76	23
	Cirripedia					
		Thoracica				
			Balanus balanus	22	14	4
			Balanus crenatus	2	1	2
			Balanus sp.	7	3	3
	Malacostraca					
		Cumacea				
			Eudorella emarginata	33	5	20
			Eudorella sp.	4	2	3
			Leucon nasica	4	3	2
			Leucon nasicoides	72	32	6
			Leucon sp.	12	3	7
			Campylaspis rubicunda	2	1	2
			Brachydiastylis resima	24	12	5
			Diastylis goodsiri	1	1	1
			Diastylis rathkei	5	3	3
			Diastylis spinulosa	1	1	1
			Diastylis sp.	2	1	2
			Diastylidae indet.	2	2	1
		Tanaidacea				
			Spyraphus anomalus	8	4	5
			Tanaidacea indet.	5	2	4
		Amphipoda				
			Acanthonotozoma serratum	2	1	2
			Ampelisca eschrichti	3	1	3
			Ampelisca macrocephala	3	1	3
			Byblis sp.	4	3	2
			Haploops tubicola	22	4	14
			Ampeliscidae indet.	2	2	1
			Amphilochidae indet.	3	1	3
			Unciola leucopis	1	1	1
			Aoridae indet.	2	1	2
			Argissa hamatipes	1	1	1
			Atylus smitti	1	1	1
			Apherusa sarsii	3	3	1
			Eusirus cuspidatus	1	1	1

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
			Rhachotropis aculeata	1	1	1
			Photis sp.	1	1	1
			Isaeidae indet.	2	1	2
			Ischyrocerus sp.	8	4	3
			Idunella aequicornis	1	1	1
			Anonyx nugax	10	8	2
			Hippomedon sp.	8	3	5
			Onisimus sp.	66	65	2
			Lysianassidae indet.	80	25	13
			Maera sp.	1	1	1
			Melita dentata	34	23	5
			Odius carinatus	2	1	2
			Arrhis phyllonyx	17	5	9
			Monoculodes tuberculatus	1	1	1
			Monoculodes sp.	8	2	6
			Paroediceros propinquus	1	1	1
			Nicippe tumida	3	2	2
			Pardalisca cuspidata	1	1	1
			Pardalisca sp.	7	4	3
			Harpinia mucronata	57	11	10
			Harpinia serrata	2	1	2
			Harpinia sp.	17	6	6
			Paraphoxus oculatus	2	2	1
			Phoxocephalus holbolli	3	2	2
			Parapleustes bicuspis	19	12	2
			Dulichia spinosissima	1	1	1
			Podoceridae indet.	5	3	3
			Stenothoidae indet.	69	44	4
			Syrrhoe crenulata	20	11	6
			Tiron spiniferus	14	9	5
			Gammaridea indet.	6	2	4
			Parathemisto libellula	1	1	1
			Parathemisto sp.	2	1	2
			Hyperiidae indet.	1	1	1
			Amphipoda indet.	1	1	1
		Isopoda				
			Gnathia oxyurea	6	2	4
			Gnathia sp.	18	5	10
			Calathura brachiata	5	2	4
			Saduria sp.	2	1	2
			Munna sp.	72	28	5
			Asellota indet.	1	1	1
			Isopoda indet.	2	1	2
		Decapoda				
			Hippolytidae indet.	2	2	1
			Natantia indet.	3	1	3
			Paguridae indet.	2	1	2
			Hyas araneus	2	2	1
			Crustacea indet.	9	5	4
MOLLUSCA						
	Caudofoveata					
		Chaetodermatida				
			Chaetoderma intermedium	1	1	1
			Chaetoderma nitidulum	3	1	3
			Caudofoveata indet.	22	5	10
	Polyplacophora					
		Ischnochitonidae				
			Ischnochiton albus	40	12	12
	Prosobranchia					

PHYLUM	CLASS	ORDER	NAME	Total Sum	Max. no. pr Repl.	No.Repl. with Species
		Archaeogastropoda				
			Puncturella noachina	13	6	4
			Lepeta caeca	55	12	14
			Margarites costalis	5	3	3
			Margarites helicinus	3	3	1
			Margarites olivaceus	23	9	7
			Moelleria costulata	22	14	3
		Mesogastropoda				
			Alvania cruenta	17	4	8
			Alvania jeffreysi	1	1	1
			Alvania scrobiculata	3	2	2
			Frigidoalvania janmayeni	7	5	3
			Trichotropis borealis	1	1	1
			Cryptonatica affinis	1	1	1
			Polinices nanus	1	1	1
			Polynices pallidus	5	1	5
		Neogastropoda				
			Trophon clathratus	1	1	1
			Colus sp. juv.	1	1	1
			Oenopota pyramidalis	5	3	3
			Oenopota sp.	3	1	3
	Opistobranchia					
		Pyramidellomorpha				
			Menestho truncatula	1	1	1
		Cephalaspidea				
			Diaphana minuta	3	2	2
			Philine finmarchica	1	1	1
			Cylichna alba	9	3	7
			Gastropoda indet.	6	2	5
	Bivalvia					
		Nuculoida				
			Nuculoma tenuis	22	7	7
			Nuculana pernula	19	5	6
			Portlandia arctica	18	6	7
			Yoldiella annenkovae	7	3	4
			Yoldiella frigida	2	1	2
			Yoldiella intermedia	2	2	1
			Yoldiella lenticula	60	17	16
			Yoldiella lucida	9	2	5
			Yoldiella nana	105	14	25
			Yoldiella propingua	1	1	1
			Yoldiella solidula	90	14	18
			Yoldiella sp.	6	2	4
		Mytiloida				
			Crenella decussata	63	20	5
			Musculus corrugatus	1	1	1
			Musculus niger	17	5	7
			Musculus sp.	1	1	1
			Dacrydium vitreum	30	5	12
		Arcoida				
			Bathyarca glacialis	11	3	6
		Ostreoidea				
			Chlamys islandica	2	1	2

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
		Veneroida				
			Thyasira flexuosa	5	2	3
			Thyasira gouldi	65	18	9
			Thyasira sarsi	10	7	3
			Thyasira equalis	65	11	25
			Thyasira ferruginea	239	38	24
			Montacuta maltzani	6	4	2
			Montacuta spitzbergensis	10	7	2
			Montacuta sp.	4	2	3
			Astarte borealis	8	8	1
			Astarte crenata	127	18	19
			Astarte elliptica	51	22	6
			Astarte montagui	25	7	5
			Ciliatocardium ciliatum	10	2	6
			Macoma calcarea	150	66	9
		Myoida				
			Mya truncata	48	14	9
			Hiatella arctica	63	11	15
			Panomya arctica	1	1	1
		Pholadomyoida				
			Thracia myopsis	33	16	5
			Cuspidaria arctica	42	12	13
			Pelecypoda indet.	8	3	5
	Scaphopoda					
		Gadilida				
			Siphonodentalium lobatum	5	2	4
BRACHIOPODA						
	Articulata					
		Rhynchonellida				
			Hemithiris psittacea	23	9	5
		Terebratulida				
			Terebratulina retusa	1	1	1
			Macandrevia cranium	3	2	2
			Brachiopoda indet.	3	1	3
BRYOZOA						
			Hemicyclopora polita	11	4	3
			Ragionula rosacea	7	2	5
			Cheilopora sincera	2	1	2
			Arctonula arctica	1	1	1
			Defrancia lucernaria	2	2	1
	Stenolaemata					
			Idmonea fenestrata	1	1	1
			Proboscina gracilis	1	1	1
		Cyclostomata				
			Oncousoecia canadensis	8	4	3
			Oncousoecia diastoporides	62	14	9
			Crisia denticulata	1	1	1
			Crisia eburnea	2	1	2
			Filicrisia sp.	2	2	1
			Idmidronea atlantica	4	2	2
			Tubulipora sp.	4	2	3
			Diplosolen obelia	2	2	1
			Entalophoroecia sp.	3	3	1
			Entalophora clavata	5	3	2
			Hornera sp.	2	2	1
			Disporella hispida	3	2	2
			Lichenopora crasiuscula	20	8	6
			Lichenopora verrucaria	4	4	1
			Cyclostomatida indet.	17	6	4

PHYLUM	CLASS	ORDER	NAME	Total Sum	Max. no. pr Repl.	No.Repl. with Species
	Gymnolaemata					
			Pachyepis producta	6	4	3
			Hippoponella pippopus	20	14	4
			Lepralioides nordlandica	1	1	1
			Myriapora sp.	7	4	4
			Myriapora subgracilis	8	2	6
			Myriozoella costata	21	15	4
			Pachyepis groenlandica	5	2	4
			Parasmittina trispinosa	1	1	1
			Reussina impressa	588	218	6
			Stegochornera sp.	2	1	2
			Hippodiplosia sp.	2	1	2
			Myriozoella crustacea	9	8	2
			Hippoponella	1	1	1
			Hippodiplosia obesa	8	6	3
			Hippodiplosia harmsworti	3	3	1
			Hippodiplosia borealis	5	3	3
			Hincksipora spinulifera	7	2	5
			Escharelloides sp.	3	3	1
			Doryporella spathulifera	10	4	6
			Cystisella saccata	25	11	5
			Cylindroporella tubulosa	11	5	6
			Cheiloporina sp.	9	8	2
			Hippodiplosia ussovi	6	5	2
			Alcyonidium gelatinosum	3	2	2
			Alcyonidium mytili	37	14	6
			Alcyonidium protoseideum	1	1	1
			Alcyonidium radicellatum	2	1	2
			Alcyonidium sp.	1	1	1
			Entalophoroecia deflexa	1	1	1
			Bowerbankia imbricata	1	1	1
		Cheiloctenostomata				
			Eucratea loricata	5	1	5
			Electra arctica	215	66	10
			Amphiblestrum auritum	1	1	1
			Amphiblestrum solidum	2	2	1
			Callopora craticula	3	2	2
			Callopora lata	7	3	4
			Callopora lineata	8	4	4
			Callopora smitti	27	9	5
			Callopora sp.	4	2	2
			Tegella spitsbergensis	17	11	3
			Sarsiflustra abyssicola	2	1	2
			Dendrobeania fruticosa	8	3	4
			Dendrobeania murrayana	3	3	1
			Dendrobeania sp.	7	7	1
			Notoplites smitti	1	1	1
			Scrupocellaria minor	1	1	1
			Scrupocellaria scabra	2	1	2
			Scrupocellaria sp.	1	1	1
			Tricellaria gracilis	3	2	2
			Tricellaria peachi	2	1	2
			Cribrilina spitzbergensis	3	3	1
			Hippothoa divaricata	105	33	7
			Hippothoa expansa	66	22	7
			Lepraliella contigua	1	1	1
			Escharella microstoma	3	3	1
			Escharella ventricosa	301	195	10
			Escharella sp.	1	1	1
			Escharoides jacksoni	1	1	1
			Escharopsis lobata	6	3	3
			Porella acutirostris	8	3	4
			Porella compressa	2	1	2
			Porella concinna	18	8	4
			Porella laevis	1	1	1
			Porella minuta	4	2	3

PHYLUM	CLASS	ORDER	NAME	Total Sum	Max. no. pr Repl.	No.Repl. with Species
			Porella obesa	4	4	1
			Porella struma	1	1	1
			Porella sp.	3	1	3
			Rhamphostomella costata	4	3	2
			Rhamphostomella hincksi	3	2	2
			Rhamphostomella scabra	2	1	2
			Rhamphostomella spinigera	5	4	2
			Rhamphostomella sp.	2	1	2
			Smittina minuscula	1	1	1
			Smittina rigida	3	1	3
			Smittinidae indet.	1	1	1
			Pseudoflustra birulai	1	1	1
			Pseudoflustra hincksi	3	2	2
			Pseudoflustra solida	5	3	3
			Schizomavella auriculata	4	3	2
			Schizomavella sp.	4	4	1
			Schizoporella elmwoodiae	2	2	1
			Schizoporella bispinosa	2	1	2
			Schizoporella incerta	3	2	2
			Schizoporella pachystega	3	1	3
			Schizoporella smitti	6	3	3
			Schizoporella sp.	2	1	2
			Stomachetosella cruenta	3	1	3
			Stomachetosella limbata	5	3	3
			Stomachetosella magniporata	2	1	2
			Stomachetosella sinuosa	4	4	1
			Microporella ciliata	77	19	8
			Buffonellaria biaperta	21	9	6
			Cellepora sp.	5	3	3
			Celleporina incrassata	22	15	4
			Celleporina surcularis	23	9	4
			Celleporina ventricosa	9	6	2
			Celleporina sp.	3	2	2
			Turbicellepora nodulosa	2	1	2
			Cheilostomatida indet.	2	1	2
ECHINODERMATA						
	Asteroidea					
		Paxillosida				
			Ctenodiscus crispatus	38	8	16
		Velatida				
			Crossaster papposus	1	1	1
		Forcipulatida				
			Icasterias panopla	1	1	1
			Asteroidea indet. juv.	2	1	2
	Ophiuroidea					
		Phrynophiurida				
			Ophioscolex glacialis	1	1	1
		Ophiurida				
			Ophiopholis aculeata	33	8	10
			Amphipholis torelli	6	3	2
			Amphiura sundevalli	18	5	6
			Amphiura sundevalli juv.	1	1	1
			Ophiacantha bidentata	19	3	15
			Ophiocten sericeum	42	7	13
			Ophiopleura borealis	1	1	1
			Ophiura robusta	535	74	20
			Ophiura sarsii	6	5	2
			Ophiuridae indet.	2	2	1
			Ophiuridae indet. juv.	9	2	8
			Ophiuroidea indet. juv.	6	2	4

PHYLUM	*CLASS*	*ORDER*	*NAME*	*Total Sum*	*Max. no. pr Repl.*	*No.Repl. with Species*
	Echinoidea					
		Echinoida				
			Strongylocentrotus pallidus	27	6	11
	Holothuroidea					
		Dendrochirotida				
			Psolus phantapus	1	1	1
			Psolus sp.	1	1	1
			Psolus sp. juv.	3	3	1
		Apodida				
			Myriotrochus eurycyclus	8	2	6
			Trochoderma elegans	11	6	4
		Molpadiida				
			Eupyrgus scaber	7	2	4
TUNICATA						
	Ascidiacea					
		Stolidobranchiata				
			Molgula sp.	42	32	3
			Ascidiacea indet.	4	2	3

Sum:	*14135*	*2206*
Max:	*1403*	*41*
Count:	*460*	*460*

APPENDIX II

Full species lists for all replicates

Station 6

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
FORAMINIFERA									
			Astrorisa limicola	23	49	13	36	48	169
			Hyperammina sp.	88	57		68		213
			Foraminifera indet.	12	70	28	14		124
PORIFERA									
			Porifera indet.	2	5	6	1		14
CNIDARIA									
	Anthozoa								
			Anthozoa indet.	2				1	3
			Alcyonacea indet.	2					2
NEMERTINI									
			Nemertini indet.		2	1		2	5
NEMATODA									
			Nematoda indet.				2	1	3
PRIAPULIDA									
			Priapulus caudatus					1	1
SIPUNCULIDA									
			Phascolion strombus	1		1	2		4
			Golfingia glacialis	3	4	1			8
			Golfingia margaritacea				1		1
			Nephasoma minutum			1	4		5
			Sipunculida indet.					2	2
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.	2					2
			Aricidea hartmanni				1		1
		Spionida							
			Apistobranchus sp.		1			1	2
			Laonice cirrata		1				1
			Laonice sarsi			1			1
			Marenzelleria sp.		1	1	1		3
			Spiophanes kroyeri		1		1		2
			Spiochaetopterus typicus	6	3	5	9	6	29
			Chaetozone sp.	1		1			2
			Cirratulidae indet.	9	3	8	4	1	25
		Capitellida							
			Heteromastus filiformis		2	1			3
			Notoproctus oculatus				2		2
			Praxillura longissima	1			2	7	10
			Nicomache sp.	3	3	20	5		31
			Petaloproctus sp.			1			1
			Maldane sarsi	19	15	14	31	20	99
			Clymenura polaris			1			1
			Euclymeninae indet.		1		2		3
			Maldanidae indet. juv.	12	5		30	8	55
		Opheliida							
			Ophelina abranchiata		2	1	2		5
			Scalibregma inflatum	4	4	4	3		15
		Phyllodocida							
			Phyllodoce groenlandica	1	1	1		1	4
			Polynoidae indet.	1	1			1	3
			Pholoe synopthalmica	5	18		6	1	30
			Langerhansia cornuta	1	1	1		4	7
		Eunicida							
			Nothria conchylega		1		5		6
			Lumbrineris sp.		3	1	2		6
		Oweniida							
			Myriochele fragilis	2	10	4	19	7	42
			Myriochele heeri	1	26	5	25	16	73
			Myriochele oculata			2			2
			Owenia fusiformis		1	2	5		8

Station 6

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
		Flabelligerida							
			Brada inhabilis					1	1
			Brada villosa				1		1
			Diplocirrus hirsutus					1	1
			Pherusa plumosa	2	1			1	4
		Terebellida							
			Glyphanostomum pallescens		1				1
			Laphania boecki			1	2		3
			Lanassa/Leaena sp.	1					1
			Terebellidae indet.	1				2	3
			Terebellides stroemi	2		3	4	3	12
		Sabellida							
			Chone duneri	1			1		2
			Chone paucibranchiata	89	191	89	180	44	593
			Euchone elegans	2					2
			Euchone papillosa			1			1
			Sabella sp.		1				1
CHELICERATA									
	Pycnogonida								
			Pycnogonida indet.	1					1
CRUSTACEA									
	Ostracoda								
			Ostracoda indet.	59	76	36	65	49	285
	Malacostraca								
		Cumacea							
			Eudorella emarginata		1	2		1	4
			Campylaspis rubicunda		1				1
			Brachydiastylis resima	1	12	4		6	23
			Diastylis rathkei				1		1
		Tanaidacea							
			Spyraphus anomalus	1		4	1		6
		Amphipoda							
			Argissa hamatipes	1					1
			Rhachotropis aculeata				1		1
			Hippomedon sp.			1	1		2
			Lysianassidae indet.					2	2
			Maera sp.	1					1
			Arrhis phyllonyx	1	4	1	5	2	13
			Monoculodes sp.				1		1
			Nicippe tumida				1	2	3
			Harpinia mucronata	1	11	7	8	4	31
			Harpinia sp.	2	6	1	1	6	16
			Parathemisto libellula	1					1
			Amphipoda indet.	1					1
		Isopoda							
			Gnathia sp.		1			1	2
			Calathura brachiata		1	2		1	4
			Saduria sp.		1				1
			Isopoda indet.	1			1		2
MOLLUSCA									
	Prosobranchia								
		Mesogastropoda							
			Alvania cruenta		2				2
			Alvania scrobiculata	2			1		3
			Polynices pallidus		1	1			2
		Neogastropoda							
			Colus sp. juv.	1					1
	Opistobranchia								
		Pyramidellomorpha							
			Menestho truncatula				1		1
		Cephalaspidea							
			Diaphana minuta		2				2
			Philine finmarchica	1					1
			Cylichna alba	1	1				2
			Gastropoda indet.		1	1	1		3
	Bivalvia								
		Nuculoida							
			Nuculana pernula	3	5	4	5		17
			Yoldiella frigida		1	1			2
			Yoldiella intermedia	2					2
			Yoldiella lenticula	11	6	1	2	5	25
			Yoldiella nana	13	12	11	14	5	55
			Yoldiella solidula	11	13	10	14	11	59
			Yoldiella sp.		2		2		4
		Mytiloida							
			Dacrydium vitreum	4	1	4	5	3	17

Station 6

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
		Veneroida							
			Thyasira equalis	1	1	11	4	6	23
			Thyasira ferruginea	38	27	27	15	25	132
			Thyasira flexuosa	2	2		1		5
			Thyasira sarsi		2	1		7	10
			Astarte crenata	11	14	18	13	12	68
		Pholadomyoida							
			Thracia myopsis		1				1
			Cuspidaria arctica	2	5	12	5		24
	Scaphopoda								
		Gadilida							
			Siphonodentalium lobatum			1	2		3
BRYOZOA									
	Stenolaemata								
			Proboscina gracilis			1			1
		Cyclostomata							
			Oncousoecia canadensis			2			2
			Filicrisia sp.	2					2
			Entalophoroecia sp.	3					3
			Entalophora clavata	3					3
	Gymnolaemata								
			Cylindroporella tubulosa	1					1
			Cystisella saccata	4					4
			Hincksipora spinulifera	1					1
			Pachyepis groenlandica	1					1
			Reussina impressa	1					1
		Cheiloctenostomata							
			Electra arctica	1					1
			Sarsiflustra abyssicola	1					1
			Scrupocellaria scabra	1					1
			Hippothoa divaricata	1		2			3
			Escharella microstoma	3					3
			Escharella sp.	1					1
			Escharella ventricosa	1					1
			Porella sp.			1			1
			Rhamphostomella sp.	1					1
			Pseudoflustra birulai	1					1
			Stomachetosella cruenta	1					1
ECHINODERMATA									
	Asteroidea								
		Paxillosida							
			Ctenodiscus crispatus		1				1
	Ophiuroidea								
		Ophiurida							
			Ophiacantha bidentata	1	1	1			3
			Ophiopleura borealis				1		1
			Ophiura robusta			1			1
			Ophiuridae indet. juv.		1				1
	Holothuroidea								
		Dendrochirotida							
			Psolus phantapus	1					1
		Apodida							
			Trochoderma elegans	1	2	2	6		11
			Max:	89	191	89	180	49	593
			Count:	78	65	60	60	42	136
			Sum:						2574

Station 7

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
FORAMINIFERA									
			Astrorisa limicola	3	7	4	2	6	22
			Foraminifera indet.	15	15	20	9	18	77
PORIFERA									
			Porifera indet.			1			1
NEMERTINI									
			Nemertini indet.	2					2
SIPUNCULIDA									
			Nephasoma minutum	1	3	1	2	3	10
ANNELIDA									
	Polychaeta								
		Spionida							
			Spiophanes kroyeri	2	11	1	9	7	30
			Spiochaetopterus typicus	5	6	5	9	6	31
			Cirratulus cirratus			2			2
			Cirratulidae indet.		2				2
		Capitellida							
			Praxillura longissima	1		1			2
			Nicomache sp.		1	4	3	1	9
			Maldane sarsi	3	30	3	16	10	62
			Euclymeninae indet.		1	1	1		3
		Opheliida							
			Ophelina abranchiata					2	2
		Phyllodocida							
			Polynoidae indet.		1				1
			Aglaophamus malmgreni		1	2	1		4
			Nephtys ciliata	1					1
		Eunicida							
			Lumbrineris sp.	4	2	5	2		13
		Oweniida							
			Myriochele fragilis					1	1
			Myriochele heeri		3	19	22	2	46
		Flabelligerida							
			Diplocirrus hirsutus		1				1
		Terebellida							
			Eclysippe vanelli					1	1
			Melinna cristata		1		1		2
			Melythasides laubieri		1				1
			Sosanopsis wireni				1		1
			Lanassa/Leaena sp.			1			1
			Phisidia aurea				1	2	3
			Terebellidae indet.		1				1
			Terebellides stroemi	1				1	2
CHELICERATA									
	Pycnogonida								
			Pycnogonida indet.					1	1
CRUSTACEA									
	Malacostraca								
		Cumacea							
			Eudorella sp.			2		1	3
			Leucon sp.	1					1
			Diastylidae indet.				2		2
		Tanaidacea							
			Spyraphus anomalus		1				1
		Amphipoda							
			Byblis sp.			3	1		4
			Haploops tubicola	1	1	2		2	6
			Hippomedon sp.	2					2
			Onisimus sp.		1		65		66
			Harpinia mucronata	4	6	7	3	6	26
			Harpinia serrata	1					1
			Harpinia sp.			1			1
			Parathemisto sp.					1	1
		Isopoda							
			Calathura brachiata				1		1
			Saduria sp.					1	1
MOLLUSCA									
	Opistobranchia								

Station 7

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
		Cephalaspidea							
			Cylichna alba					1	1
			Gastropoda indet.			1			1
	Bivalvia								
		Nuculoida							
			Yoldiella annenkovae	1	3	2		1	7
			Yoldiella lenticula		1		1	1	3
			Yoldiella nana				1	2	3
			Yoldiella propingua		1				1
			Yoldiella solidula		3	1	1		5
		Mytiloida							
			Dacrydium vitreum		1		2	1	4
		Veneroida							
			Thyasira equalis	1	3		2	3	9
			Thyasira ferruginea	4	3	2	5	14	28
			Astarte crenata	1	3	8		4	16
		Pholadomyoida							
			Cuspidaria arctica	1	1			4	6
	Scaphopoda								
		Gadilida							
			Siphonodentalium lobatum	1		1			2
BRYOZOA									
	Stenolaemata								
		Cyclostomata							
			Crisia eburnea	1					1
			Diplosolen obelia				2		2
	Gymnolaemata								
			Alcyonidium gelatinosum	1					1
			Alcyonidium radicellatum		1			1	2
		Cheiloctenostomata							
			Eucratea loricata			1		1	2
			Sarsiflustra abyssicola					1	1
			Notoplites smitti				1		1
			Pseudoflustra hincksi	2			1		3
			Pseudoflustra solida			1	3		4
			Turbicellepora nodulosa				1	1	2
ECHINODERMATA									
	Ophiuroidea								
		Ophiurida							
			Ophiacantha bidentata			1			1
			Ophiuridae indet. juv.	1				1	2
	Holothuroidea								
		Apodida							
			Myriotrochus eurycyclus	1				1	2
			Max:	15	30	20	65	18	77
			Count:	27	31	29	30	34	70
			Sum:						561

Station 9

Phylum	Class	Order	Species	01	02	03	04	05	Sum
PORIFERA									
			Porifera indet.	1					1
CNIDARIA									
	Anthozoa								
			Edwardsiidae indet.				1		1
			Alcyonacea indet.		2			1	3
			Limnactinia laevis	1					1
NEMERTINI									
			Nemertini indet.			1			1
PRIAPULIDA									
			Priapulus caudatus	1					1
SIPUNCULIDA									
			Phascolion strombus	1	3	1	2	1	8
			Golfingia margaritacea		1				1
			Nephasoma minutum	13	4	5	6	6	34
			Sipunculida indet.			1		1	2
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.			1	1	2	4
			Paraonis gracilis			3			3
		Cossurida							
			Cossura longocirrata					1	1
		Spionida							
			Polydora sp.	2	7			4	13
			Spiophanes kroyeri	7	2		4	1	14
			Spiochaetopterus typicus	17	2	10	3	13	45
			Chaetozone sp.	9	5	4	13	3	34
			Cirratulidae indet.		1	1	2	2	6
		Capitellida							
			Rhodine gracilior	2	3	4	3	9	21
			Lumbriclymene minor	78	36	6	71	30	221
			Maldane sarsi	207	146	123	232	90	798
		Phyllodocida							
			Eteone sp.			1			1
			Phyllodoce groenlandica	1	1			2	4
			Langerhansia cornuta	1					1
			Glycera capitata	1		1			2
			Aglaophamus malmgreni					1	1
			Nephtys sp. juv.					1	1
		Eunicida							
			Lumbrineris sp.	12	9	15	21	5	62
			Lumbrineridae indet.			1	1		2
		Oweniida							
			Myriochele fragilis	1	4	1	1	7	14
			Myriochele heeri		3	10		4	17
			Myriochele oculata	30	20	13	27	17	107
		Flabelligerida							
			Diplocirrus hirsutus		1	1			2
			Flabelligeridae indet.	3					3
		Terebellida							
			Ampharete finmarchica		1	1			2
			Amphicteis gunneri		1				1
			Glyphanostomum pallescens		2	2	7	1	12
			Lysippe labiata		1				1
			Melinna cristata				2		2
			Sosane gracilis				1		1
			Terebellides stroemi			1			1
		Sabellida							
			Chone paucibranchiata	2	2	1	2		7
			Euchone papillosa	1					1
			Euchone sp.					1	1
CRUSTACEA									
	Ostracoda								
			Ostracoda indet.	1	1	3	3	2	10

Station 9

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
	Malacostraca								
		Cumacea							
			Eudorella emarginata	1	2		1	2	6
			Leucon nasica					3	3
			Campylaspis rubicunda				1		1
			Diastylis rathkei				3	1	4
			Diastylis spinulosa				1		1
		Amphipoda							
			Ampelisca eschrichti		1				1
			Ampelisca macrocephala	1					1
			Haploops tubicola		1				1
			Unciola leucopis			1			1
			Idunella aequicornis			1			1
			Hippomedon sp.	3		1			4
			Lysianassidae indet.	1	1				2
			Arrhis phyllonyx	1		1		1	3
			Paraphoxus oculatus				2		2
			Phoxocephalus holbolli	2				1	3
			Podoceridae indet.		1				1
			Gammaridea indet.		1			2	3
		Isopoda							
			Gnathia oxyurea	2	1	2		1	6
MOLLUSCA									
	Caudofoveata								
			Caudofoveata indet.		3	5	3	3	14
	Prosobranchia								
		Mesogastropoda							
			Alvania cruenta	4	2			4	10
	Opistobranchia								
		Cephalaspidea							
			Diaphana minuta				1		1
			Cylichna alba		1		3		4
	Bivalvia								
		Nuculoida							
			Nuculoma tenuis					1	1
			Yoldiella lucida	2	1	2	2	2	9
			Yoldiella nana	1	1	5	3	1	11
			Yoldiella solidula	5	6	2	2	5	20
		Mytiloida							
			Dacrydium vitreum	3	1		3	2	9
		Arcoida							
			Bathyarca glacialis	2	1	3	1	3	10
		Veneroida							
			Thyasira equalis	2	2	1	1		6
			Thyasira ferruginea	7	3	1	8	3	22
			Astarte crenata			1			1
			Ciliatocardium ciliatum				1		1
		Pholadomyoida							
			Cuspidaria arctica	2	1	3	1	2	9
BRYOZOA									
	Gymnolaemata								
			Alcyonidium sp.		1				1
ECHINODERMATA									
	Asteroidea								
		Paxillosida							
			Ctenodiscus crispatus	2	3	1	2		8
			Asteroidea indet. juv.	1					1
	Ophiuroidea								
		Phrynophiurida							
			Ophioscolex glacialis		1				1
		Ophiurida							
			Ophiacantha bidentata		1		1	1	3
			Ophiocten sericeum			1		1	2
			Ophiuridae indet. juv.	1		1	2	1	5
			Ophiuroidea indet. juv.	1					1
	Holothuroidea								
		Apodida							
			Myriotrochus eurycyclus	1	2	1		2	6
		Molpadiida							
			Eupyrgus scaber		2			2	4
			Max:	***207***	***146***	***123***	***232***	***90***	***798***
			Count:	***43***	***48***	***43***	***40***	***46***	***88***
			Sum:						***1673***

Station 11

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
CNIDARIA									
	Hydrozoa								
			Halecium muricatum			6	5		11
			Laomedea sp.				2		2
			Sertulariidae indet.	1					1
	Anthozoa								
			Anthozoa indet.					3	3
			Edwardsiidae indet.			2		2	4
			Actinia sp.				1		1
NEMERTINI									
			Nemertini indet.	6	15	5	2	1	29
NEMATODA									
			Nematoda indet.	1	18			1	20
PRIAPULIDA									
			Priapulus caudatus					1	1
SIPUNCULIDA									
			Golfingia sp.				1	15	16
			Sipunculida indet.	1					1
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.			1	6	5	12
			Paraonella sp.			2			2
		Cossurida							
			Cossura longocirrata			1			1
		Spionida							
			Polydora caulleryi	7	5	2			14
			Pygospio elegans	1					1
			Spio armata	30		18	27	25	100
			Chaetozone sp.	1		1		2	4
			Cirratulidae indet.	6		8	13	13	40
		Capitellida							
			Capitella capitata	2		1	2	5	10
			Notoproctus oculatus					1	1
			Clymenura polaris					1	1
			Praxillella praetermissa	8		5	14	8	35
		Opheliida							
			Scalibregma inflatum	7		2	16	17	42
		Phyllodocida							
			Eteone sp.	3	1		2	2	8
			Gattyana sp.	3			1	1	5
			Harmothoe imbricata	41		43	24	27	135
			Nemidia torelli		1				1
			Polynoidae indet.		6				6
			Pholoe synopthalmica	19	4	10	47	37	117
			Pilargidae indet.	1			1		2
			Autolytus sp.			1	1	1	3
			Pionosyllis sp.	2		4	5	2	13
			Proceraea sp.	5		12	3	3	23
			Sphaerosyllis erinaceus	4	1	1		2	8
			Syllis sp.	9		17	9	8	43
			Langerhansia cornuta		11			1	12
			Nereis zonata	1					1
			Glycera capitata			5	2	1	8
			Nephtys pente	2		2	5	1	10
		Eunicida							
			Lumbrineris sp.	1					1
			Ophryotrocha sp.			2			2
		Flabelligerida							
			Flabelligera sp.					1	1
			Pherusa plumosa				1		1
		Terebellida							
			Ampharete finmarchica	2			2		4
			Ampharete goesi			2	3	1	6
			Ampharete lindstroemi	1					1
			Ampharete sp.				2		2
			Amphitrite cirrata	3	1	3	2	2	11

Station 11

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
			Lanassa nordenskioeldi		1				1
			Lanassa venusta		1			1	2
			Laphania boecki	3	8	7	19	17	54
			Leaena ebranchiata					1	1
			Paramphitrite birulai	1					1
			Polycirrus medusa	8		1	3	10	22
			Proclea graffi	2		6	9	5	22
			Terebellides stroemi	4			4	8	16
			Trichobranchus glacialis					1	1
		Sabellida							
			Chone infundibuliformis		1			3	4
			Chone paucibranchiata	41		19	9		69
			Chone sp.	2	3	2		3	10
			Euchone elegans		1				1
			Chitinopoma serrula	4		9	5	3	21
			Spirorbis sp.					12	12
			Spirorbidae indet.	59	2	65	110		236
CRUSTACEA									
	Cirripedia								
		Thoracica							
			Balanus balanus	4					4
			Balanus crenatus	1				1	2
			Balanus sp.	3		1			4
	Malacostraca								
		Cumacea							
			Eudorella emarginata				2		2
			Eudorella sp.	1					1
			Leucon nasicoides	5	1	1	32	31	70
		Tanaidacea							
			Tanaidacea indet.	1	1	1		2	5
		Amphipoda							
			Acanthonotozoma serratum	1			1		2
			Amphilochidae indet.		1		1		2
			Eusirus cuspidatus			1			1
			Ischyrocerus sp.		4	3	1		8
			Anonyx nugax		2		8		10
			Lysianassidae indet.	24	1	10	9	25	69
			Melita dentata	1	1	23	5	4	34
			Odius carinatus	1			1		2
			Pardalisca cuspidata			1			1
			Pardalisca sp.	1			2	4	7
			Parapleustes bicuspis			12	7		19
			Dulichia spinosissima				1		1
			Podoceridae indet.	3		1			4
			Stenothoidae indet.	1		19	44	5	69
			Syrrhoe crenulata					1	1
			Tiron spiniferus		9	1			10
			Gammaridea indet.	2					2
			Parathemisto sp.			1			1
		Isopoda							
			Munna sp.	8	1	13	22	28	72
			Asellota indet.			1			1
		Decapoda							
			Hippolytidae indet.				2		2
			Natantia indet.		1		1	1	3
			Paguridae indet.				1	1	2
			Hyas araneus	2					2
MOLLUSCA									
	Polyplacophora								
		Ischnochitonidae							
			Ischnochiton albus	1		11	12		24
	Prosobranchia								
		Archaeogastropoda							
			Puncturella noachina	2		2	3	6	13
			Lepeta caeca			1		1	2
			Margarites costalis	1		1	3		5
			Margarites olivaceus	2	3	5	9	2	21
			Moelleria costulata				7	14	21
		Mesogastropoda							
			Cryptonatica affinis					1	1
			Polinices nanus					1	1
			Polynices pallidus		1	1			2
		Neogastropoda							
			Trophon clathratus				1		1
			Oenopota pyramidalis	1		1	3		5
			Oenopota sp.				1		1
	Bivalvia								
		Nuculoida							
			Portlandia arctica	3	1	2	6	1	13

Station 11

Phylum	Class	Order	Species	01	02	03	04	05	Sum
		Mytiloida							
			Crenella decussata	5	20	9	13	16	63
			Musculus niger		5	1	1	3	10
		Veneroida							
			Thyasira equalis			5	3	3	11
			Thyasira gouldi	3			6	2	11
			Montacuta maltzani		4				4
			Montacuta sp.					1	1
			Astarte elliptica	6	6	6	22	5	45
			Astarte montagui	5	6	3	4	7	25
		Myoida							
			Mya truncata	3	14	5	4	6	32
			Hiatella arctica	7	7	2	6	4	26
		Pholadomyoida							
			Thracia myopsis	1		4	11	16	32
			Pelecypoda indet.	2		1		3	6
BRACHIOPODA									
	Articulata								
		Rhynchonellida							
			Hemithiris psittacea	5	2	1	6	9	23
		Terebratulida							
			Terebratulina retusa		1				1
			Macandrevia cranium		1				1
			Brachiopoda indet.		1				1
BRYOZOA									
	Stenolaemata								
		Cyclostomata							
			Oncousoecia diastoporides	11		1		4	16
			Lichenopora verrucaria					4	4
	Gymnolaemata								
			Cylindroporella tubulosa	1					1
			Doryporella spathulifera	1		1			2
			Escharelloides sp.	3					3
			Hincksipora spinulifera					1	1
			Hippodiplosia obesa			1			1
			Hippoponella pippopus	14					14
			Myriapora sp.		1	1	1	4	7
			Myriapora subgracilis		1			2	3
			Myriozoella costata	15			2		17
			Myriozoella crustacea	1				8	9
		Cheiloctenostomata							
			Electra arctica	8			1	6	15
			Amphiblestrum auritum					1	1
			Amphiblestrum solidum	2					2
			Callopora craticula	2					2
			Callopora lata	3					3
			Callopora lineata	4				1	5
			Callopora sp.				2		2
			Tegella spitsbergensis	11		1	5		17
			Dendrobeania fruticosa	1					1
			Dendrobeania murrayana	3					3
			Cribrilina spitzbergensis	3					3
			Hippothoa expansa	12				1	13
			Escharella ventricosa	195		2	1	30	228
			Escharopsis lobata	1			2		3
			Porella acutirostris	3					3
			Porella obesa					4	4
			Porella sp.					1	1
			Rhamphostomella hincksi	1					1
			Rhamphostomella spinigera	1					1
			Smittina rigida	1					1
			Smittinidae indet.	1					1
			Schizomavella auriculata	3					3
			Schizomavella sp.	4					4
			Schizoporella bispinosa			1	1		2
			Schizoporella elmwoodiae	2					2
			Schizoporella pachystega	1					1
			Schizoporella smitti	1					1
			Stomachetosella cruenta	1				1	2
			Microporella ciliata	8		1		7	16
			Buffonellaria biaperta	9				6	15
			Celleporina incrassata	15	2				17
			Celleporina sp.				2		2
			Celleporina ventricosa	6				3	9

Station 11

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
ECHINODERMATA									
	Asteroidea								
		Velatida							
			Crossaster papposus	1					1
	Ophiuroidea								
		Ophiurida							
			Ophiopholis aculeata			1			1
			Amphipholis torelli				3	3	6
			Amphiura sundevalli juv.					1	1
			Ophiura robusta	71	50	25	72	74	292
			Ophiuroidea indet. juv.		1				1
	Echinoidea								
		Echinoida							
			Strongylocentrotus pallidus	2			2		4
TUNICATA									
	Ascidiacea								
		Stolidobranchiata							
			Molgula sp.		32	7		3	42
			Ascidiacea indet.		2				2
			Max:	195	60	65	110	74	292
			Count:	104	48	76	82	92	179
			Sum:						2876

Station 12

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
FORAMINIFERA									
			Foraminifera indet.		11	106		215	332
CNIDARIA									
	Hydrozoa								
			Monobrachium parasitum		2		1	3	6
	Anthozoa								
			Anthozoa indet.			2			2
NEMERTINI									
			Nemertini indet.					3	3
PRIAPULIDA									
			Priapulus caudatus				1		1
SIPUNCULIDA									
			Golfingia margaritacea		1				1
			Sipunculida indet.				1		1
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.	9	1	8	1	3	22
			Aricidea hartmanni			1			1
			Paraonis gracilis	2			1		3
		Spionida							
			Polydora sp.	2					2
			Spio decoratus				4		4
			Spiochaetopterus typicus					1	1
			Chaetozone sp.	7	1	12	6	4	30
			Cirratulidae indet.	1	1		1		3
		Capitellida							
			Heteromastus filiformis	1	1	2		1	5
			Maldane sarsi			2			2
			Euclymeninae indet.			2			2
		Opheliida							
			Ophelina acuminata			1			1
			Scalibregma inflatum		1	4		1	6
		Phyllodocida							
			Eteone sp.		1	1	2		4
			Phyllodoce groenlandica			1			1
			Eunoe sp.	2		2			4
			Gattyana sp.			1			1
			Harmothoe sp.	3			1	1	5
			Polynoidae indet.				4		4
			Pholoe synopthalmica	7	1	6	7	2	23
			Eusyllis blomstrandi	1					1
			Langerhansia cornuta	1					1
			Nephtys ciliata	2	1	1		1	5
		Eunicida							
			Nothria conchylega			1			1
			Lumbrineris sp.	6	4	16	18	13	57
		Oweniida							
			Myriochele oculata	3	3	4	3		13
		Flabelligerida							
			Brada villosa	2					2
			Diplocirrus hirsutus				1		1
			Pherusa plumosa	1					1
		Terebellida							
			Pectinaria hyperborea		1				1
			Ampharete finmarchica					2	2
			Lysippe labiata		8	6	1	1	16
			Melinna cristata			1			1
			Sosane gracilis		1	1			2
			Amphitrite cirrata	1					1
			Lanassa/Leaena sp.	1	1				2
			Polycirrus arcticus	1			1		2
			Terebellidae indet.	2					2
			Terebellides stroemi	5	10	14	6	4	39
			Trichobranchus glacialis	2	4		3		9
		Sabellida							
			Chone paucibranchiata	6					6
			Chone sp.	1	1				2

Station 12

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
CRUSTACEA									
	Ostracoda								
			Ostracoda indet.	4	2			2	8
	Cirripedia								
		Thoracica							
			Balanus balanus	14	1		3		18
	Malacostraca								
		Cumacea							
			Eudorella emarginata	2	2			2	6
		Amphipoda							
			Photis sp.			1			1
			Lysianassidae indet.	3			1		4
			Monoculodes tuberculatus	1					1
			Syrrhoe crenulata		3				3
			Tiron spiniferus			2			2
MOLLUSCA									
	Caudofoveata								
			Caudofoveata indet.		1				1
	Polyplacophora								
		Ischnochitonidae							
			Ischnochiton albus	4	1	2		1	8
	Prosobranchia								
		Archaeogastropoda							
			Lepeta caeca	2	11	4	1	6	24
			Margarites helicinus	3					3
			Margarites olivaceus			1			1
			Moelleria costulata			1			1
		Neogastropoda							
			Oenopota sp.				1		1
	Bivalvia								
		Nuculoida							
			Nuculoma tenuis	7	5	4	2	2	20
			Nuculana pernula			1			1
		Mytiloida							
			Musculus corrugatus	1					1
		Ostreoidea							
			Chlamys islandica	1					1
		Veneroida							
			Thyasira equalis	1					1
			Thyasira gouldi	5	17	18	3	10	53
			Astarte borealis			8			8
			Astarte elliptica			6			6
			Ciliatocardium ciliatum		2	2			4
			Macoma calcarea	38	22	66	8	8	142
		Myoida							
			Mya truncata	1	5	7			13
			Hiatella arctica	11	4	2	2	1	20
BRYOZOA									
			Hemicyclopora polita	3		4	4		11
			Ragionula rosacea	1					1
	Stenolaemata								
		Cyclostomata							
			Oncousoecia canadensis	2				4	6
			Oncousoecia diastoporides	8	8	6	14	3	39
			Tubulipora sp.				1		1
			Lichenopora crasiuscula	7		2	8	1	18
			Cyclostomatida indet.	6	6	3		2	17
	Gymnolaemata								
			Cheiloporina sp.	1					1
			Cylindroporella tubulosa			5	2	1	8
			Cystisella saccata	11		3	3	4	21
			Doryporella spathulifera	1		1	2	4	8
			Hincksipora spinulifera		2	2		1	5
			Hippodiplosia borealis		1		1	3	5
			Hippodiplosia obesa				1	6	7
			Hippodiplosia sp.				1	1	2
			Hippodiplosia ussovi	5					5
			Hippoponella fascigatoavicularis				1		1
			Hippoponella pippopus			4	1	1	6
			Lepralioides nordlandica		1				1
			Myriapora subgracilis	1	1			1	3
			Myriozoella costata				2	2	4
			Pachyepis groenlandica		1	1		2	4
			Pachyepis producta	1		1	4		6
			Reussina impressa	50	63	153	218	103	587

Station 12

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
			Alcyonidium mytili	3	4	14	7	8	36
			Entalophoroecia deflexa			1			1
		Cheiloctenostomata							
			Eucratea loricata		1				1
			Electra arctica	2	28	42	60	66	198
			Callopora craticula		1				1
			Callopora lata			2	1	1	4
			Callopora lineata	1					1
			Callopora smitti	1	7	9	9	1	27
			Callopora sp.				2		2
			Dendrobeania fruticosa	3		1			4
			Scrupocellaria scabra	1					1
			Hippothoa divaricata	9	14	20	33	26	102
			Hippothoa expansa	6	2	3	20	22	53
			Lepraliella contigua				1		1
			Escharella ventricosa	13	3	18	28	10	72
			Escharopsis lobata	3					3
			Porella acutirostris	1			2		3
			Porella compressa				1		1
			Porella concinna		1	8	3	6	18
			Porella minuta			1	2	1	4
			Porella struma		1				1
			Rhamphostomella costata	1					1
			Rhamphostomella hincksi	2					2
			Rhamphostomella sp.				1		1
			Rhamphostomella spinigera	4					4
			Smittina minuscula				1		1
			Smittina rigida			1	1		2
			Schizoporella incerta				2	1	3
			Schizoporella pachystega			1	1		2
			Schizoporella smitti			2	3		5
			Schizoporella sp.				1	1	2
			Stomachetosella limbata			3	1	1	5
			Stomachetosella magniporata					1	1
			Microporella ciliata	10	3	15	19	14	61
			Buffonellaria biaperta	1		1	2	2	6
			Cellepora sp.		1		3	1	5
			Celleporina sp.		1				1
			Celleporina surcularis	8	3	9	3		23
			Cheilostomatida indet.			1			1
ECHINODERMATA									
	Asteroidea								
			Asteroidea indet. juv.	1					1
	Ophiuroidea								
		Ophiurida							
			Ophiopholis aculeata	8	1	1	4		14
			Amphiura sundevalli			4	5		9
			Ophiocten sericeum		2	3		1	6
			Ophiura robusta	10	26	17	23	47	123
	Echinoidea								
		Echinoida							
			Strongylocentrotus pallidus	4	2		6		12
			Max:	**50**	**63**	**153**	**218**	**215**	**587**
			Count:	**74**	**59**	**73**	**71**	**57**	**145**
			Sum:						**2581**

Station 16

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
PORIFERA									
			Porifera indet.	3					3
CNIDARIA									
	Anthozoa								
			Anthozoa indet.				1		1
			Edwardsiidae Indet.	1	3	1			5
			Gersemia glomerata	1			1		2
			Gersemia rubiformis	2				1	3
NEMERTINI									
			Nemertini indet.	1		1	1	3	6
SIPUNCULIDA									
			Phascolion strombus				3		3
			Golfingia sp.	1				1	2
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.			3	2	12	17
			Paradoneis lyra			1			1
		Spionida							
			Polydora ciliata					1	1
			Polydora sp.	2					2
			Spio filicornis	1					1
			Spiophanes kroyeri		1	1	4	2	8
			Spiochaetopterus typicus	17	12	55	23	45	152
			Chaetozone sp.	1	1	4	1	5	12
			Cirratulus cirratus				1		1
			Cirratulidae indet.	2		6	6	8	22
		Capitellida							
			Heteromastus filiformis			1		2	3
			Nicomache lumbricalis			1	1		2
			Nicomache sp.	1	1				2
			Maldane sarsi	2	5	1	1	20	29
			Clymenura polaris					2	2
			Praxillella praetermissa			2			2
		Opheliida							
			Scalibregma inflatum				1		1
		Phyllodocida							
			Eteone sp.					2	2
			Phyllodoce groenlandica		1				1
			Harmothoe impar				7	1	8
			Pholoe synopthalmica				2		2
			Autolytus sp.			1			1
			Nephtys ciliata					2	2
			Nephtys paradoxa			1	2	3	6
			Sphaerodorum gracilis				1		1
		Eunicida							
			Nothria conchylega	3		13	4	34	54
			Lumbrineris sp.	1		19	17	39	76
		Oweniida							
			Myriochele heeri		1	1	1		3
			Myriochele oculata	22	18	31	19	26	116
		Flabelligerida							
			Pherusa plumosa				2		2
		Terebellida							
			Pectinaria hyperborea				4	3	7
			Ampharete finmarchica			1	2		3
			Lysippe labiata			4	3	2	9
			Lanassa venusta					1	1
			Pista sp.				1		1
			Terebellides stroemi	6	1	6	7	8	28
		Sabellida							
			Chone paucibranchiata	1					1
			Chone sp.			1		2	3
			Euchone papillosa	1					1
			Myxicola infundibulum	2				1	3
			Protula sp.	1					1
			Serpula sp.	3					3
			Spirorbidae indet.			3	1	2	6
			Polychaeta indet.			5		1	6

Station 16

Phylum	Class	Order	Species	01	02	03	04	05	Sum
CHELICERATA									
	Pycnogonida								
		Pantopoda							
			Pantopoda indet.			1		1	2
CRUSTACEA									
	Ostracoda								
			Ostracoda indet.	4	1	1	4	2	12
	Cirripedia								
		Thoracica							
			Balanus sp.	3					3
	Malacostraca								
		Cumacea							
			Eudorella emarginata	1				1	2
			Leucon sp.		2		1		3
			Diastylis sp.					1	1
		Amphipoda							
			Ampelisca eschrichti		1				1
			Haploops tubicola		1				1
			Amphilochidae indet.				1		1
			Aoridae indet.				1	1	2
			Monoculodes sp.				1		1
			Paroediceros propinquus				1		1
			Syrrhoe crenulata				1		1
			Gammaridea indet.					1	1
		Isopoda							
			Gnathia sp.	2	2	5		2	11
			Crustacea indet.			1	1	5	7
MOLLUSCA									
	Caudofoveata								
		Chaetodermatida							
			Chaetoderma nitidilum	1					1
			Caudofoveata indet.		2				2
	Polyplacophora								
		Ischnochitonidae							
			Ischnochiton albus			1	1	4	6
	Prosobranchia								
		Archaeogastropoda							
			Lepeta caeca	2		5	4	12	23
			Margarites olivaceus					1	1
		Mesogastropoda							
			Frigidoalvania janmayeni		5		1		6
			Polynices pallidus				1		1
			Gastropoda indet.			2			2
	Bivalvia								
		Nuculoida							
			Yoldiella lenticula	4	17				21
			Yoldiella nana	6	8			1	15
		Mytiloida							
			Musculus niger		5		1	1	7
		Ostreoidea							
			Chlamys islandica				1		1
		Veneroida							
			Astarte crenata	3	3	1	6	11	24
		Myoida							
			Hiatella arctica	3			2		5
			Panomya arctica					1	1
			Pelecypoda indet.		1				1
BRACHIOPODA									
	Articulata								
		Terebratulida							
			Macandrevia cranium	2					2
			Brachiopoda indet.				1	1	2
BRYOZOA									
			Arctonula arctica					1	1
			Defrancia lucernaria	2					2
			Ragionula rosacea	1			2		3

Station 16

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
	Stenolaemata								
		Cyclostomata							
			Idmidronea atlantica	2					2
			Tubulipora sp.	1					1
			Hornera sp.	2					2
			Disporella hispida	1					1
			Lichenopora crasiuscula				1		1
	Gymnolaemata								
			Hippodiplosia harmsworti	3					3
			Stegochornera sp.				1	1	2
			Alcyonidium gelatinosum				2		2
			Alcyonidium mytili	1					1
			Bowerbankia imbricata	1					1
		Cheiloctenostomata							
			Dendrobeania fruticosa	3					3
			Dendrobeania sp.	7					7
			Scrupocellaria minor	1					1
			Scrupocellaria sp.	1					1
			Tricellaria gracilis				1		1
			Tricellaria peachi	1			1		2
			Escharoides jacksoni	1					1
			Porella compressa		1				1
			Porella laevis	1					1
			Rhamphostomella costata				3		3
			Stomachetosella sinuosa	4					4
			Celleporina incrassata	4			1		5
ECHINODERMATA									
	Asteroidea								
		Paxillosida							
			Ctenodiscus crispatus	1	5		1		7
		Forcipulatida							
			Icasterias panopla				1		1
	Ophiuroidea								
		Ophiurida							
			Ophiopholis aculeata	1					1
			Amphiura sundevalli	2	2	3	2		9
			Ophiacantha bidentata	1	1	3	1	1	7
			Ophiocten sericeum	5		2		6	13
			Ophiura robusta	25		7	14	2	48
			Ophiura sarsii					5	5
			Ophiuridae indet.				2		2
			Ophiuroidea indet. juv.					2	2
	Echinoidea								
		Echinoida							
			Strongylocentrotus pallidus	3		1		1	5
	Holothuroidea								
		Dendrochirotida							
			Psolus sp.			1			1
			Psolus sp. juv.			3			3
		Molpadiida							
			Eupyrgus scaber					2	2
			Max:	25	18	55	23	45	152
			Count:	58	26	39	59	52	126
			Sum:						959

Station 16

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
NEMERTINI									
			Nemertini indet.	2	2		3		7
SIPUNCULIDA									
			Phascolion strombus			1			1
			Golfingia sp.	2					2
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.	3	1	1	2		7
			Cirrophorus branchiatus		1			1	2
		Spionida							
			Laonice cirrata		1		1		2
			Spio martinensis	1					1
			Spiophanes kroyeri	10	5		35	8	58
			Spiochaetopterus typicus	68	68	18	74	62	290
			Cirratulidae indet.	3	1	1	4		9
		Capitellida							
			Heteromastus filiformis			1	3		4
			Lumbriclymene minor		2		1	1	4
			Praxillura longissima	6	3			1	10
			Maldane sarsi	13	6	3	8	5	35
			Maldane sp.	3					3
			Clymenura polaris				3		3
			Praxillella praetermissa				3		3
			Euclymeninae indet.		1				1
		Opheliida							
			Ophelina acuminata		1				1
			Scalibregma inflatum				1	2	3
		Phyllodocida							
			Eteone sp.			7			7
			Aglaophamus malmgreni	1	4		7	1	13
			Nephtys paradoxa	1	1				2
		Amphinomida							
			Paramphinome jeffreysii	10	3	6	5	1	25
		Eunicida							
			Abyssoninoe hibernica	1					1
			Lumbrineris sp.	3		2	2	2	9
			Scoletoma fragilis					1	1
		Oweniida							
			Myriochele heeri	1			1	1	3
			Myriochele oculata	9	3		3	1	16
			Owenia fusiformis					1	1
		Flabelligerida							
			Diplocirrus hirsutus					1	1
		Terebellida							
			Pectinaria hyperborea	1	1				2
			Melinna cristata	2					2
			Sosane gracilis				1		1
			Terebellides stroemi	1					1
		Sabellida							
			Euchone papillosa		1			1	2
CRUSTACEA									
	Malacostraca								
		Cumacea							
			Leucon nasica				1		1
		Amphipoda							
			Haploops tubicola	1	1	1	1		4
			Isaeidae indet.	1					1
		Isopoda							
			Gnathia sp.	1				1	2
MOLLUSCA									
	Prosobranchia								
		Mesogastropoda							
			Frigidoalvania janmayeni			1			1
			Tricholropis borealis				1		1
	Bivalvia								
		Nuculoida							
			Yoldiella sp.	1	1				2
		Veneroida							
			Thyasira equalis		1		1		2
			Montacuta sp.	1					1
			Macoma calcarea		2		3		5
			Pelecypoda indet.				1		1

Station 16

Phylum	Class	Order	Species	01	02	03	04	05	Sum
ECHINODERMATA									
	Asteroidea								
		Paxillosida							
			Ctenodiscus crispatus		3	3	2		8
	Ophiuroidea								
		Ophiurida							
			Ophiura sarsii			1			1
			Max:	68	68	18	74	62	290
			Count:	25	23	13	25	17	49
			Sum:						563

Station 20

Phylum	*Class*	*Order*	*Species*	*01*	*02*	*03*	*04*	*05*	*Sum*
FORAMINIFERA									
			Foraminifera indet.					50	50
CNIDARIA									
	Anthozoa								
			Edwardsiidae indet.	3					3
NEMERTINI									
			Nemertini indet.			1	2		3
NEMATODA									
			Nematoda indet.					2	2
SIPUNCULIDA									
			Golfingia margaritacea		4	4		2	10
			Sipunculida indet.			5		1	6
ANNELIDA									
	Polychaeta								
		Orbiniida							
			Leitoscoloplos sp.	6	4	3	3	9	25
			Aricidea hartmanni		1			1	2
			Paraonis gracilis					1	1
			Paraonis sp.				1		1
			Paradoneis eliasoni				1		1
			Paradoneis lyra	2					2
		Spionida							
			Apistobranchus sp.	1		2		2	5
			Laonice cirrata	2		1			3
			Polydora caulleryi				3		3
			Spio martinensis	7			2		9
			Spiophanes kroyeri	6	1	4	2	1	14
			Spiochaetopterus typicus	101	42	107	129	78	457
			Chaetozone sp.	2			1		3
			Cirratulidae indet.	15	4	3	5	5	32
		Capitellida							
			Capitella capitata				2		2
			Heteromastus filiformis	5	12	7	1	15	40
			Notomastus latericeus		1			1	2
			Maldane sarsi	1		4	1	2	8
			Clymenura polaris	1	1	1			3
			Praxillella praetermissa	2					2
			Euclymeninae indet.				1	1	2
		Opheliida							
			Scalibregma inflatum	8		2	5	2	17
		Phyllodocida							
			Eteone sp.	1		2		1	4
			Phyllodoce groenlandica			1		1	2
			Antinoella sp.				1	1	2
			Gattyana sp.	1					1
			Harmothoe fragilis	1					1
			Harmothoe impar		2				2
			Harmothoe sp.		4	2	2	1	9
			Pholoe synopthalmica	6	9	2	3	9	29
			Proceraea sp.					1	1
			Langerhansia cornuta			1			1
			Typosyllis sp.	1				1	2
			Nereis zonata	4		2		1	7
			Glycera capitata					1	1
			Aglaophamus malmgreni	1			2	3	6
			Nephtys ciliata	1		1			2
			Nephtys paradoxa	1	1	2	3	3	10
			Sphaerodorum gracilis				1	4	5
		Eunicida							
			Nothria conchylega			2	1		3
			Lumbrineris sp.	37	15	24	12	22	110
			Ophryotrocha sp.	1					1
		Oweniida							
			Myriochele oculata	20	7	9	6	5	47
		Flabelligerida							
			Brada inhabilis			1			1
			Brada villosa			1			1
			Diplocirrus hirsutus			1			1
			Pherusa arctica				1		1
			Pherusa plumosa	1					1

Station 20

Phylum	Class	Order	Species	01	02	03	04	05	Sum
		Terebellida							
			Pectinaria hyperborea	3	1			2	6
			Ampharete finmarchica				2	1	3
			Lysippe labiata			1	2	2	5
			Melinna cristata	1			1		2
			Sosane gracilis			1			1
			Amphitrite cirrata			1			1
			Laphania boecki	1		2		1	4
			Paramphitrite birulai					2	2
			Polycirrus medusa	3	1		5	7	16
			Thelepus cincinnatus	1		1	2	4	8
			Terebellides stroemi	3		1	1	1	6
			Trichobranchus glacialis		1	1			2
		Sabellida							
			Chone paucibranchiata	3		2	4	3	12
			Polychaeta indet.	2	2			5	9
CHELICERATA									
	Pycnogonida								
		Pantopoda							
			Pantopoda indet.					1	1
CRUSTACEA									
	Ostracoda								
			Ostracoda indet.	6	3	2	7	1	19
	Malacostraca								
		Cumacea							
			Eudorella emarginata	2	1	5	1	2	11
			Leucon nasicoides			2			2
			Leucon sp.	3	2		2	1	8
			Brachydiastylis resima				1		1
			Diastylis sp.	1					1
		Amphipoda							
			Ampelisca eschrichti	1					1
			Haploops tubicola					4	4
			Ampeliscidae indet.	2					2
			Atylus smitti	1					1
			Apherusa sarsii		3				3
			Isaeidae indet.				1		1
			Lysianassidae indet.		1	1		1	3
			Monoculodes sp.	1		2	2	1	6
			Harpinia serrata					1	1
			Syrrhoe crenulata		11	2		2	15
			Tiron spiniferus	1		1			2
			Hyperiidae indet.			1			1
		Isopoda							
			Gnathia sp.				1	2	3
			Crustacea indet.		2				2
MOLLUSCA									
	Caudofoveata								
		Chaetodermatida							
			Chaetoderma intermedium		1				1
			Chaetoderma nitidilum		1		1		2
	Polyplacophora								
		Ischnochitonidae							
			Ischnochiton albus		1			1	2
	Prosobranchia								
		Archaeogastropoda							
			Lepeta caeca			3	1	2	6
	Opistobranchia								
		Cephalaspidea							
			Cylichna alba			1			1
	Bivalvia								
		Nuculoida							
			Portlandia arctica	1			4		5
			Yoldiella nana	1		1	7	2	11
		Mytiloida							
			Musculus sp.	1					1
		Veneroida							
			Thyasira equalis			1			1
			Montacuta maltzani					2	2
			Montacuta sp.	2					2
			Montacuta spitzbergensis		7			3	10
			Astarte crenata	13		3			16
			Ciliatocardium ciliatum				2	2	4
			Macoma calcarea	2			1		3
		Myoida							
			Mya truncata			3			3
			Hiatella arctica	2		9		1	12

Station 20

Phylum	Class	Order	Species	01	02	03	04	05	Sum
BRYOZOA									
			Ragionula rosacea	1				2	3
	Stenolaemata								
		Cyclostomata							
			Oncousoecia diastoporides	7					7
			Disporella hispida	2					2
	Gymnolaemata								
			Cheiloporina sp.	8					8
			Cylindroporella tubulosa	1					1
			Myriapora subgracilis		2				2
			Alcyonidium protoseideum					1	1
		Cheiloctenostomata							
			Electra arctica	1					1
			Callopora lineata				2		2
			Tricellaria gracilis				2		2
			Porella sp.				1		1
			Schizomavella auriculata	1					1
			Stomachetosella magniporata	1					1
			Cheilostomatida indet.	1					1
ECHINODERMATA									
	Asteroidea								
		Paxillosida							
			Ctenodiscus crispatus				1		1
	Ophiuroidea								
		Ophiurida							
			Ophiopholis aculeata	4	5		3	5	17
			Ophiacantha bidentata	1			1		2
			Ophiocten sericeum	2		5	7	6	20
			Ophiura robusta	8	5	15	14	29	71
			Ophiuroidea indet. juv.			2			2
	Echinoidea								
		Echinoida							
			Strongylocentrotus pallidus		3	2		1	6
TUNICATA									
	Ascidiacea								
			Ascidiacea indet.			1		1	2
			Max:	101	42	107	129	78	457
			Count:	65	34	55	53	64	128
			Sum:						1360

APPENDIX III

Statistical data

Replicate data

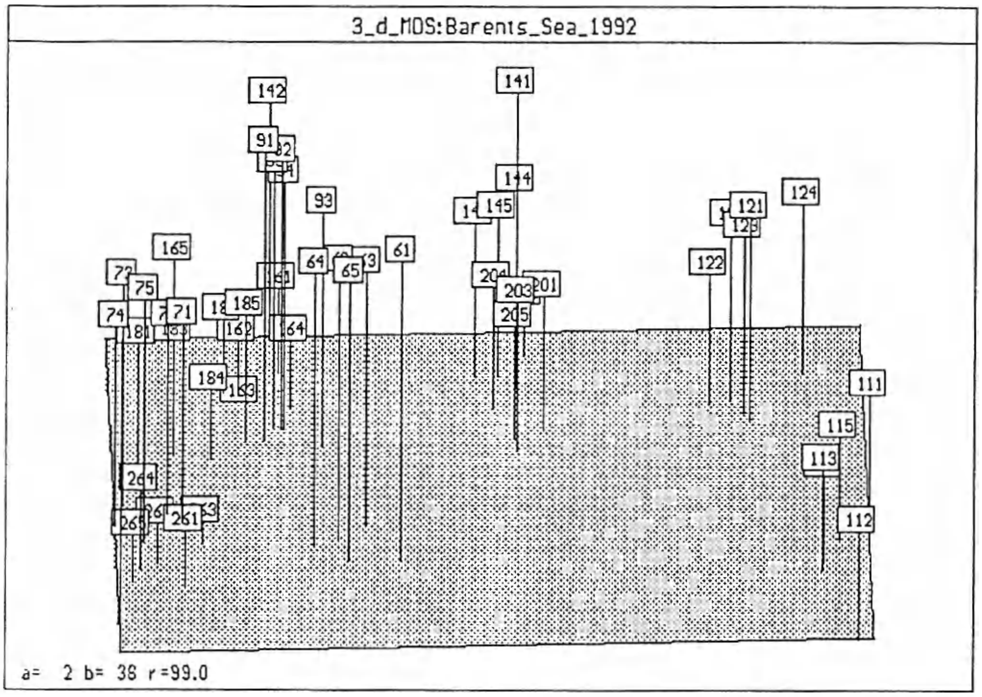
Bray Curtis dissimilarity matrix

	61	62	63	64	65	71	72	73	74	75	91	92	93	94	95	111	112	113	114
61	0.00																		
62	0.44	0.00																	
63	0.46	0.33	0.00																
64	0.45	0.35	0.36	0.00															
65	0.49	0.40	0.46	0.48	0.00														
71	0.79	0.73	0.68	0.67	0.73	0.00													
72	0.67	0.62	0.61	0.58	0.61	0.51	0.00												
73	0.72	0.64	0.63	0.60	0.72	0.49	0.44	0.00											
74	0.76	0.66	0.66	0.64	0.68	0.60	0.39	0.47	0.00										
75	0.66	0.61	0.61	0.60	0.66	0.47	0.41	0.51	0.50	0.00									
91	0.74	0.67	0.61	0.68	0.67	0.70	0.71	0.80	0.72	0.69	0.00								
92	0.73	0.66	0.65	0.69	0.68	0.75	0.65	0.76	0.73	0.68	0.35	0.00							
93	0.73	0.68	0.62	0.66	0.64	0.66	0.68	0.78	0.74	0.68	0.39	0.39	0.00						
94	0.73	0.65	0.66	0.69	0.73	0.75	0.67	0.79	0.71	0.69	0.37	0.36	0.38	0.00					
95	0.73	0.67	0.65	0.69	0.70	0.77	0.68	0.75	0.71	0.71	0.36	0.29	0.36	0.38	0.00				
111	0.89	0.91	0.90	0.90	0.90	0.96	0.98	0.98	0.99	0.98	0.96	0.92	0.91	0.96	0.95	0.00			
112	0.95	0.91	0.93	0.95	0.89	0.95	0.98	1.00	1.00	0.98	0.95	0.98	0.95	0.98	0.98	0.69	0.00		
113	0.90	0.89	0.88	0.91	0.90	0.97	0.96	1.00	0.98	0.97	0.93	0.92	0.91	0.92	0.95	0.46	0.58	0.00	
114	0.88	0.89	0.88	0.90	0.88	0.96	0.97	1.00	0.99	0.97	0.94	0.93	0.90	0.94	0.96	0.45	0.66	0.35	0.00
115	0.87	0.92	0.88	0.91	0.89	0.96	0.97	1.00	0.99	0.97	0.93	0.95	0.91	0.94	0.96	0.44	0.62	0.43	0.40
121	0.79	0.87	0.82	0.89	0.84	0.93	0.94	0.96	0.97	0.97	0.83	0.85	0.84	0.86	0.86	0.70	0.87	0.78	0.78
122	0.82	0.89	0.82	0.88	0.92	0.90	0.93	0.91	0.95	0.94	0.91	0.86	0.83	0.83	0.84	0.77	0.87	0.81	0.80
123	0.78	0.86	0.84	0.85	0.93	0.90	0.91	0.92	0.91	0.94	0.91	0.90	0.87	0.87	0.88	0.72	0.87	0.80	0.81
124	0.86	0.95	0.91	0.94	0.89	0.96	0.94	0.98	0.98	0.99	0.91	0.89	0.84	0.91	0.90	0.71	0.90	0.84	0.83
125	0.78	0.86	0.81	0.88	0.90	0.86	0.93	0.92	0.93	0.93	0.91	0.88	0.84	0.89	0.86	0.74	0.90	0.83	0.82
141	0.84	0.79	0.75	0.82	0.80	0.87	0.85	0.87	0.89	0.87	0.79	0.79	0.76	0.77	0.79	0.86	0.90	0.87	0.88
142	0.80	0.78	0.76	0.82	0.77	0.76	0.74	0.74	0.80	0.72	0.76	0.70	0.74	0.75	0.75	0.97	0.97	0.94	0.97
143	0.84	0.78	0.74	0.80	0.82	0.80	0.82	0.79	0.87	0.86	0.80	0.74	0.67	0.73	0.72	0.85	0.91	0.82	0.84
144	0.79	0.76	0.75	0.78	0.80	0.78	0.84	0.82	0.88	0.85	0.79	0.75	0.69	0.73	0.75	0.86	0.82	0.83	0.83
145	0.85	0.78	0.75	0.83	0.81	0.79	0.84	0.85	0.89	0.86	0.77	0.74	0.70	0.72	0.69	0.86	0.84	0.85	0.83
161	0.86	0.82	0.82	0.81	0.78	0.70	0.67	0.73	0.73	0.78	0.81	0.78	0.73	0.75	0.73	0.95	0.98	0.95	0.92
162	0.89	0.81	0.85	0.83	0.83	0.72	0.71	0.75	0.77	0.81	0.75	0.76	0.73	0.73	0.77	0.97	0.97	0.94	0.94
163	0.90	0.87	0.86	0.88	0.90	0.79	0.78	0.81	0.85	0.87	0.82	0.79	0.73	0.77	0.80	0.96	0.97	0.97	0.95
164	0.87	0.77	0.77	0.83	0.84	0.74	0.68	0.76	0.74	0.79	0.75	0.73	0.70	0.72	0.71	0.92	0.97	0.88	0.91
165	0.89	0.83	0.82	0.82	0.82	0.76	0.70	0.72	0.73	0.82	0.76	0.77	0.77	0.80	0.76	0.97	1.00	0.98	0.98
181	0.84	0.78	0.76	0.76	0.81	0.67	0.64	0.59	0.58	0.71	0.65	0.71	0.67	0.68	0.63	0.99	1.00	1.00	0.99
182	0.87	0.87	0.83	0.84	0.85	0.73	0.71	0.75	0.78	0.76	0.75	0.73	0.75	0.73	0.73	0.95	1.00	0.95	0.94
183	0.83	0.75	0.80	0.77	0.83	0.62	0.56	0.59	0.57	0.61	0.73	0.72	0.67	0.67	0.68	0.98	0.98	0.99	0.97
184	0.82	0.78	0.77	0.80	0.84	0.73	0.62	0.73	0.69	0.76	0.68	0.72	0.70	0.69	0.66	0.98	1.00	0.96	0.97
185	0.75	0.71	0.73	0.74	0.82	0.71	0.65	0.67	0.70	0.71	0.68	0.63	0.66	0.60	0.63	0.96	1.00	0.96	0.95
201	0.78	0.76	0.73	0.79	0.80	0.84	0.84	0.85	0.88	0.89	0.80	0.79	0.76	0.74	0.77	0.79	0.87	0.78	0.78
202	0.90	0.85	0.83	0.84	0.87	0.87	0.88	0.90	0.91	0.94	0.81	0.80	0.82	0.79	0.80	0.90	0.91	0.87	0.86
203	0.80	0.70	0.71	0.74	0.69	0.77	0.81	0.87	0.87	0.82	0.73	0.71	0.67	0.73	0.75	0.80	0.75	0.78	0.77
204	0.82	0.73	0.73	0.79	0.80	0.83	0.83	0.84	0.85	0.91	0.79	0.75	0.71	0.71	0.75	0.81	0.90	0.80	0.81
205	0.82	0.75	0.76	0.74	0.77	0.80	0.81	0.82	0.85	0.87	0.79	0.76	0.74	0.80	0.78	0.79	0.83	0.81	0.78
261	0.80	0.80	0.79	0.80	0.79	0.69	0.65	0.76	0.69	0.71	0.84	0.80	0.79	0.81	0.82	0.96	0.98	0.96	0.92
262	0.84	0.81	0.80	0.81	0.79	0.72	0.67	0.80	0.67	0.71	0.81	0.82	0.82	0.82	0.77	0.98	1.00	0.95	0.96
263	0.83	0.81	0.80	0.83	0.82	0.77	0.68	0.80	0.72	0.75	0.85	0.83	0.75	0.77	0.81	0.98	1.00	0.93	0.94
264	0.79	0.79	0.75	0.77	0.74	0.72	0.58	0.71	0.63	0.68	0.80	0.81	0.76	0.78	0.79	0.98	1.00	0.95	0.95
265	0.84	0.81	0.81	0.81	0.79	0.72	0.64	0.75	0.71	0.72	0.85	0.85	0.83	0.83	0.83	0.99	1.00	0.97	0.97

	115	121	122	123	124	125	141	142	143	144	145	161	162	163	164	165	181	182	183
115	0.00																		
121	0.74	0.00																	
122	0.74	0.46	0.00																
123	0.73	0.50	0.41	0.00															
124	0.77	0.47	0.49	0.42	0.00														
125	0.78	0.51	0.38	0.38	0.38	0.00													
141	0.88	0.76	0.77	0.80	0.81	0.81	0.00												
142	0.92	0.93	0.92	0.90	0.91	0.93	0.64	0.00											
143	0.84	0.78	0.72	0.76	0.80	0.73	0.61	0.63	0.00										
144	0.83	0.76	0.74	0.75	0.80	0.74	0.63	0.66	0.47	0.00									
145	0.83	0.78	0.70	0.76	0.83	0.75	0.61	0.71	0.39	0.49	0.00								
161	0.92	0.91	0.88	0.89	0.91	0.90	0.78	0.69	0.62	0.71	0.65	0.00							

3-dimensional MDS

Minimum was achieved
Final STRESS2 = 0.22988



2-dimensional MDS
Minimum was achieved
Final STRESS2 = 0.29137