IMR/PINRO
JOINT REPORT SERIES
2
2012

Survey Report
from the Joint Norwegian/Russian Ecosystem Survey in the Barents Sea, August – October 2012

Institute of Marine Research - IMR

Polar Research Institute of Marine Fisheries and Oceanography - PINRO

This report should be cited as:

Eriksen, E. (Ed.). 2012. Survey report from the joint Norwegian/Russian ecosystem survey in the Barents Sea August-October 2012. IMR/PINRO Joint Report Series, No. 2/2012. ISSN 1502-8828, 139 pp.

The chapters of this report should be cited as:

Author's names. 2012. *Chapter's name*. In: Eriksen, E. (Ed.) Survey report from the joint Norwegian/Russian ecosystem survey in the Barents Sea August-October 2012. IMR/PINRO Joint Report Series, No. 2/2012. ISSN 1502-8828, *pages*

Survey report
from the joint Norwegian/Russian ecosystem Survey in the Barents Sea, August – October 2012

Editor Elena Eriksen
Institute of Marine Research

Authors in alphabetical order:
Bogstad, B., Boitsov, S., Dalpadado, P., Dolgov, A., Eriksen, E., Gjøsæter, H., Grøsvik, B.E., Heldal, H.E., Ingvaldsen, R., Johansen, T., Jørgensen, L.L., Klepikosky, R., Klungsøyr, J., Krivoshey, P., Lubin, P., Macaulay, G.J., Murashko, P., Orlova, E., Pimchukov, M., Prokhorova, T., Prokopchuk, I., Prozorkevic, D., Rey, A., Rosen, S., Skern-Mauritzen M., Sunde, J., Thangstad, T.H., Trofimov, A., Zabavnikon, V.

Gyrfalcon (*Falco rusticolus*), the largest of the falcon species. This specimen was observed resting on the deck on the Russian research vessel "Vilnus" during the ecosystem survey 2012. Photo: R. Klepikovsky.

Bergen, December 2012

HAVFORSKNINGSINSTITUTTET
INSTITUTE OF MARINE RESEARCH

Content

1 Background

The 9th joint survey (BESS) was carried out during the period 8th of August to 30th of September 2012. The survey plans and tasks were agreed upon at the annual IMR-PINRO Meeting in March 2012 and the almost joint collaborative tasks were executed according to this plan.

"Johan Hjort" (15/8-21/8) started the ecosystem survey with special investigations of the ecosystem of Isfjord and Billefjord (Spitsbergen/Svalbard) area. All ecosystem components (plankton, fish, invertebrates) were collected by trawl and grabs. In addition, genetic and biochemical biological samples were also collected. A new fish sampling technology was also tested during this part of survey. Reports from these investigations will be presented later on the website (http://www.imr.no/tokt/okosystemtokt_i_barentshavet/nn-no). "Vilnyus" (08/08-30/9) started the ecosystem survey from the southeastern part of the Barents Sea and then continued to cover the REEZ from south to north. "G.O. Sars" (18/08-12/09) covered the central parts of the NEEZ and "Johan Hjort" (17/8- 30/9) covered the western part. "Helmer Hansen" started out with a special investigation on the Yermak plateau north of the Svalbard archipelago, where the hydrography in that area and the plankton community were studied in the period 6/8-20/8. That vessel continued to survey the coastal areas of Svalbard until it finished the survey at 3rd September. Only "J.Hjort" and "Vilnyus" were involved in the survey from September 12 to the end of the survey period, where the two vessels covered the northern areas east of the Spitsbergen/Svalbard archipelago.

There were variable weather conditions during the survey, and heavy winds delayed activity in areas covered by the Norwegian vessels. Large areas in the REEZ were also closed and inaccessible for sailing due to military activity. This led to a significant loss of time for "Vilnyus" and lack of survey coverage in the north-eastern parts of the Barents Sea, including the adjacent waters of the Kara Sea. For inexplicable reasons, "Vilnyus" was also denied access to areas close to the Novaja Zemlja coast and to the south of Franz Josef Land.

Except for coverage in the north-eastern parts, the investigations were kept at the same level as in previous years. Thus though there was a reduction in the oceanographic sampling of the standard sections, some new investigations were introduced such as, a special subsurvey in Svalbord/Spitsbergen fjords.

The contents of this report cover many but not all aspects of the survey. The content will be updated and made available in electronic form on the Internet (www.imr.no). An internet site dedicated to collating all information from the ecosystem survey is currently under preparation. The site (http://www.imr.no/tokt/okosystemtokt_i_barentshavet/nn-no) will be store information covering all aspects of the survey, including all previous reports, maps, etc. Post-survey information which is not included in the written report may also be found at this site.

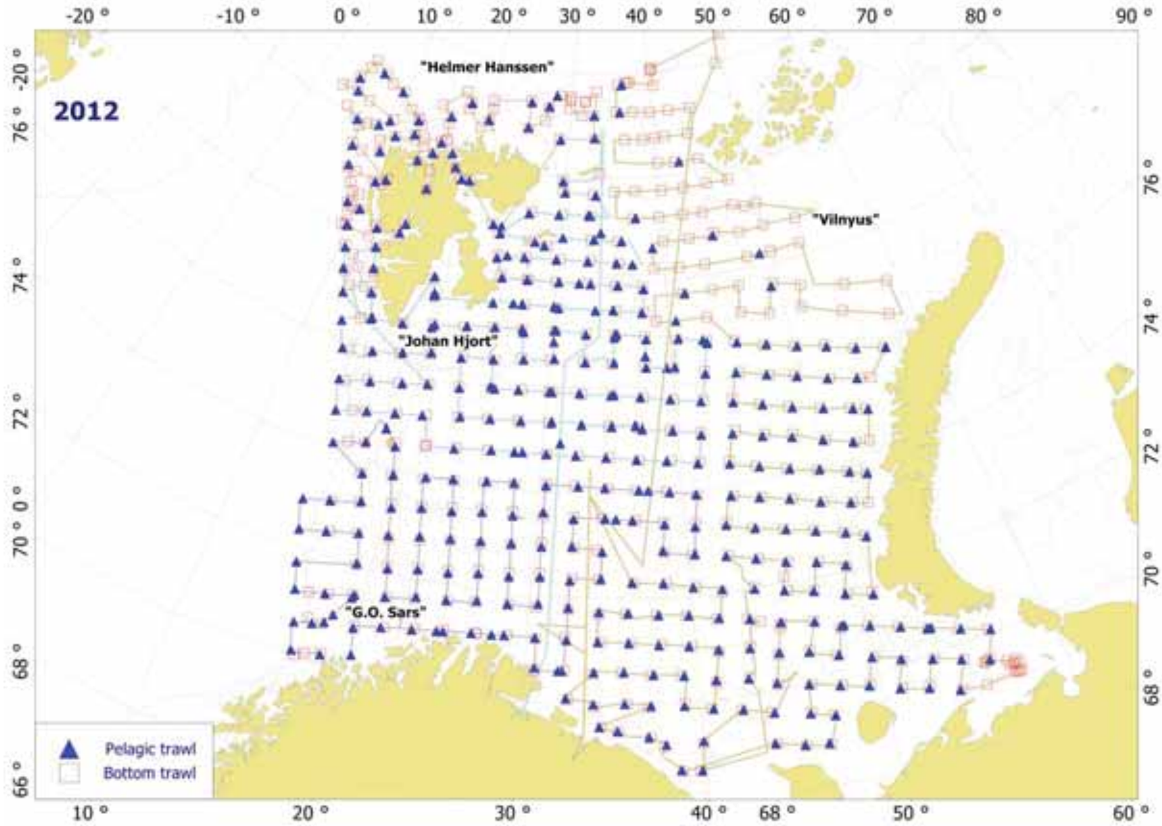


Figure 1.1. Ecosystem survey, August-September 2012. Trawl stations.

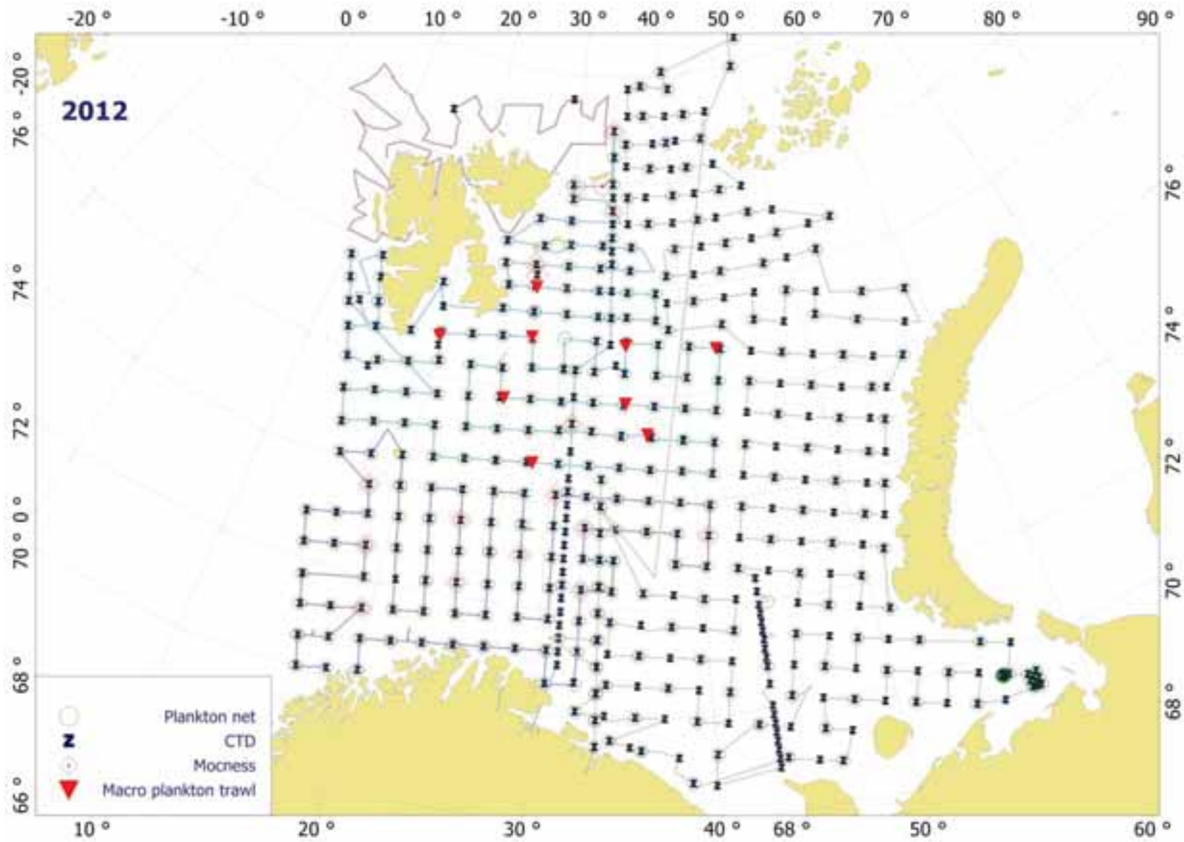


Figure 1.2. Ecosystem survey, August-September 2012. Hydrography and plankton stations.

2 Data monitoring

Huge amounts of data are collected during the ecosystem surveys. Most data will add to those from earlier surveys to form time series, while some data belong to special investigations conducted once or to projects of short duration. Another way of classifying data is distinguishing between *joint data*, i.e. data collected jointly by IMR and PINRO, and data collected by visiting researchers from other institutions, using the survey vessels as a platform for data collection without being part of the overall aim with this survey.

Joint data are owned by IMR and PINRO and this joint ownership is realized through a full exchange of data during and after the survey. Since the data infrastructure is different at IMR and PINRO (see below), the data are converted to institute-specific formats before they are entered into databases on the institutes. However, some aggregated time series data are entered into a joint database called “Sjømil”, which is present both at IMR and PINRO. These data are also accessible outside of these two institutions, see below.

2.1 Data use

Joint data are contained in the databases of both PINRO and IMR and are freely accessible to all inside the institutions. At IMR, the management of the data is left to NMD, (Norsk Marint Datasenter = Norwegian marine data centre) which is a part of IMR. Norway and Russia have quite different data policy in general and this affects the accessibility to the data from outside of these institutions. In Norway, access is in principle granted to everyone for use in research while in Russia access to data collected by one institution for other persons or institutions is highly restricted. This also affects the management of data at IMR, since data collected by PINRO as part of a joint project with IMR can be used by researchers at IMR but cannot be distributed to third parties. In effect, the total amount of joint data cannot be distributed from IMR, and persons or institutions interested in using these data will have to contact IMR for access to Norwegian data and PINRO for access to Russian data.

2.2 Databases

IMR is now developing a new data-infrastructure through the project S2D. Old databases are replaced by a new family of databases administered by NMD. Although the data are split on several databases, for instance one for acoustic data, one for biological data, another for physical and yet another for chemical data, they are linked through a common reference database and all data can be seen through a common user interface. At PINRO they are also planning to move their data into a new set of databases but at present all data are placed in one database for all kinds of data. In addition to these institutional data repositories a joint database for some selected time series of aggregated data has been developed, called “Sjømil”. At present this database is present at IMR and PINRO, and the IMR database is accessible to the outside world through a web interface (http://www.imr.no/sjomil/index.html). This database is general and has data from many other monitoring programs and from other areas than the Barents Sea.

3 Monitoring the marine enviroment

3.1 Hydrography

Text by Trofimov A. and Ingvaldsen R.
Figures by Trofimov A.

The oceanographic investigations consisted of measurements of temperature and salinity in depth profiles distributed over the total investigated area and along the sections Fugløya–Bear Island, Vardø–North, Kola, and Kanin. All vessels used CTD-probes.

3.1.1 Oceanographic sections

Figure 3.1.1.1 shows the temperature and salinity conditions along the oceanographic sections: Fugløya – Bear Island, Vardø–North, Kola, and Kanin. The mean temperatures in the main parts of these sections are presented in Table 3.1, along with historical data back to 1965. Anomalies have been calculated using the long-term means for the periods 1954–1990 (Kanin section) and 1951–2010 (Kola section).

The Fugløya–Bear Island and Vardø–North sections cover the inflow of Atlantic and Coastal water masses from the Norwegian Sea to the Barents Sea. In 2012 the Vardø–North section was extended northwards to 81°N, thus also covering the Arctic water masses in the northern Barents Sea. The mean Atlantic Water (50–200 m) temperature in the Fugløya–Bear Island section was, as it also was in 2011, 0.5°C higher than the long-term mean for the period 1965–2012 (Table 3.1.1.1). Going further east to the Vardø–North section, the mean Atlantic Water (50–200 m) temperature increased and reached an absolute maximum (since 1965) of 5.7°C. That is 1.4°C higher than the long-term mean for the period 1965–2012 and 0.6°C higher than in 2011.

The Kola and Kanin sections cover the flow of Coastal and Atlantic waters in the southern Barents Sea. In August 2012, the mean temperature in the upper 200 m of the inner Kola section was 0.5°C higher than usual and 0.4°C higher than in 2011. In the central and outer parts of the section however, the Atlantic Water temperatures reached an absolute maximum (since 1951) of 6.0 and 5.2°C respectively. That is 1.1–1.4°C higher than the long-term mean and 0.5–1.2°C higher than in 2011. The highest positive anomalies of 1.5–1.7°C were observed in the intermediate and deep waters (50–200 and 150–200 m) in the central part of the section. This shows that the high temperatures in the Barents Sea in 2012 are mostly caused by more or warmer Atlantic Water. At the end of August 2012, the shallow inner part of the Kanin section had a temperature of 6.2°C in the 0–bottom layer, which was 1.9° higher than usual and 1.1°C higher than in 2011. The outer part had the highest (since 1965) temperature of 5.2°C in the 0–200 m, that was 1.7°C higher than the long-term mean for the period 1965–2012 and 1.4°C higher than in 2011.

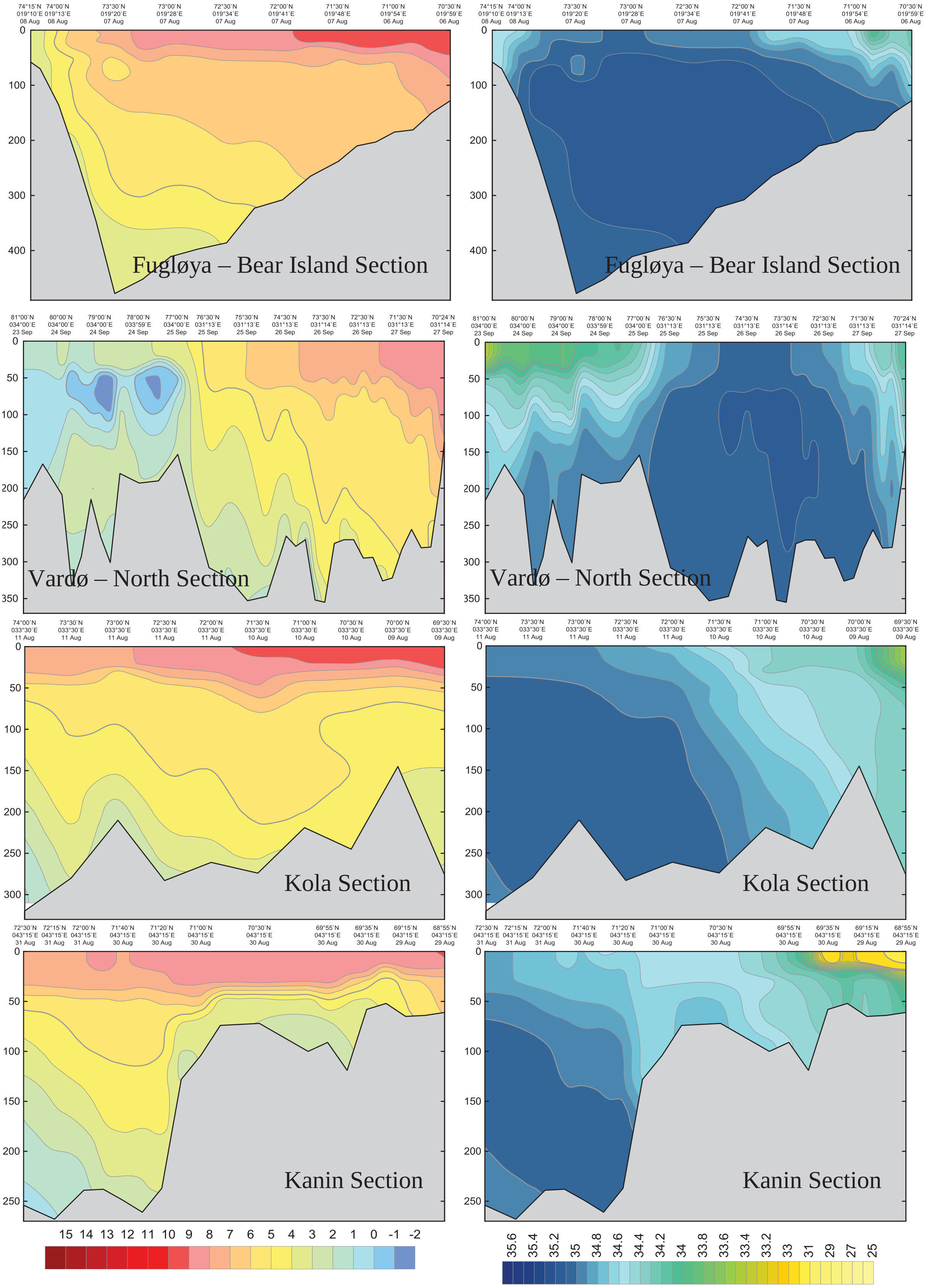


Figure 3.1.1.1. Temperature (°C, left panels) and salinity (right panels) along standard oceanographic sections in August–September 2012.

Table 3.1.1.1. Mean water temperatures in the main parts of standard oceanographic sections in the Barents Sea and adjacent waters in August–September 1965–2012.
The sections are: **Kola** (70º30´N – 72º30´N, 33º30´E), **Kanin S** (68º45´N – 70º05´N, 43º15´E), **Kanin N** (71º00´N – 72º00´N, 43º15´E), North Cape – Bear Island (**NCBI**, 71º33´N, 25º02´E – 73º35´N, 20º46´E), Bear Island – West (**BIW**, 74º30´N, 06º34´E – 15º55´E), Vardø – North (**VN**, 72º15´N – 74º15´N, 31º13´E) and Fugløya – Bear Island (**FBI**, 71º30´N, 19º48´E – 73º30´N, 19º20´E).

Year	Section and layer (depth in metres)								
	Kola	Kola	Kola	Kanin S	Kanin N	NCBI	BIW	VN	FBI
	0–50	50–200	0–200	0–bot.	0–bot.	0–200	0–200	50–200	50–200
1965	6.7	3.9	4.6	4.6	3.7	5.1	-	3.8	5.2
1966	6.7	2.6	3.6	1.9	2.2	5.5	3.6	3.2	5.3
1967	7.5	4.0	4.9	6.1	3.4	5.6	4.2	4.4	6.3
1968	6.4	3.7	4.4	4.7	2.8	5.4	4.0	3.4	5.0
1969	6.7	3.1	4.0	2.6	2.0	6.0	4.2	3.8	6.3
1970	7.8	3.7	4.7	4.0	3.3	6.1	-	4.1	5.6
1971	7.1	3.2	4.2	4.0	3.2	5.7	4.2	3.8	5.6
1972	8.7	4.0	5.2	5.1	4.1	6.3	3.9	4.6	6.1
1973	7.7	4.5	5.3	5.7	4.2	5.9	5.0	4.9	5.7
1974	8.1	3.9	4.9	4.6	3.5	6.1	4.9	4.3	5.8
1975	7.0	4.6	5.2	5.6	3.6	5.7	4.9	4.5	5.7
1976	8.1	4.0	5.0	4.9	4.4	5.6	4.8	4.4	5.8
1977	6.9	3.4	4.3	4.1	2.9	4.9	4.0	3.6	4.9
1978	6.6	2.5	3.6	2.4	1.7	5.0	4.1	3.2	4.9
1979	6.5	2.9	3.8	2.0	1.4	5.3	4.4	3.6	4.7
1980	7.4	3.5	4.5	3.3	3.0	5.7	4.9	3.7	5.5
1981	6.6	2.7	3.7	2.7	2.2	5.3	4.4	3.4	5.3
1982	7.1	4.0	4.8	4.5	2.8	5.8	4.9	4.1	6.0
1983	8.1	4.8	5.6	5.1	4.2	6.3	5.1	4.8	6.1
1984	7.7	4.1	5.0	4.5	3.6	5.9	5.0	4.2	5.7
1985	7.1	3.5	4.4	3.4	3.4	5.3	4.6	3.7	5.6
1986	7.5	3.5	4.5	3.9	3.2	5.8	4.4	3.8	5.5
1987	6.2	3.3	4.0	2.7	2.5	5.2	3.9	3.5	5.1
1988	7.0	3.7	4.5	3.8	2.9	5.5	4.2	3.8	5.7
1989	8.6	4.8	5.8	6.5	4.3	6.9	4.9	5.1	6.2
1990	8.1	4.4	5.3	5.0	3.9	6.3	5.7	5.0	6.3
1991	7.7	4.5	5.3	4.8	4.2	6.0	5.4	4.8	6.2
1992	7.5	4.6	5.3	5.0	4.0	6.1	5.0	4.6	6.1
1993	7.5	4.0	4.9	4.4	3.4	5.8	5.4	4.2	5.8
1994	7.7	3.9	4.8	4.6	3.4	6.4	5.3	4.8	5.9
1995	7.6	4.9	5.6	5.9	4.3	6.1	5.2	4.6	6.1
1996	7.6	3.7	4.7	5.2	2.9	5.8	4.7	3.7	5.7
1997	7.3	3.4	4.4	4.2	2.8	5.6	4.1	4.0	5.4
1998	8.4	3.4	4.7	2.1	1.9	6.0	-	3.9	5.8
1999	7.4	3.8	4.7	3.8	3.1	6.2	5.3	4.8	6.1
2000	7.6	4.5	5.3	5.8	4.1	5.7	5.1	4.2	5.8
2001	6.9	4.0	4.7	5.6	4.0	5.7	4.9	4.2	5.9
2002	8.6	4.8	5.8	4.0	3.7	-	5.4	4.6	6.5
2003	7.2	4.0	4.8	4.2	3.3	-	-	4.7	6.2
2004	9.0	4.7	5.7	5.0	4.2	-	5.8	4.8	6.4
2005	8.0	4.4	5.3	5.2	3.8	6.7	-	5.0	6.2
2006	8.3	5.3	6.1	6.1	4.5	-	5.8	5.3	6.9
2007	8.2	4.6	5.5	4.9	4.3	6.9	5.6	4.9	6.5
2008	6.9	4.6	5.2	4.2	4.0	6.2	5.1	4.8	6.4
2009	7.2	4.3	5.0	-	4.3	-	-	5.2	6.4
2010	7.8	4.7	5.5	4.9	4.5	-	5.4	-	6.2
2011	7.6	4.0	4.9	5.0	3.8	-	-	5.1	6.4
2012	8.2	5.3	6.0	6.2	5.2	-	-	5.7	6.4
Average 1965–2012	7.5	4.0	4.9	4.4	3.5	5.8	4.8	4.3	5.9

3.1.2 Spatial variation

Horizontal distributions of temperature and salinity are shown for depths of 0, 50, 100 m and near the bottom in Figures 3.1.2.1 - 3.1.2.8, and anomalies of temperature at the surface and near the bottom are presented in Figures 3.1.2.9 - 3.1.2.10. Anomalies have been calculated using the long-term means for the period 1929–2007.

As usual, the temperature near the surface gradually decreased northwards and temperatures below 0°C were observed only in the far northern surveyed areas (Figure 3.1.2.1). The surface temperatures were higher (on average by 0.5–2.0°C) than the long-term mean in most of the Barents Sea with the highest positive anomalies (> 2.0°C) north of 76°N. Only in the central and southwestern Barents Sea, small negative anomalies (–0.1 to –0.5°C) took place (Figure 3.1.2.9). Compared to 2011, the surface temperatures were lower (by 0.4–1.3°C) in most of the sea, especially in its central and southwestern parts.

Arctic waters were, as usual, most dominant in 50 m depth north of 76°N (Figure 3.1.2.3) and covered a smaller area than in 2011. The temperatures were mainly higher than both the long-term mean (by 0.7–2.4°C) and the 2011 temperatures (by 0.5–1.9°C). Only the area between 78 and 80°N and east of 35°E showed lower (by 0.1–0.5°C) temperatures than both the long-term mean and those in 2011.

At 100 m depth and close to bottom, only very small areas with temperatures below –1°C were observed (Figure 3.1.2.5 and 3.1.2.7). The temperatures in the depths below 100 m were in general above both the average (by 0.8–1.9°C) and those in 2011 (by 0.4–1.5°C) throughout the Barents Sea (Figure 3.1.2.10). The area occupied by water with temperatures below zero was much less than in the previous year, and near the bottom it was smallest since 1999. The high temperature in the Barents Sea is mostly due to the inflow of water masses with high temperatures from the Norwegian Sea. During the last 10 years the inflow to the Barents Sea has been warm.

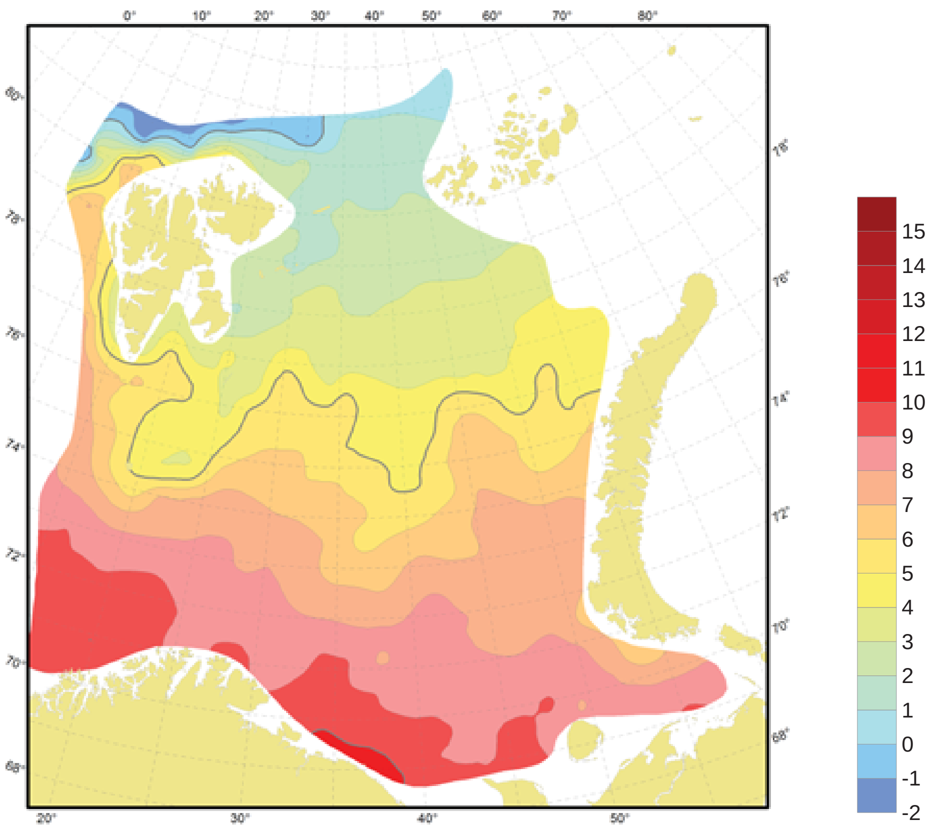


Figure 3.1.2.1. Distribution of surface temperature (°C), August–September 2012.

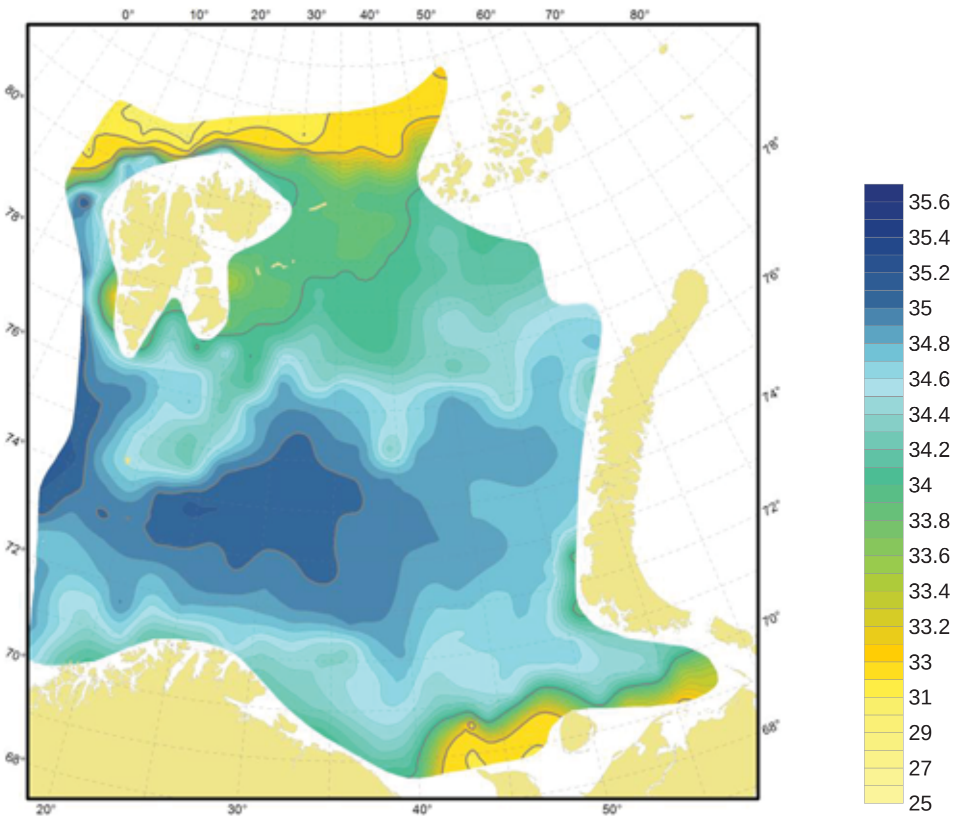


Figure 3.1.2.2. Distribution of surface salinity, August–September 2012.

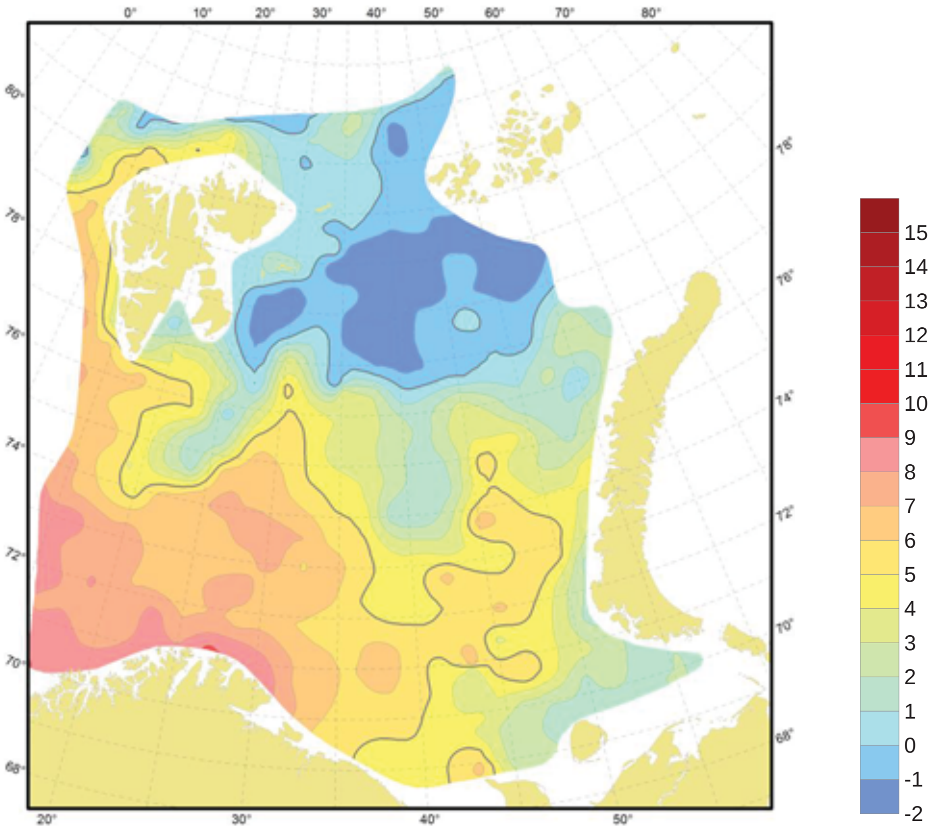


Figure 3.1.2.3. Distribution of temperature (°C) at the 50 m depth, August–September 2012.

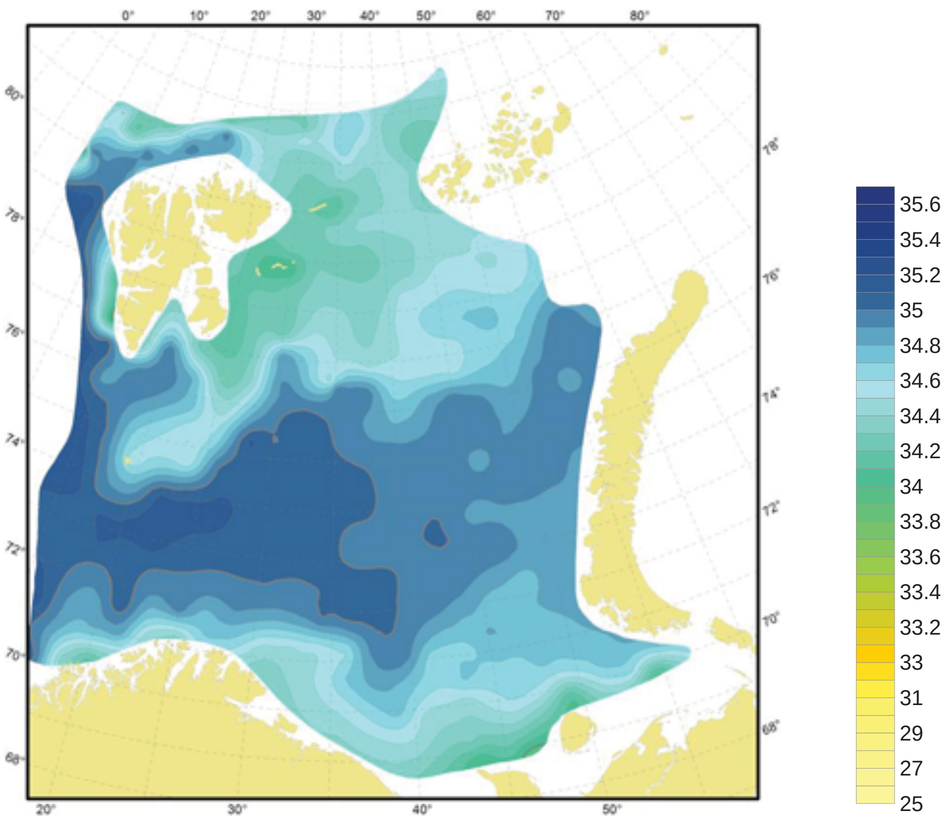


Figure 3.1.2.4. Distribution of salinity at the 50 m depth, August–September 2012.

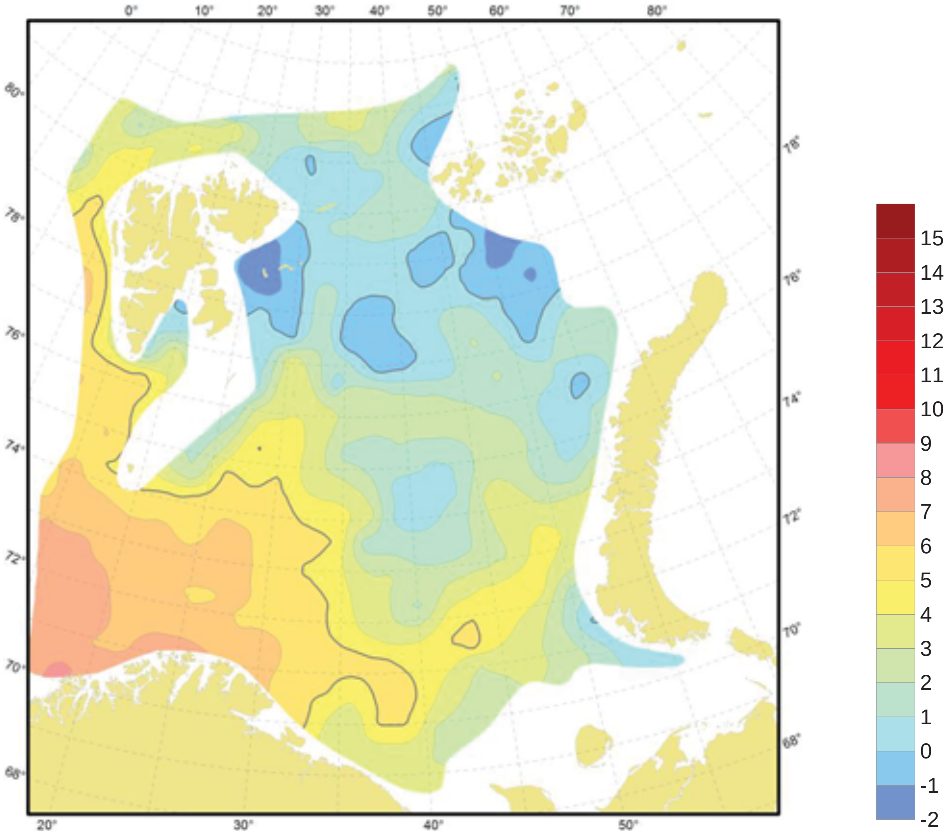


Figure 3.1.2.5. Distribution of temperature (°C) at the 100 m depth, August–September 2012.

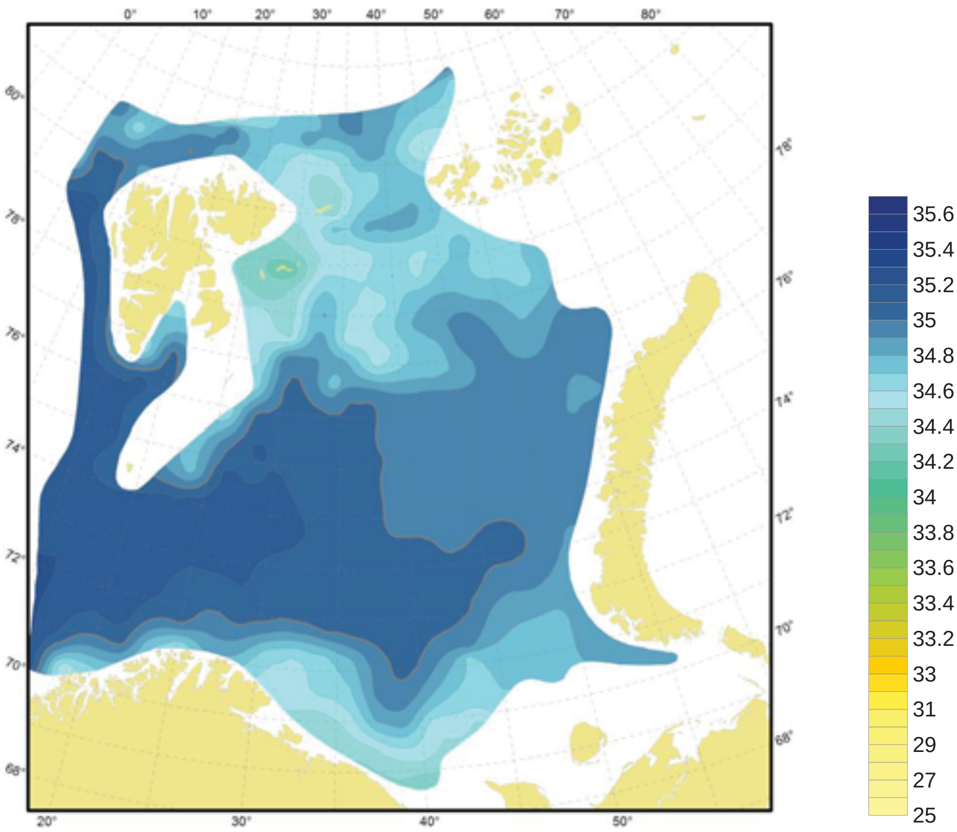


Figure 3.1.2.6. Distribution of salinity at the 100 m depth, August–September 2012.

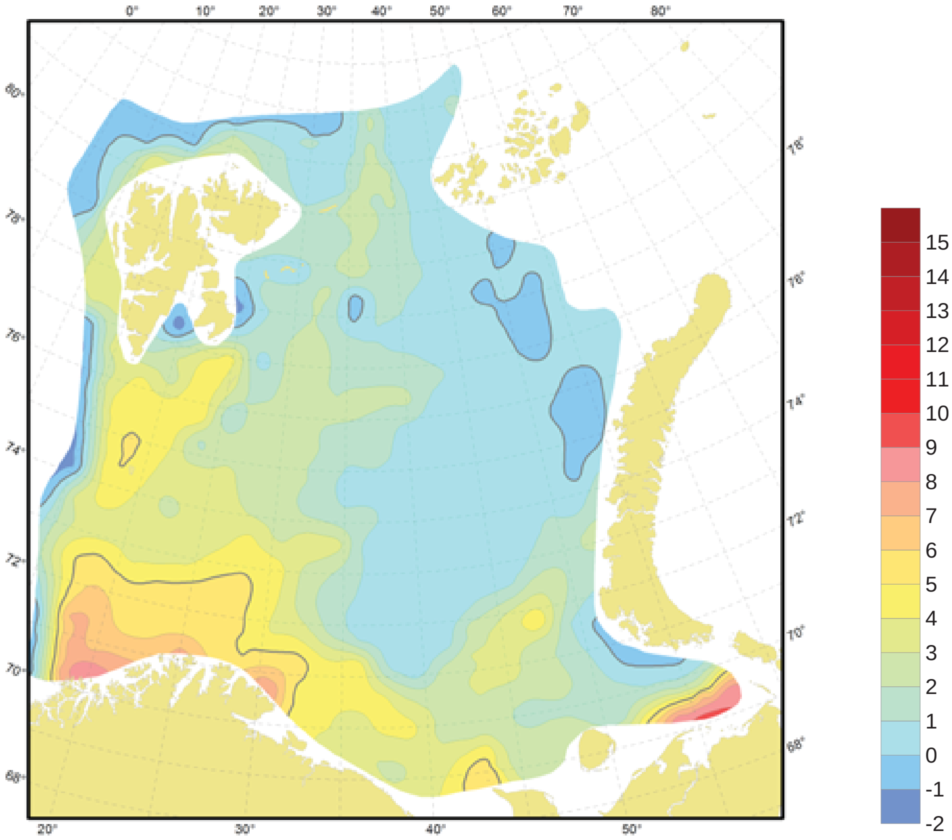


Figure 3.1.2.7. Distribution of temperature (°C) at the bottom, August–September 2012..

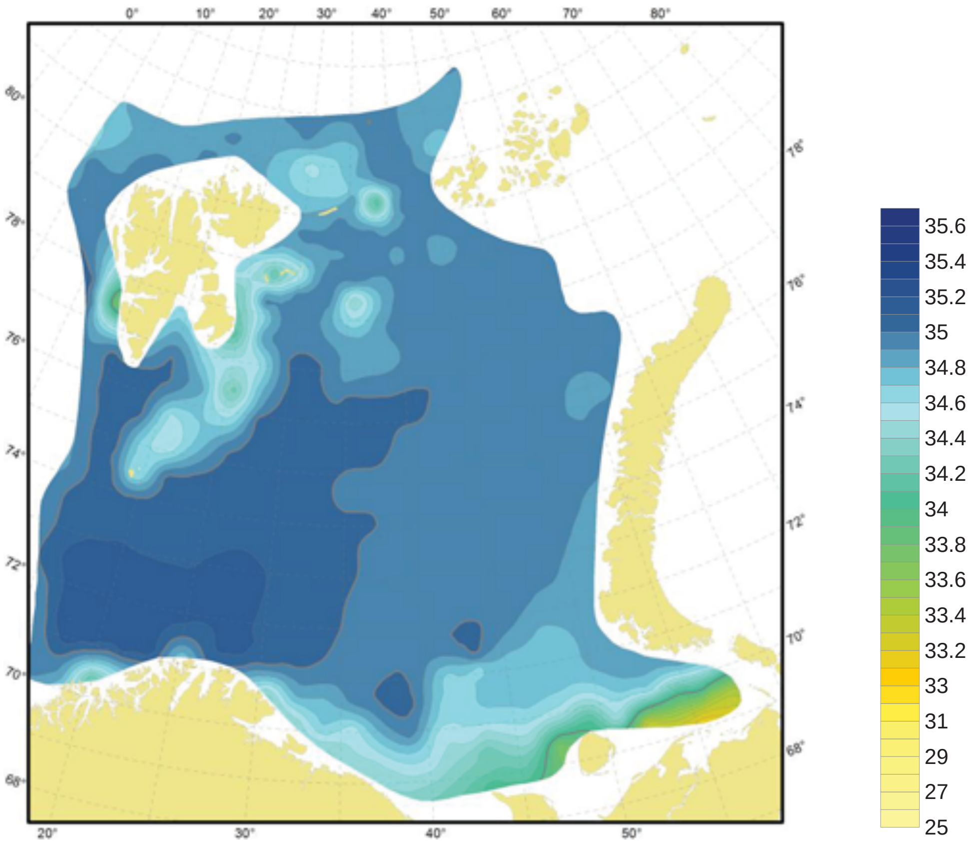


Figure 3.1.2.8. Distribution of salinity at the bottom, August–September 2012.

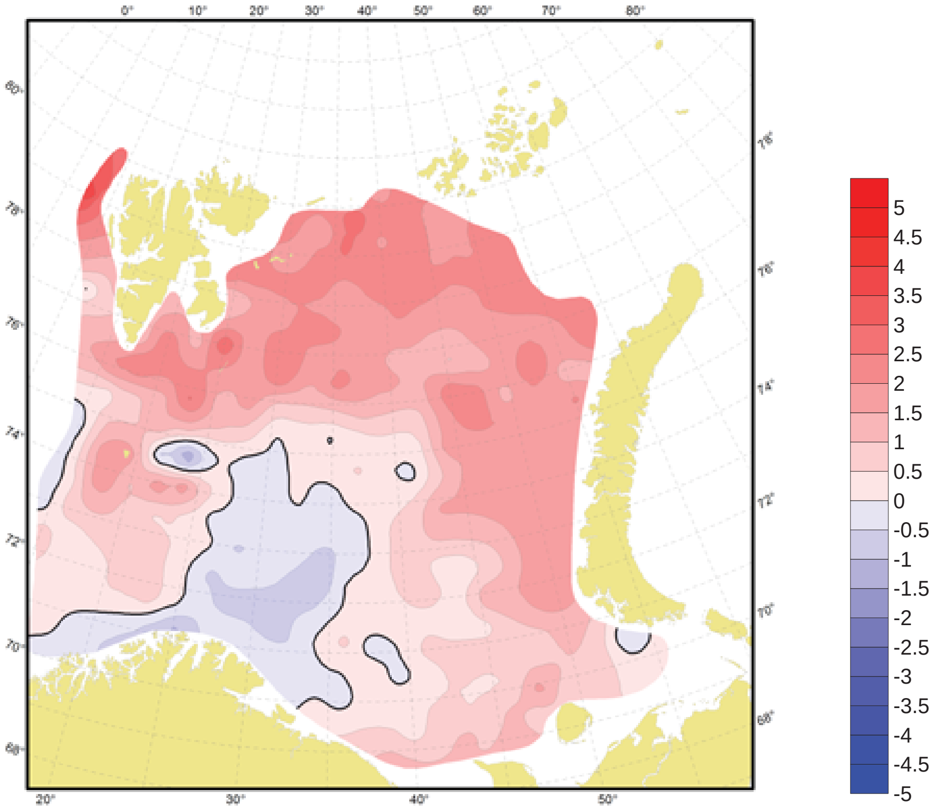


Figure 3.1.2.9. Surface temperature anomalies (°C), August–September 2012.

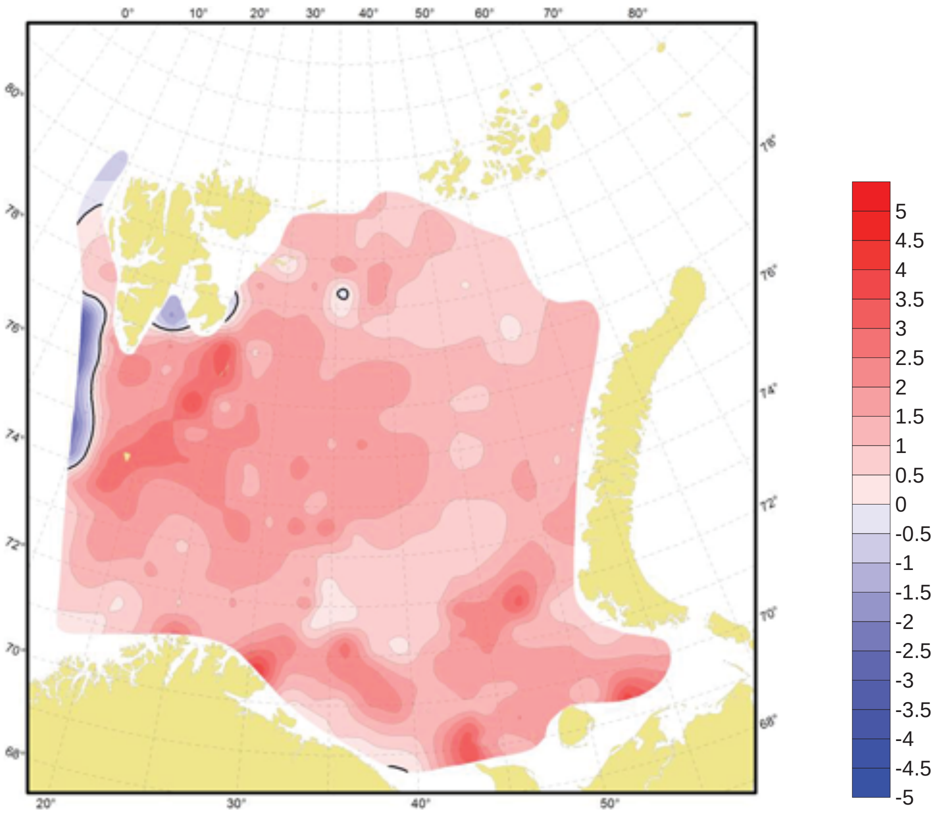


Figure 3.1.2.10. Temperature anomalies (°C) at the bottom, August–September 2012.

3.2 Pollution

3.2.1 Chemical pollution

by Stepan Boitsov, Bjørn Einar Grøsvik, Hilde Elise Heldal, Jarle Klungsøyr (author list in alphabetic order)

In 2012 IMR investigations of the levels of organic pollutants, metals/GS (grain size)/TOC and radionuclides in sea water, sediments and marine biota in the Barents Sea was carried out. The analysis includes different hydrocarbons, persistent organic pollutants (POPs) (PCB, DDT, HCH, HCB) and radionuclides. Monitoring of radionuclides is performed within the monitoring programme "Radioactivity in the Marine Environment" (RAME), which is coordinated by the Norwegian Radiation Protection Authority (NRPA). Monitoring of organic contaminants is performed in close cooperation with NGU (The Geological Survey of Norway) and National Institute of Nutrition and Seafood Research (NIFES).

Results will be not presented in this report, but will be available later on website http://www.imr.no/tokt/okosystemtokt_i_barentshavet/survey_report/nb-no

3.2.2 Antropogenic matter

Text by T. Prokhorova

Figures by P. Krivosheya

Surface investigations showed the plastic and wood prevalence among man-made garbage (Figure 3.2.2.1). It is likely that garbage was drifted into the area by ocean currents. Metal, rubber and paper observed among floating garbage sporadically (Figure 3.2.2.2).

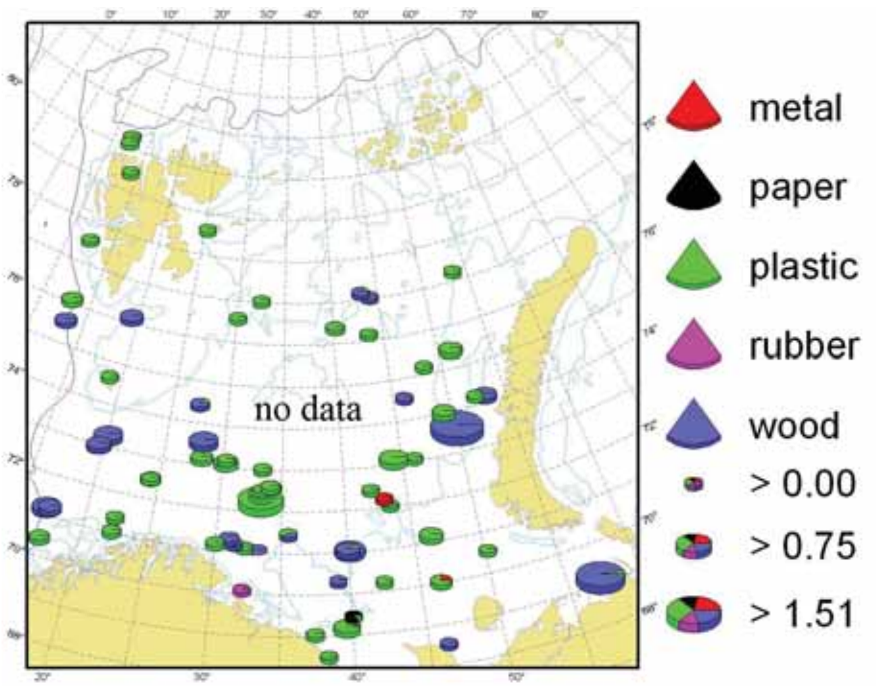


Figure 3.2.2.1. Type of visible antropogenic matter (m^3) at surface in the survey area in the 2012

Figure 3.2.2.2. Floating antropogenic matter in survey area in the 2012.

As in previous years, plastic featured among man-made garbage in the trawl catches (Figure 3.2.2.3). The occurrence of plastic in the bottom trawls catches increased in the directions of northwest, northeast and east, which correspond to the directions of the main currents. In the pelagic trawls catches garbage occurred mainly in the central parts of the Barents Sea.

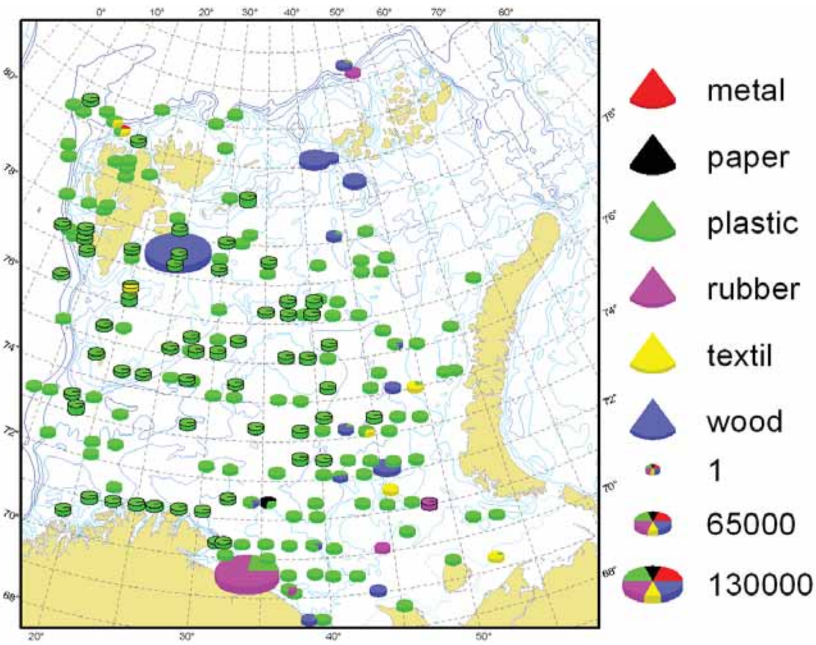


Figure 3.2.2.3. Types of garbage collected in the pelagic and bottom trawls (g^3) in the 2012 survey area. Legend: symbols with contours– in pelagic trawl, symbols without contours – in bottom trawl.

Because the bottom trawl catchability is small for low density polymer materials, the amount of anthropogenic garbage in the Barents Sea may be larger than that observed.

The occurrence of wood dominated in the north and southwest, and might have been transported to the area by ocean currents from the eastern seas, since timber-rafting occurs in the Siberian Rivers. Alternatively, the wood could have been lost material from ships. This phenomenon is observed annually.

Dangerous and potential dangerous for man objects were seldom presented in the observations. In the majority of cases only inactive objects were found, which do not effect on the environment directly harmful. On the other hand, big lumps of threads, lines and nets which sea organisms may be tangled in, were found.

4 Monitoring the plankton community

4.1 Nutrients and chlorophyll a

No results available. Take contact with responsible scientific group at IMR and PINRO.

4.2 Phytoplankton

No results available. Take contact with responsible scientific group at IMR and PINRO.

4.3 Zooplankton

4.3.1 Calanus composition at the Fugløya-Bear Island (FB) transect

Text and figures by P. Dalpadado

The stations in the FB transect are taken at fixed positions located at the western entrance to the Barents Sea. The numbers of sampled stations are normally 5 to 8 depending on weather conditions. In this report, four stations, representing different water masses (coastal; Atlantic; and mixed Atlantic/Arctic water) from 1995 to 2011(except 1999), have been analyzed for species composition of the two most abundant species *C. finmarchicus*, and *C. glacialis*, and the occurrence of *C. helgolandicus* in March and August. *C. helgolandicus* is quite similar in appearance especially to *C. finmarchicus*, but is a more southerly species with a different spawning period. *C. helgolandicus* has in recent years become more frequent in the North Sea and southern parts of the Norwegian Sea (Svinøy transect), and it is expected that it could potentially increase its abundance in the western part of the Barents Sea in the years to come. Results so far seem to indicate that the abundance of *C. helgolandicus* at the western entrance to the Barents Sea is rather low and has remained more or less unchanged during the study period (not shown).

Though *C. finmarchicus* display inter-annual variations in abundance, comparison of abundance during three periods shows that there is little change in abundance over time. (Figure 4.3.1.1). For *C. glacialis* there seem to be a decrease in abundance after 2000. The lowest abundance for *C. hyperboreus* was recorded during 2006-2011 (59 no.m^{-2}) compared to 2001-2005 (189 no. m^{-2}) and 1995-2000 (119 no.m^{-2}).

The highest abundances were recorded in 2010 over the whole transect except for the northernmost locality at 74º00'N, where the abundance was considerably lower (Figure 4.3.1.2). On average over all years, it is the locality at 73º30'N that shows the highest number of individuals. As expected *C. glacialis* has its highest abundance at the two northernmost stations, localities that are typical of a mixture of Atlantic and Arctic waters. The highest number of individuals (5472 no.m^{-2}) was observed for the year 1997(not shown). The most stable occurrence and the highest average abundance are found at the northernmost locality a 74º00'N having a mixture of Atlantic and Arctic water masses. Also *C. glacialis* is subject to large inter-annual variations, and its abundance during 2008 and 2009 of year is considerably well below what can be considered the log-term mean for the two northernmost localities.

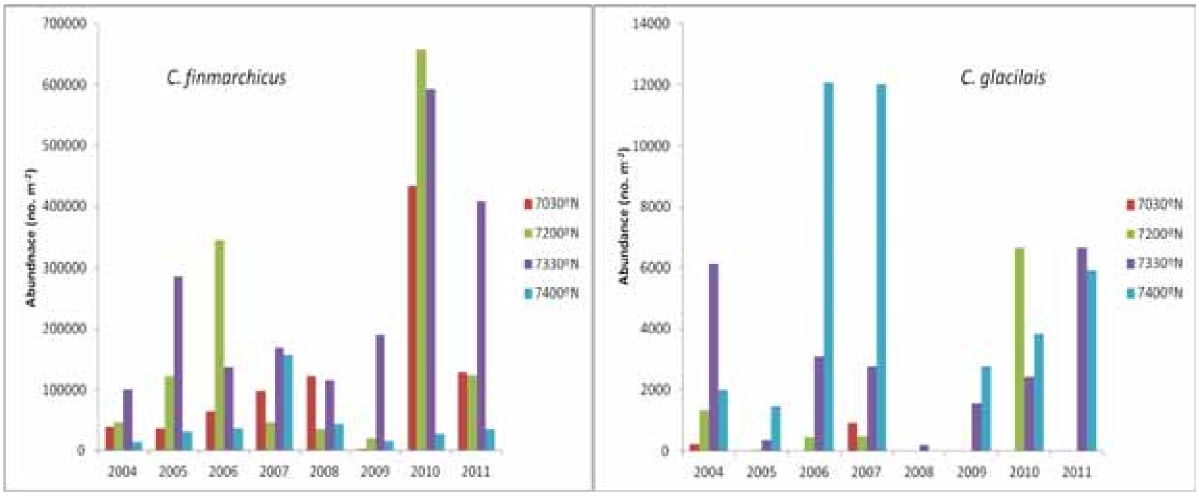


Figure 4.3.1.1. Abundance of *Calanus* species at the FB section during three periods: 1995-2000; 2001-2005; 2006-2011.

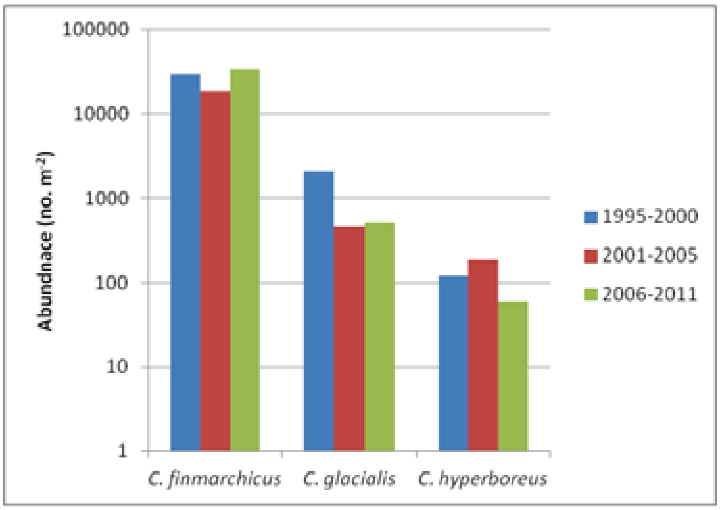


Figure 4.3.1.2. Development of copepod abundance along the FB section during the period 2004 - 2010. On a few occasions, when stations were lacking at a particular position, stations closest to that position were analyzed.

4.3.2 Spatial distribution and biomasses

No results available. Take contact with responsible scientific group at IMR and PINRO.

4.3.3 Biomass indices of krill and jellyfish- non target

Text by Eriksen E., Dalpadado P. and Dolgov A.
Figures by Eriksen E.

Distribution and amount of larger krill

In 2012, krill (group without species identifications) were distributed in the western, eastern areas and around Svalbard/Spitsbergen (Figure 4.3.3.1). The highest catches were taken during the night, with average of 11 gram per m-2, however the catches on the night stations were 2 time lower than day stations during the survey (Table 4.3.3.1). During the night most of krill migrate to upper water layer, and therefore better available for the capturing.

In 2012, the biomass of krill was twice higher than long term mean (8.2 million tonnes) and was around 15.2 million tonnes after the heavy feeding summer season.
During the survey only three catches with amphipods were taken, two along the southwestern coast of Novaya Zemlya and one near the northern Norwegian coast.

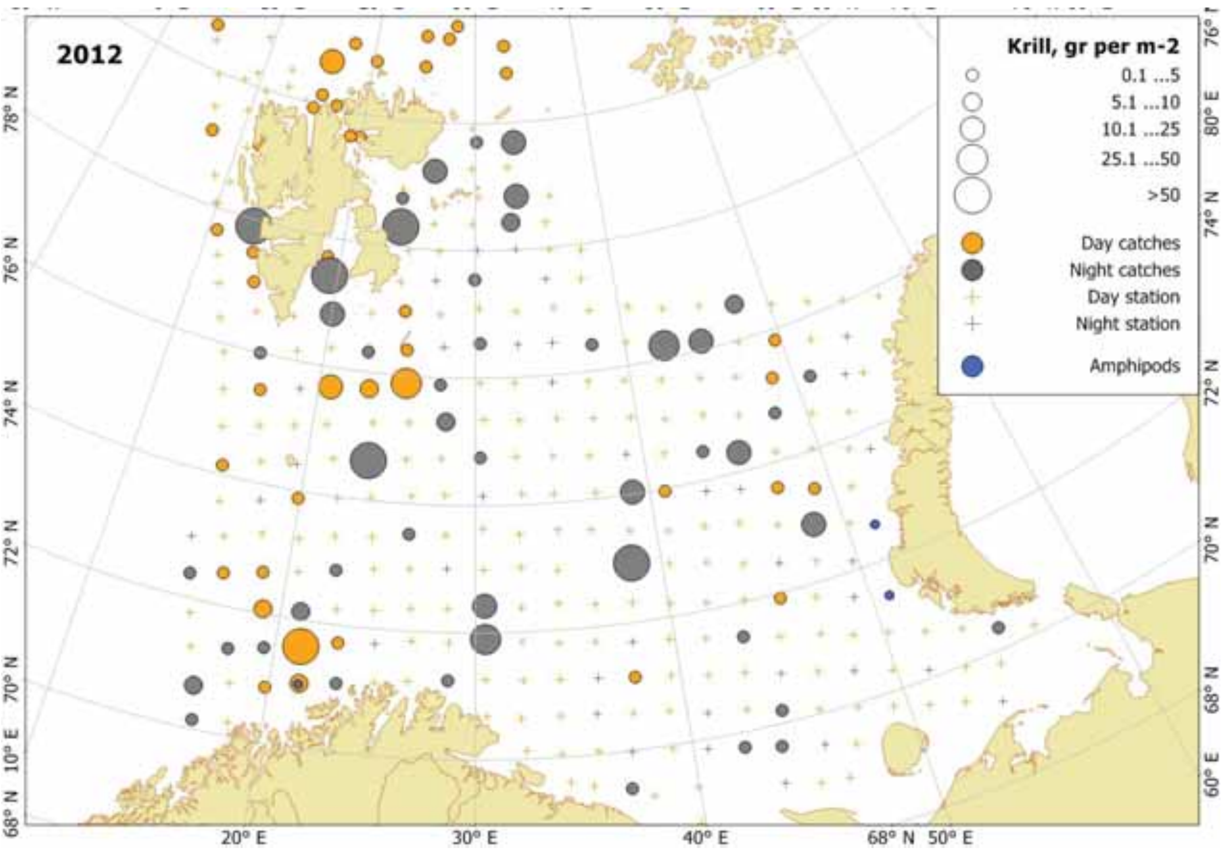
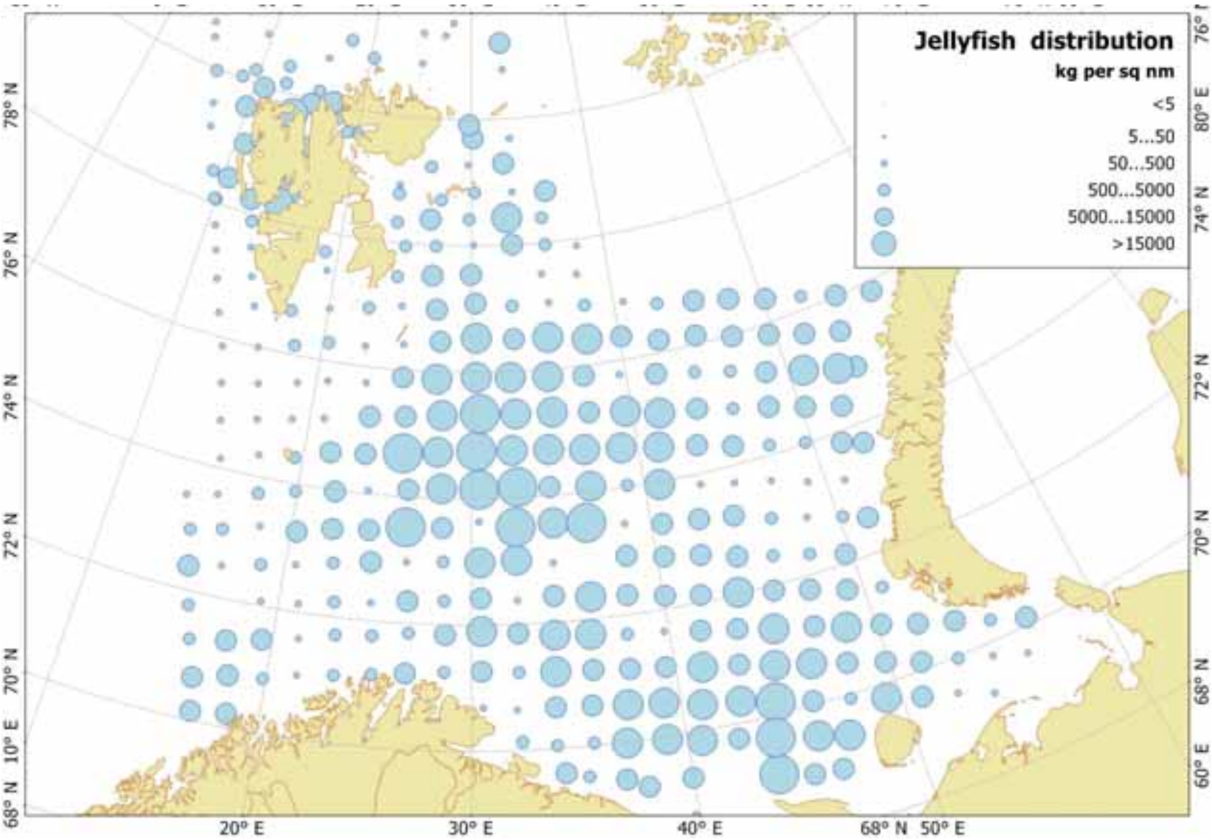


Figure 4.3.3.1. Krill distribution, based on trawl stations covering 0-60m, in the Barents Sea in August-September 2012.

Table 4.3.3.1. Day and night catches of krill taken by the pelagic trawl within 0-60 m.

Year	Day			Night		
	N	Mean gm-2	Std Dev	N	Mean gm-2	Std Dev
1980	237	1.49	11.38	90	4.86	23,96
1981	214	1.19	9.14	83	7.95	21,53
1982	192	0.18	1.19	69	6.29	22,57
1983	203	0,32	2.76	76	0.39	1,91
1984	217	0.15	1.64	66	1.72	9,17
1985	217	0.07	0.54	75	0.80	4,42
1986	229	3.03	11.70	76	11.90	37,82
1987	200	4.90	22.44	88	3.82	13,08
1988	207	2,69	30.16	81	11.84	55,84
1989	296	1,99	8.45	129	3.71	13,01
1990	283	0,11	0.76	115	1.18	6,32
1991	284	0,03	0.33	124	7.03	25,11
1992	229	0,11	1.18	77	0.92	2,92
1993	194	1,21	6.69	79	2.23	7,36
1994	175	3,01	10.23	72	7.27	18,78
1995	166	4,86	18.86	80	9.13	36,46
1996	282	4,34	26.62	118	9.32	21,53
1997	102	4,12	22.71	167	3.58	12,94
1998	176	2,24	1600	185	5.68	23,95
1999	140	1,50	9.64	90	4.64	13,09
2000	202	1,52	9.53	67	3.54	11,49
2001	212	0,07	0.63	66	5.77	19,60
2003	203	1,26	9.54	74	2.84	11,23
2004	229	0,34	2.94	80	6.49	22,47
2005	314	3,50	30.53	86	9.02	24,78
2006	227	1,23	6.66	103	9.66	31,54
2007	192	1,79	10.93	112	9.04	39,29
2008	199	0,11	10.02	77	16.92	43,57
2009	241	0,42	2.56	131	10.29	25,02
2010	198	1,76	13.00	105	14.98	43,35
2011	212	0,13	0.69	95	19.46	77,70
2012	243	4,00	12.35	84	11.48	34,21
1980-2011	216	1,68	10	94	6.99	23,56

Distribution and amount of jellyfish, mostly Cyanea capillata



In the 2012 jellyfish (mostly *Cyanea capillata*) were found over the larger areas in the Barents Sea. The highest catches were taken in the southern and central areas, and some of catches were as high as 15 tonnes per nautical miles. Jellyfish were distributed not only in the Atlantic warm waters, but also in the mixed and colder arctic waters.

The calculated biomass of the jellyfish taken by pelagic trawl in the 0-60 m was 1.3 million tonnes in the Barents Sea in August-September. It was at same level that in 2004-2008, which is higher than long term mean (945 thousand tonnes).

The jellyfish preys on zooplankton, fish eggs and fish larvae. They should utilize a huge amount of plankton during the summer to reached so high biomasses.

Table 4.3.3.2. Estimates of Barents Sea jellyfish biomass (1000 tonnes) with 95% confidence interval for the period 1980-2012. In addition, the surveyed area (nm^2), number of stations and annual mean biomass ($tonnes/nm^2$) are presented.

Year	Cov_area	Stations	Biomass	Conf_min	Conf_mas
1980	356174	327	227	178	277
1981	334230	298	392	307	477
1982	292778	280	485	359	610
1983	322125	279	688	532	844
1984	326232	324	623	459	788
1985	343843	292	68	37	100
1986	317294	305	136	97	176
1987	313977	285	195	97	294
1988	324901	288	371	97	645
1989	406372	424	123	64	182
1990	353669	398	1279	1067	1492
1991	382531	403	973	784	1161
1992	314132	306	1096	804	1388
1993	312212	273	716	529	902
1994	277693	250	63	39	87
1995	260370	247	30	16	43
1996	319267	400	485	383	597
1997	276425	269	19	9	28
1998	320425	361	212	169	255
1999	303076	230	524	384	664
2000	338769	269	1260	1009	1511
2001	345169	278	4906	4191	5620
2002	329118	255	2870	2436	3303
2003	343000	277	2663	2202	3125
2004	333431	309	1510	1260	1759
2005	396600	318	1423	1040	1806
2006	314402	304	1157	715	1599
2007	378208	305	1221	725	1716
2008	363379	316	1174	864	1483
2009	371317	331	664	499	828
2010	370759	304	279	193	364
2011	367267	309	2056	1674	2437
2012	3871212	329	1304	961	1648
Long term mean	336253	307	945	733	1158

5 Monitoring the pelagic fish community

Number of fish sampled during the survey is presented in Appendix 2.

5.1 Fish recruitment: fish distribution and abundance/biomass indices

Text by E. Eriksen and D. Prozorkevich
Figures by E. Eriksen E. and D. Prozorkevich

The 2012 year class of capelin is the highest on record, and the 0-group cod was also found to be a strong year class. The 2012 year classes of herring, redfish and Greenland halibut are close to the long term mean levels, while those of haddock, saithe, long rough dab and polar cod were poor. Abundance indices calculated for eleven 0-group fish species from 1980-2012 are shown in Tables 5.1.1 and 5.1.2.

The total biomass of the four most abundant 0-group fish (cod, haddock, herring and capelin) reached 2.2 million tonnes in August-September. Cod contributed to almost half of the total 0-group fish biomass. Most of the biomass distributes in the central part of the Barents Sea. Biomass indices calculated for four 0-group fish species from 1993-2012 are shown in Table 5.1.3.

Length measurements of 0-group fish taken on board indicated that the lengths of most of 0-group fish for cod, haddock, capelin, saithe, polar cod and sand eels was higher than the long term mean (1980-2012), while 0-group herring and redfish were smaller in size. Length frequency distributions of the main species are given in Table 5.1.4.

Table 5.1.1. 0-group abundance indices (in millions) with 5% confidence limits, not corrected for capture efficiency. Record high year classes in bold.

Year classes	Capelin	Cod	Haddock	Herring	Redfish	Saithe	Gr. halibut	Long rough dab	Polar cod East	Polar cod West
1980	197278	72	59	4	277873	3	111	1273	28958	9650
1981	123870	48	15	3	153279	0	74	556	595	5150
1982	168128	651	649	202	106140	143	39	1013	1435	1187
1983	100042	3924	1356	40557	172392	239	41	420	1246	9693
1984	68051	5284	1295	6313	83182	1339	31	60	127	3182
1985	21267	15484	695	7237	412777	12	48	265	19220	809
1986	11409	2054	592	7	91621	1	**112**	**6846**	12938	2130
1987	1209	167	126	2	23747	1	35	804	7694	74
1988	19624	507	387	8686	107027	17	8	205	383	4634
1989	251485	717	173	4196	16092	1	1	180	199	18056
1990	36475	6612	1148	9508	94790	11	1	55	399	31939
1991	57390	10874	3857	81175	41499	4	1	90	88292	38709
1992	970	44583	1617	37183	13782	159	9	121	7539	9978
1993	330	38015	1502	61508	5458	366	4	56	41207	8254
1994	5386	21677	1695	14884	52258	2	39	1696	**267997**	5455
1995	862	74930	472	1308	11816	148	15	229	1	25
1996	44268	66047	1049	57169	28	131	6	41	70134	4902
1997	54802	67061	600	45808	132	78	5	97	33580	7593
1998	33841	7050	5964	79492	755	86	8	27	11223	10311
1999	85306	1289	1137	15931	46	136	14	105	129980	2848
2000	39813	26177	2907	49614	7530	206	43	233	116121	22740
2001	33646	908	1706	844	6	20	51	162	3697	13490
2002	19426	19157	1843	23354	130	553	51	731	96954	27753
2003	94902	17304	7910	28579	216	65	13	78	11211	1627
2004	16901	19408	19372	**136053**	862	**1400**	72	36	37156	341
2005	42354	21789	**33637**	26531	12676	55	10	200	6545	3231
2006	168059	7801	11209	68531	20403	139	11	707	26016	2112
2007	161594	9896	2873	22319	156548	53	1	262	25883	2533
2008	288799	52975	2742	15915	9962	45	6	956	6649	91
2009	189747	54579	13040	18916	49939	22	7	115	23570	21433
2010	91730	40635	7268	20367	66392	402	14	128	31338	1306
2011	175836	**119736**	7441	13674	7026	27	20	58	37431	627
2012	**310519**	105176	1814	26480	58535	69	30	173	4173	17281
Long term mean 1980-2012	88343	26139	4186	27950	62270	180	28	545	34845	8762

Table 5.1.2. 0-group abundance indices (in millions) with 5% confidence limits, corrected for capture efficiency.

Year	Capelin	Cod	Haddock	Herring	Saithe	Polar cod	
						East	West
1980	740289	276	265	77	21	203226	82871
1981	477260	289	75	37	0	4882	46155
1982	599596	3480	2927	2519	296	1443	10565
1983	340200	19299	6217	195446	562	1246	87272
1984	275233	24326	5512	27354	2577	871	26316
1985	63771	66630	2457	20081	30	143257	6670
1986	41814	10509	2579	93	4	102869	18644
1987	4032	1035	708	49	4	64171	631
1988	65127	2570	1661	60782	32	2588	41133
1989	862394	2775	650	17956	10	1391	164058
1990	115636	23593	3122	15172	29	2862	246819
1991	169455	40631	13713	267644	9	823828	281434
1992	2337	166276	4739	83909	326	49757	80747
1993	952	133046	3785	291468	1033	297397	70019
1994	13898	70761	4470	103891	7	2139223	49237
1995	2869	233885	1203	11018	415	6	195
1996	136674	280916	2632	549608	430	588020	46671
1997	189372	294607	1983	463243	341	297828	62084
1998	113390	24951	14116	476065	182	96874	95609
1999	287760	4150	2740	35932	275	1154149	24015
2000	140837	108093	10906	469626	851	916625	190661
2001	90181	4150	4649	10008	47	29087	119023
2002	67130	76146	4381	151514	2112	829216	215572
2003	340877	81977	30792	177676	286	82315	12998
2004	54573	66846	42640	801684	4795	290686	2644
2005	150341	72989	92536	126836	177	44703	26091
2006	520553	24773	27639	302762	276	182714	16232
2007	490817	43412	8527	142871	298	191111	22811
2008	995101	234144	9864	201046	142	42657	619
2009	673027	185457	33339	104233	62	168990	154687
2010	318569	135355	23669	117087	1066	267430	12045
2011	594248	448005	19114	83051	96	249269	4924
2012	988600	410757	5281	177189	229	25026	125306
Mean	300816	99882	11785	166301	516	281688	71053

Table 5.1.3. Biomass indices of 0-group capelin, cod, haddock and herring (in thousand tonnes).

Year	Capelin	Cod	Haddock	Herring	Total biomass, in 1000 tonnes
1993	3	475	34	1035	1547
1994	6	666	54	173	898
1995	2	1546	14	12	1573
1996	98	919	34	438	1489
1997	82	657	12	352	1103
1998	51	117	168	988	1323
1999	158	32	39	440	668
2000	55	319	44	404	822
2001	51	11	58	9	130
2002	-	-	-	-	
2003	149	160	115	471	894
2004	33	317	686	2243	3279
2005	60	431	749	406	1647
2006	335	181	329	1321	2166
2007	312	123	69	275	779
2008	396	632	54	106	1189
2009	197	955	346	289	1788
2010	100	786	134	254	1274
2011	228	1855	215	151	2449
2012	519	1429	39	212	2199
Mean	129	566	175	520	1390

Table 5.1.4. Length distribution (%) of 0-group fish in the Barents Sea and adjacent waters

Length, mm	Cod	Haddock	Capelin	Herring	Saithe	Redfish	Polar cod	Gr. halibut	LRD	Sandeel
10 - 14						0.2				
15 - 19						0.7				
20 - 24			0.2			1.5			6.2	0.1
25 - 29			1.7			3.6			38.0	0.3
30 - 34			3.3			6.1	0.8		33.3	0.5
35 - 39			7.6			15.7	6.8		15.2	2.9
40 - 44	0.1	0.1	14.1		0.3	25.8	38.0		6.6	6.2
45 - 49	0.3	0.5	18.1	0.2	0.7	32.7	33.3	0.6	0.6	12.0
50 - 54	1.2	0.8	20.5	1.1	0.5	11.4	8.9	6.1	0.1	16.2
55 - 59	2.7	0.9	17.8	7.3	0.6	2.2	5.9	13.2		23.1
60 - 64	7.7	2.1	11.6	26.6	0.3	0.0	4.2	26.7		16.6
65 - 69	9.2	3.2	4.9	37.2	0.5		2.1	21.4		4.2
70 - 74	14.8	4.4	0.2	23.3	5.6			17.2		1.1
75 - 79	19.2	4.9		4.1	14.9			10.0		0.9
80 - 84	19.0	7.9		0.1	27.0			2.3		0.3
85 - 89	13.7	9.9			12.6			2.6		0.1
90 - 94	6.2	14.2			14.3					0.2
95 - 99	3.9	14.2			15.7					0.2
100 - 104	1.2	12.0			1.9					0.2
105 - 109	0.5	14.4			1.5					4.3
110 - 114	0.3	7.3			1.7					10.9
115 - 119		2.1			1.7					
120 - 124		0.8								
125 - 129		0.1								
130 - 134		0.0								
135 - 139		0.1								
Mean length, cm	7.7	9.3	5.0	6.6	8.6	4.2	4.6	6.6	2.9	6.2
Long term mean length, cm	7.6	9.0	4.8	7.1	9.2	3.9	4.0	6.2	3.4	5.6

5.1.1 Capelin (*Mallotus villosus*)

The 0-group capelin had the widest distribution since observations started in 1965 (Figure 5.1.1.1). The density legend in the figure is based on the catches, measured as number of fish per square nautical mile. More intensive colouring indicates denser concentrations. The survey could not identify boundaries for capelin distribution in the north and west.

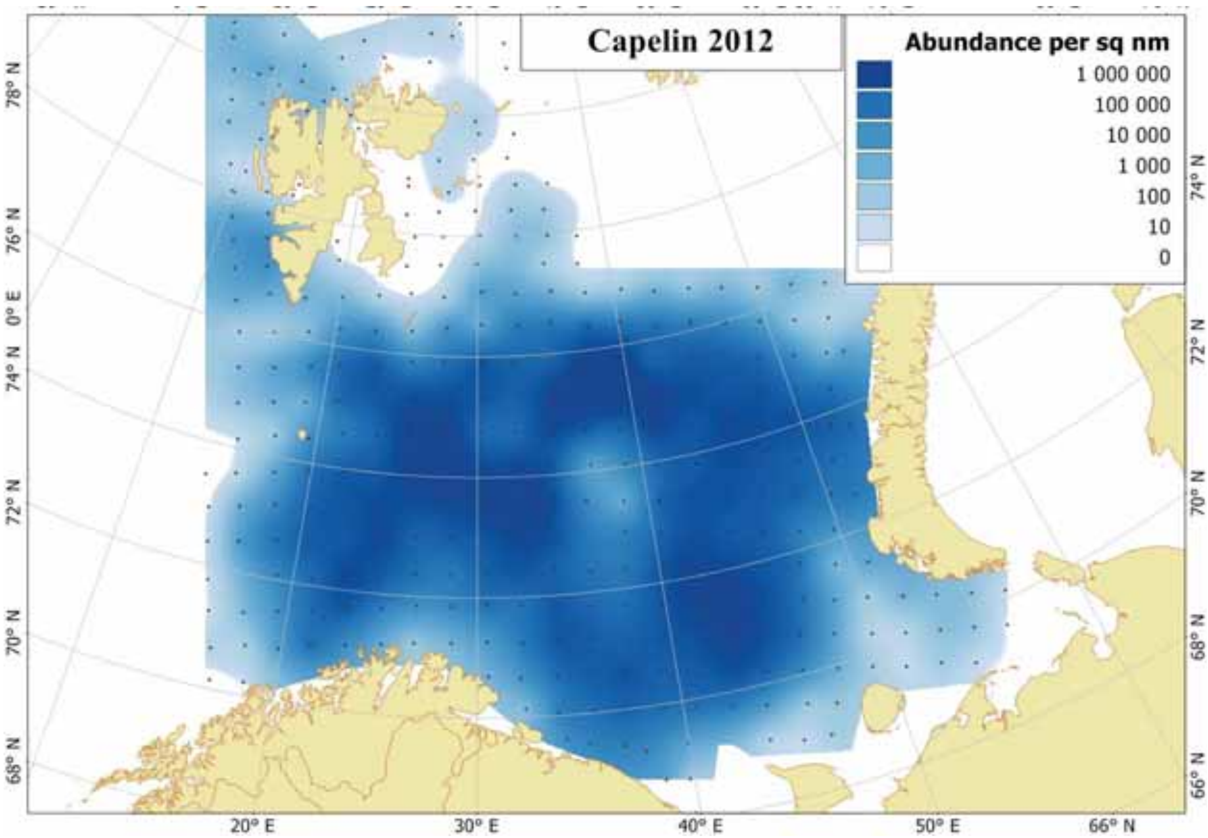


Figure 5.1.1.1. Distribution of 0-group capelin, August-September 2012.

Fish otoliths were taken at stations when it was difficult to separate of 0-group capelin from older fish. In most samples (about 76%) length of 0-group capelin were between 3.5 and 6.5 cm, with an average of 5.0 cm; being somewhat higher than the long term mean length (4.8 cm). Observation of good growth in the autumn may be indicative of suitable feeding condition during the early months of a fish's life. Capelin spawning took place far to the west in spring 2012, and this can partly explain the rapid grow of capelin larva and 0-group.Very small capelin with lengths less than 3 cm were found along the coast, from 30˚E to 50˚E. This may indicate that summer spawning had taken place in this area.

The calculated density varied from 120 to 18 million fish per square nautical mile. Mean catch per trawl was 4397 fish.

The 2012 year class is the highest year class ever recorded. The 0-group capelin biomass was about 519 thousand tonnes, and this is much higher than the long term mean (for period 1993-2012). The capelin biomass is shown in Table 5.1.3.

5.1.2 Cod (*Gadus morhua*)

Except for a limited area in the south-western of the Barents Sea (Fig. 5.1.2.1), 0-group cod was generally widely distributed over a wide area. The main dense concentrations were registered in the central part of the sea between 71˚N-74˚N and 28˚E-40˚E. The 2012 year class was a bit lower than the extremely high 2011 year class, even though the 0-group capelin had a wider distribution this year.

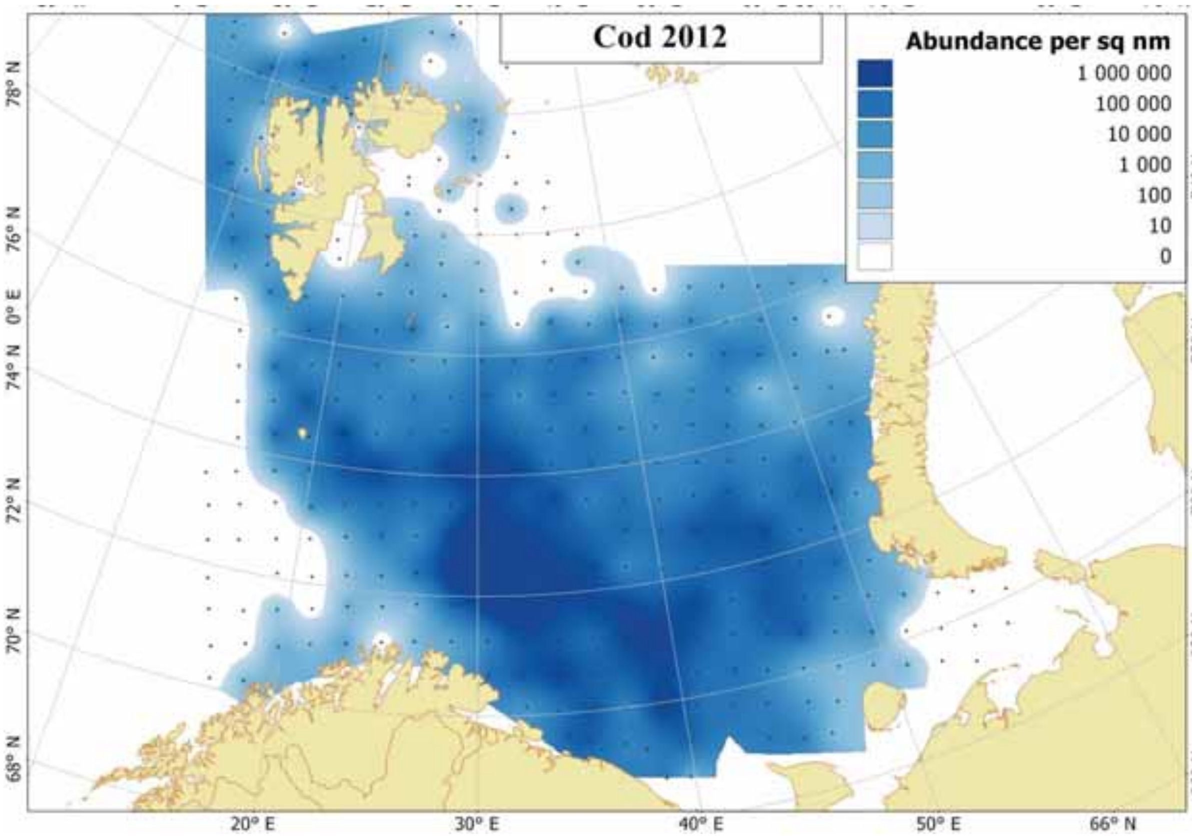


Figure 5.1.2.1. Distribution of 0-group cod, August-September 2012.

The lengths of 0-group cod were between 4 and 11.5 cm. Most of the fish were between 6.0 and 9.0 cm, with a mean length of 7.7 cm (Table 5.1.4). The mean length was similar to that in 2011. This value was close to the long term mean, thus indicating suitable growth conditions during the early years of fish life.

The highest calculated density was about 20 million fish per square nautical mile, which is similar to that in 2011. The mean catch was 1364 fish per trawl haul.

The abundance index of 2012 year-class is somehow lower than the record high 2011 year class. Therefore, the 2011and 2012 year classes will probably contribute to strong recruitment to the fishery from 2014-15. The 0-group cod biomass of1.4 million tonnes (Table 5.1.3), was lower than in 2011.

5.1.3 Haddock (*Melanogrammus aeglefinus*)

The observed 0-group haddock covered a relatively wide area; stretching from the northern Norwegian coast to the west and north of the Spitsbergen, and between 10˚E and 50˚E (Fig. 5.1.3.1). Haddock concentrations were not as dense as in previous years.

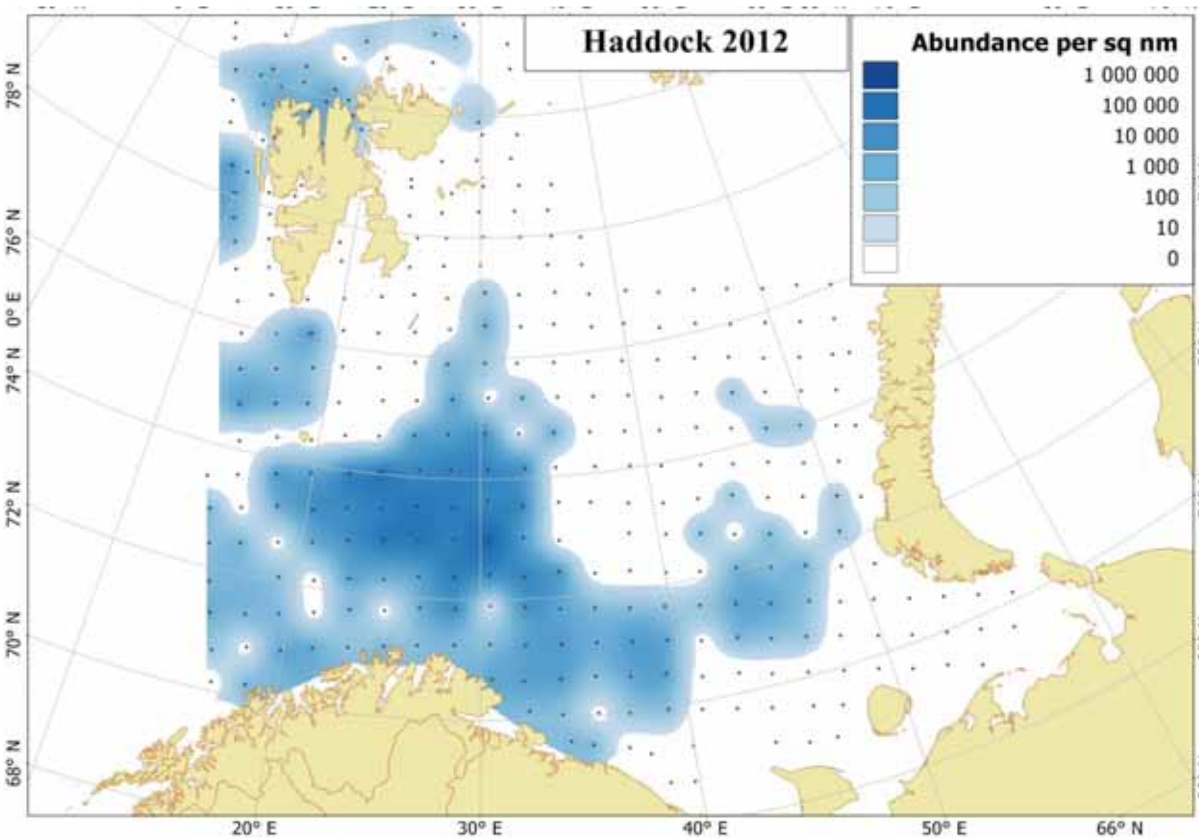


Figure 5.1.3.1. Distribution of 0-group haddock, August-September 2012.

The length of 0-group haddock varied between 4.0 and 14.0 cm, while the length of most fish was between 8.0 and 11.5 cm (Table 5.1.4). The mean length of haddock was 9.3 cm, which is lower than in 2011 and slightly higher than the long term mean. The observed fish sizes is indicative of suitable feeding conditions for haddock in 2012.

The calculated density varied between 120 and 315 thousand fish per square nautical mile. The mean catch per trawl was 20 fish, which is much lower than in all previous years.

The number of fish belonging to the 2012 year class is much lower than the long term mean level, and can therefore be characterized as a weak year class. This is the first weak year class since 2003. The 0-group haddock biomass was about 40 thousand tones; being thus 5 times lower than the long term mean (for period 1993-2012); (Table 5.1.3).

5.1.4 Herring (*Clupea harengus*)

0-group herring were distributed from southeast to northwest of the Barents Sea. The occupation area of herring was similar to 2011 and smaller than in previous years. The main dense concentration of herring was located between 73-75˚N and 20-32˚E (Fig. 5.1.4.1).

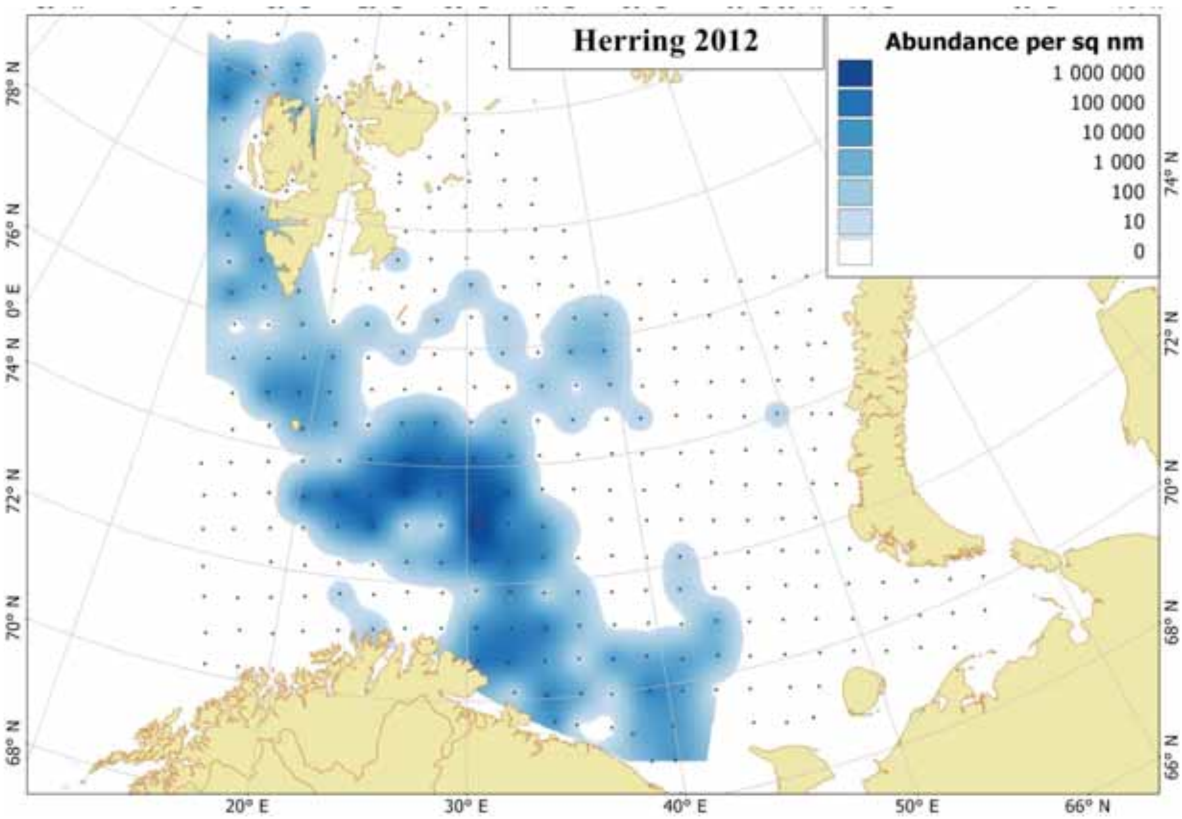


Figure 5.1.4.1. Distribution of 0-group herring, August-September 2012.

Mean length of herring was 6.6 cm, and this is somewhat lower than in previous years and the long term mean. The length of herring varied between 4.5 and 8.5 cm, and most of the fish were 5.5-7.5 cm long (Table 5.1.4).

The mean catch per trawl haul was 1385 fish. The calculated density varied from 134 to 4.5 million fish per square nautical mile. One extreme catch was taken in strata 13 (ser.nr. 02718) by "G.O.Sars". In order to reduce bias, the calculation of total abundance index had to be carried out in two steps. In the first step, an average sub-density for the extreme catch was determined based on actual trawling distance (no extrapolation). In the second step, an average density per stratum (excluding the extreme catch) was calculated. The two sub-densities were then combined in calculating the total abundance index for the stratum.

The 0-group herring biomass was 212 thousand tonnes (Table 5.1.3). This is half of the long-term mean (for period 1993-2012).

The 2012 year-class of herring is close to the average level, and therefore can be characterized as medium. No strong year classes have been observed since 2004, and the medium level of 0-group herring abundance may positively influence the recruitment to the fishable stock.

5.1.5 Polar cod (*Boreogadus saida*)

In 2012, the distribution of 0-group polar cod was split into two components. An eastern component, which had a distribution along the western coast of Novaja Zemlya, and a western component located around Spitsbergen (Fig. 5.1.5.1). The eastern component is usually denser than the western. However, observations in 2012 indicated low density in concentrations from both locations.

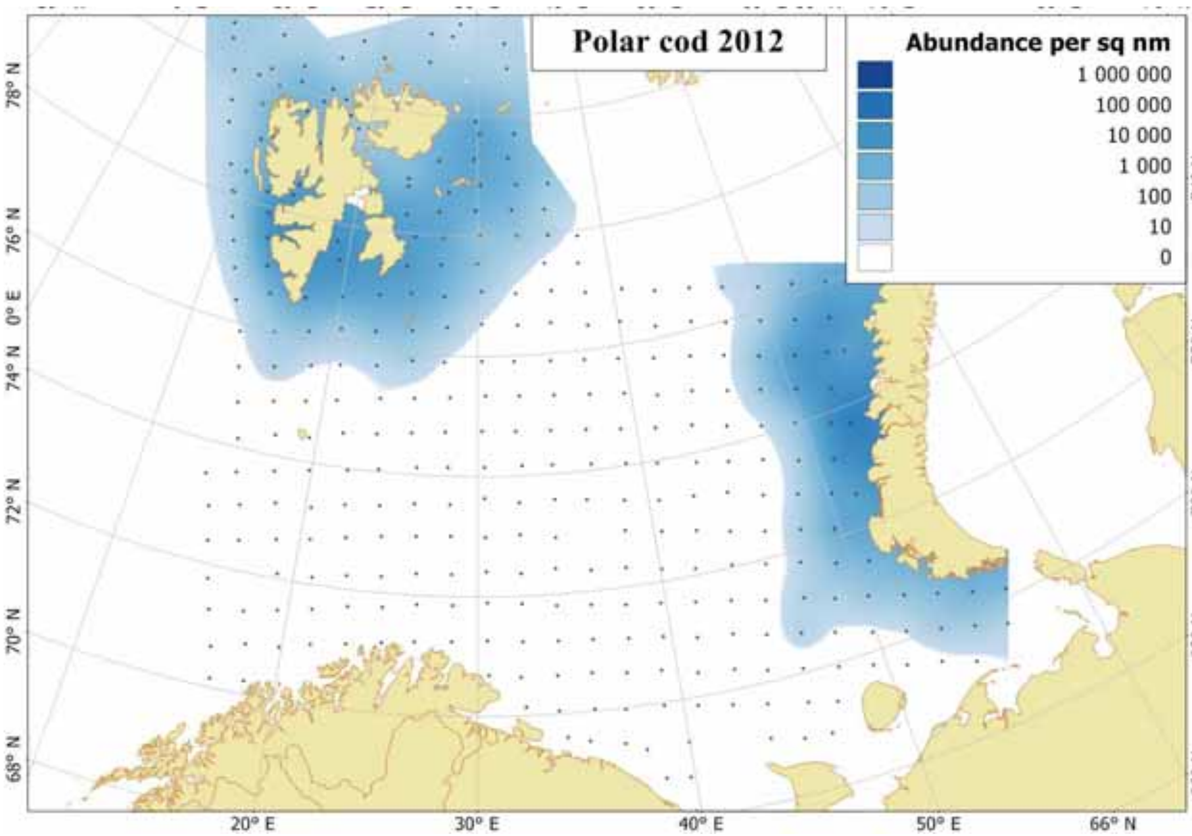


Figure 5.1.5.1. Distribution of 0-group polar cod, August-September 2012.

The abundance index for each component was calculated separately. Abundance of the eastern component was about 10 times lower than in previous two years and the long term average level, while abundance index of western component was about twice higher than the average level.

The mean length of 0-group polar cod was 4.6 cm, and was lower than in 2012, while being higher than the long term mean of 4.0 cm. Most of the fish had lengths between 4.0 and 5.0 cm (Table 5.1.4).

The 0-group polar cod distribution covered an area, stretching further north and east than the surveyed area covered by trawling. Additional tracking with echosounder recordings north of the main 0-group stations indicated a farther distribution of 0-group polar cod. There was no significant registration of 0-group cod outside the main group stations in 2012.

5.1.6 Saithe (*Pollachius virens*)

The 0-group saithe was found over wider area in the central and western parts of the Barents Sea than previous years (Fig. 5.1.6.1). Saithe concentrations were very sporadic.

The length of 0-group saithe varied between 4.0 and 12.0 cm, and most of the fish (about 70%) was between 7.0 and 10.0 cm. The mean length of saithe was 8.6 cm. This was lower than in 2010 and the long term mean of 9.2 cm (Table 5.1.4).

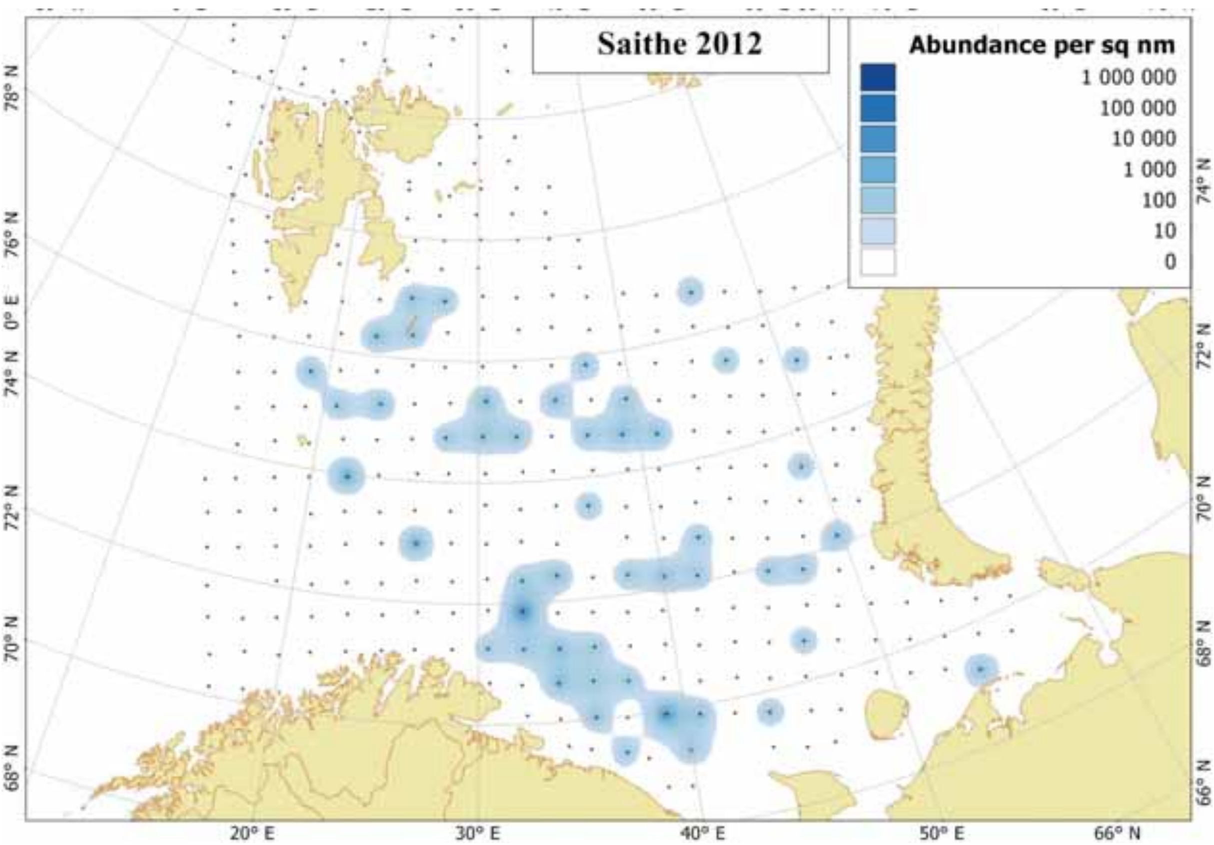


Figure 5.1.6.1. Distribution of 0-group saithe, August-September 2012.

The maximum calculated density was 27 thousand fish per nautical mile and the maximal catch was only 150 fish. Both density and catch rates were higher than in 2011.

Since 2004 (except in 2010) abundance indices of 0-group saithe have been lower than the long term average. The 2012 year class is 3 times lower than the long term mean and therefore the 2012 year-class of saithe in the Barents Sea may be characterized as poor.

5.1.7 Redfish (*Sebastes mentella*)

0-group redfish was observed in the western part of the Barents Sea as usual (Fig. 5.1.7.1). The dense concentrations were located in the centre and in the north of their occupation area.

In 2012 the mean fish length was 4.2 cm. This mean is somewhat higher than the long term mean (3.9 cm) but close to measurements in 2011. Relatively large 0-group redfish in the last four years indicate better-than-average feeding condition during the first year of fish life.

Mean catch per trawl haul was 800 fish. The calculated average density reached 150 thousand fish per square nautical mile.

The abundance of 0-group redfish is close to the long term average. So the 2012 year-class can be characterized as average.

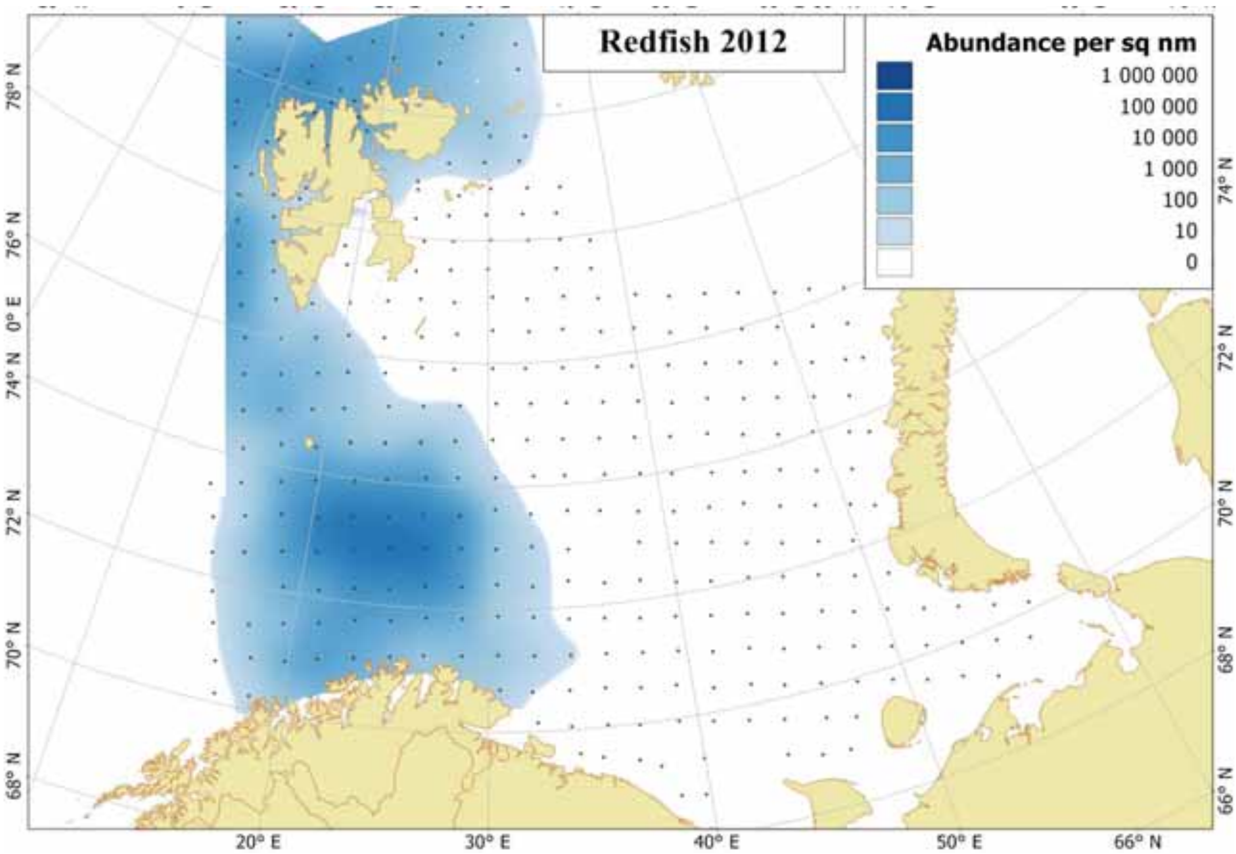


Figure 5.1.7.1. Distribution of 0-group redfishes, August-September 2012.

5.1.8 Greenland halibut (*Reinhardtius hippoglossoides*)

As in the previous four years, 0-group Greenland halibut were found in very low densities. In 2012 Greenland halibut were observed to the north and in small areas south of Svalbard/Spitsbergen (Fig. 5.1.8.1). Greenland halibut were found during the spatial investigation of the Isfjord ecosystem. The catches, taken by 0-group stations, were much higher than outside of Svalbard/Spitsbergen. Data from Isfjord was not used in the calculation of the indices. Given that the survey coverage area is smaller than the distribution area for 0-group Greenland halibut, the calculated abundance might not indicative of the real abundance. However, this may reflect the minimum abundance index of the year-class strength.

Fish length varied between 4.5 and 9.0 cm, while most of the fish were between 5.5 and 8.0 cm. The mean length of fish was 6.6 cm which, being higher than the long term mean (Table 5.1.4), also indicates good feeding and living condition within the observed area.

The highest calculated density concentration was 4.5 thousand fish per square nautical mile. The average concentration of 100 fish per square nautical mile indicates a denser concentration in 2012 than in 2011.

Since 2007 abundance of Greenland halibut continuously increased and index of 2012 year-class reached the long term average.

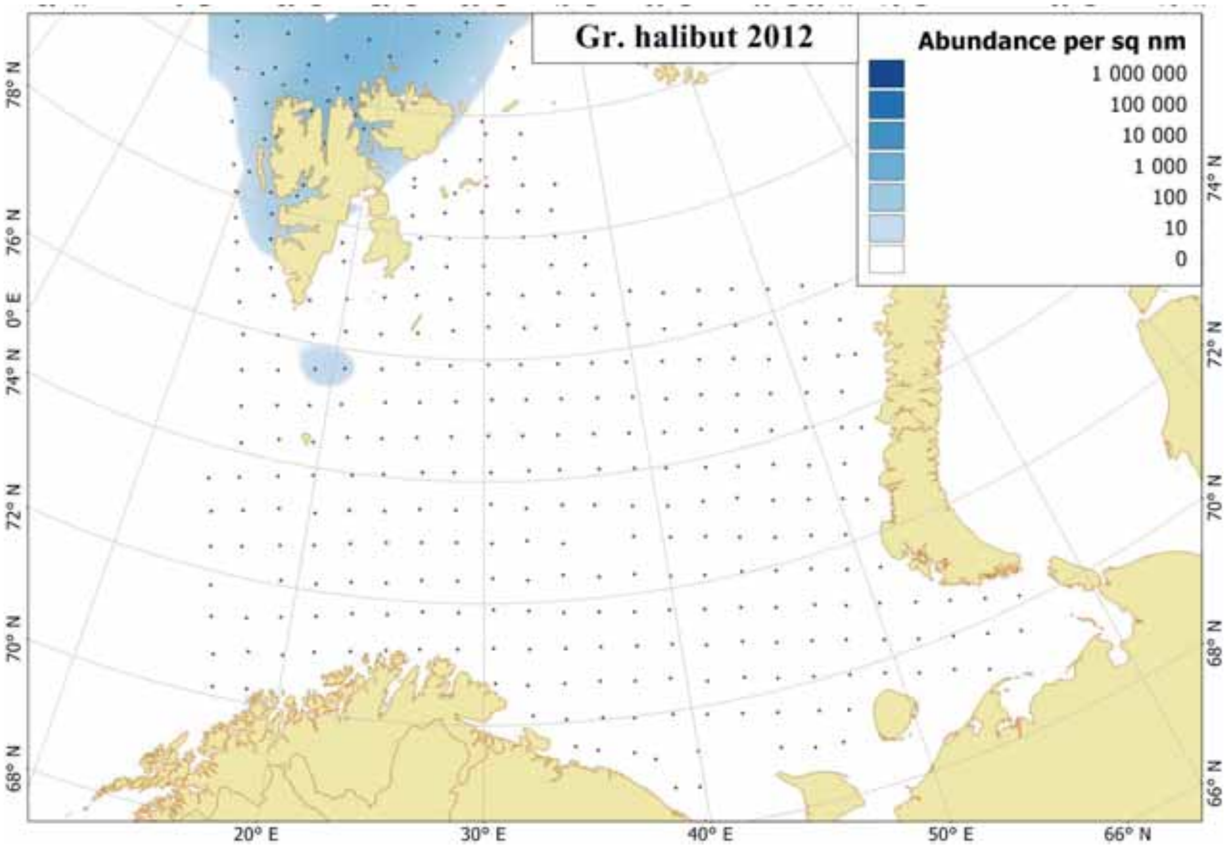


Figure 5.1.8.1. Distribution of 0-group Greenland halibut, August-September 2012.

5.1.9 Long rough dab (*Hippoglossoides platessoides*)

Long rough dab were distributed in two separate local areas. The first location was found south of Novaya Zemlya and second location was situated between King Karl Land and Hope Island (Fig.5.1.9.1). Dense concentrations of 0-group long rough dab were not observed.

The mean length of fish was 2.9 cm. This is significantly lower than in 2011 and lower than the long term average. Fish length varied between 2.0 and 5.5 cm, while most of the fish were between 2.5 and 4.0 cm (Table 5.1.4).

Although being 5 times lower than the long term average, the abundance index is the highest since 2009. The year class is characterized as poor. Abundance index is the highest since 2009, but is 5 times lower than much long term average. The year class is characterized as poor.

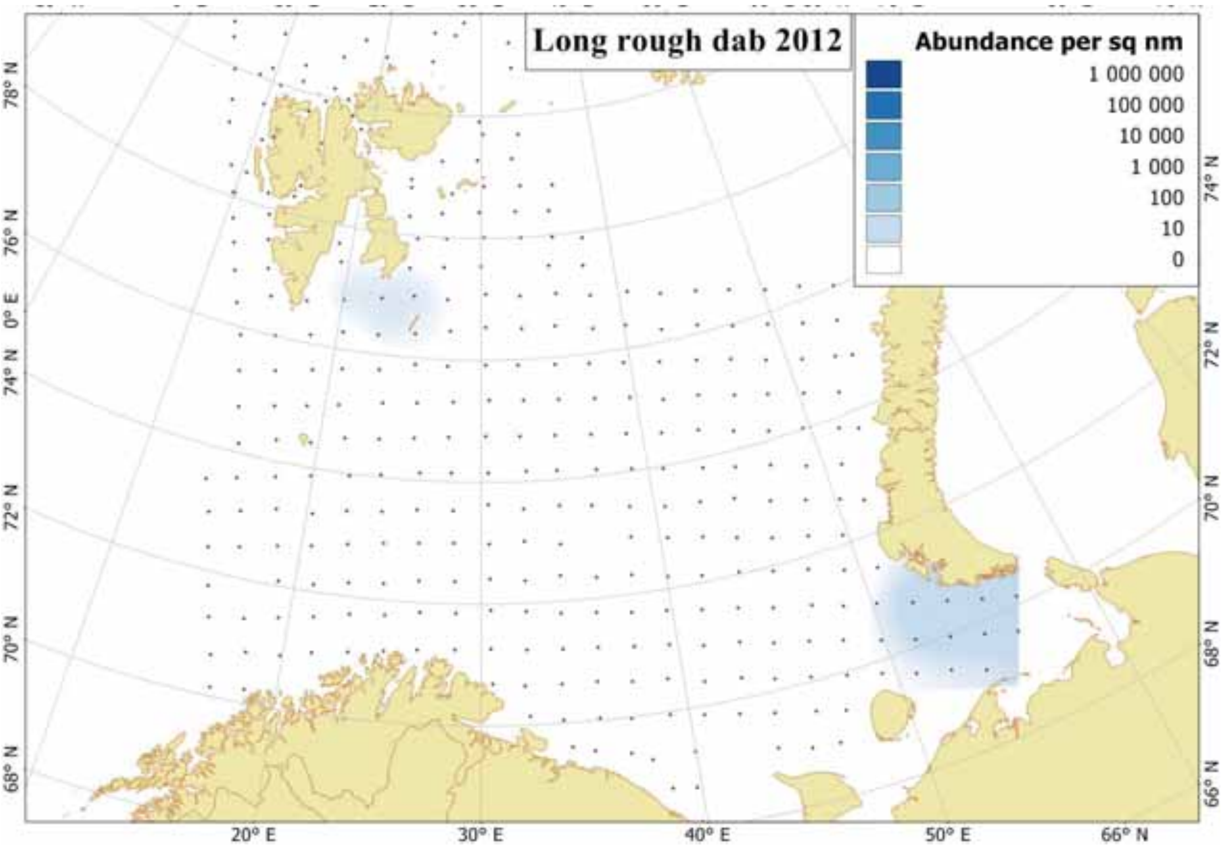


Figure 5.1.9.1. Distribution of 0-group long rough dab, August-September 2012.

5.1.10 Wolffishes (Anarhichas sp.)

There are three species of wolffish found in the Barents Sea: Atlantic wolffish (*Anarhichas lupus*), Spotted wolffish (*Anarhichas minor*) and Northern wolffish (*Anarhichas denticulatus*). Due to very low catches of each species, all the catches were lumped together into a larger group (Genus), whose distribution is shown in the map (Fig. 5.1.10.1). Most 0-group wolfish was found north of Spitsbergen/Svalbard. However, some catches were registered sporadically in the central and eastern areas.

The calculated mean density reached 2.4 thousand fish per square nautical miles, with an average of 49 fish per square nautical miles. This is lower than in 2008-2011. No index is calculated for this species.

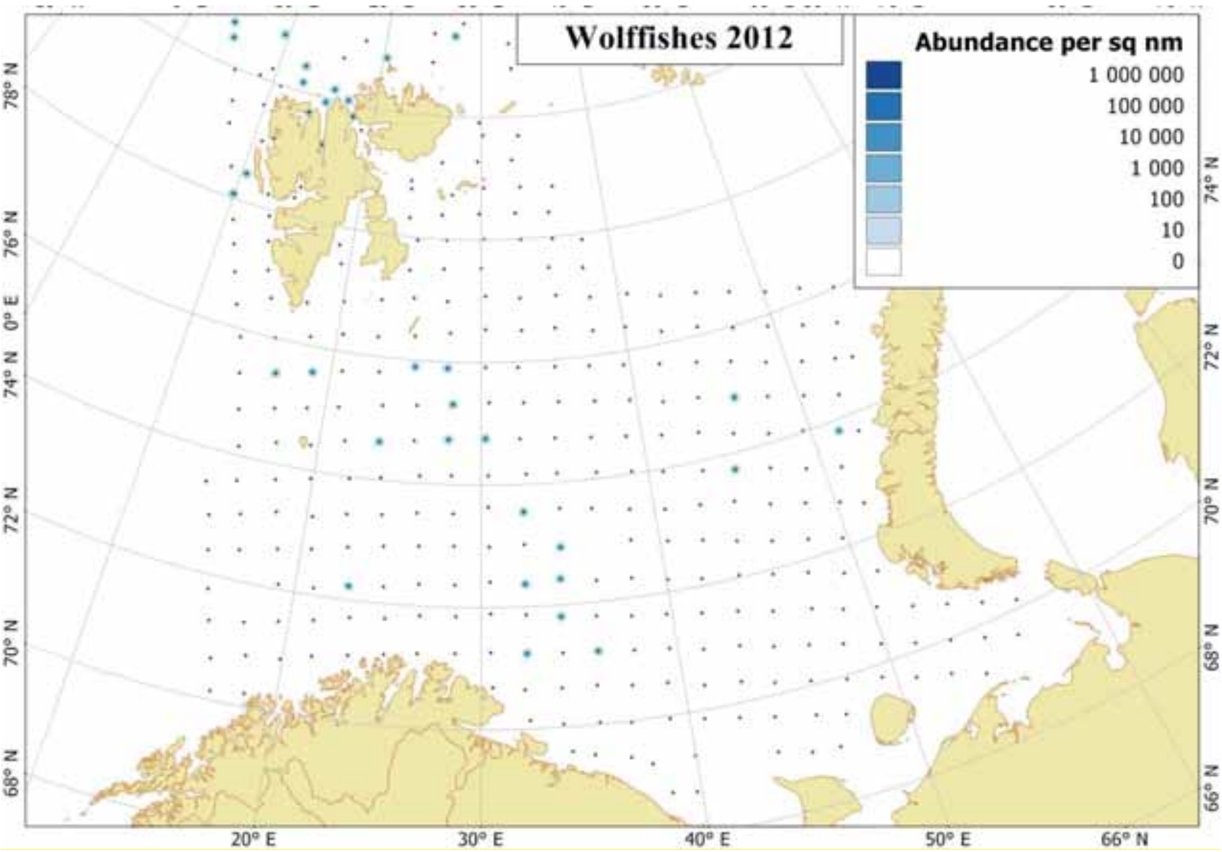


Figure 5.1.10.1. Distribution of 0-group wolffishes, August-September 2012.

5.1.11 Sandeel (*Ammodytes marinus*)

The species *Ammodytes marinus* and *Ammodytes tobianus* have been recorded in the Barents Sea. The *Ammodytes marinus* species was widely distributed in the sea, while *Ammodytes tobianus* was found to be very rare; being only distributed along the northern Norwegian coast. Thus figure 5.1.11.1. only shows the distribution of *Ammodytes marinus*. In 2012, 0-group sandeel were found over the larger area from south of Spitsbergen to Pechora Shallow than it was observed in recent years. The highest densities were registered in southeast part of Barents Sea.

The mean catch was 368 fish per trawl haul. This is about 30 times higher than in 2011. The calculated density reached 1.4 million fish per square nautical miles, with an average of 20 thousand fish per square nautical miles.

The abundance and biomass calculations are based on pelagic catches. These represent mostly 0-group fish migrating to the upper water layers to feed. The minimum abundance of 43503 million individuals corresponds to a minimum biomass of 21 thousand tonnes. This is higher than the long term mean for the period 1980-2012 (see "Biodiversity" section Table 8.1.3.1).

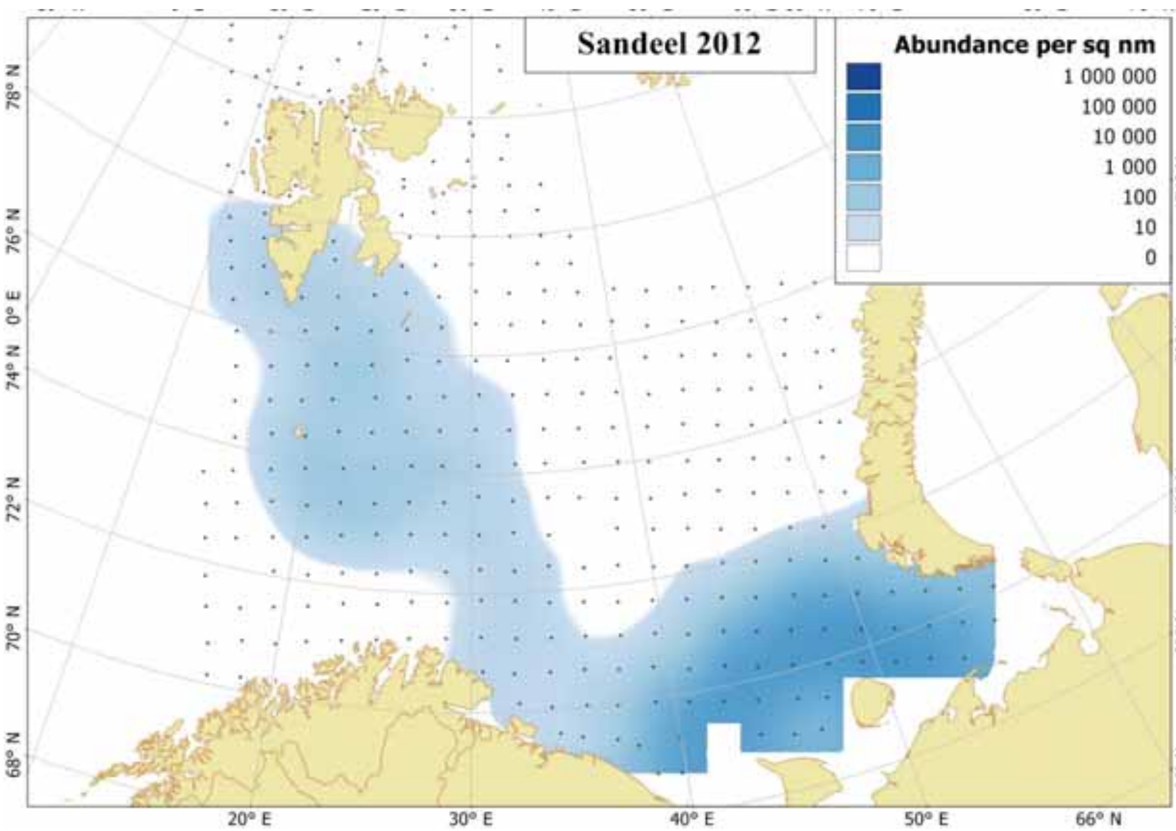


Figure 5.1.11.1. Distribution of 0-group *A. marinus*, August-September 2012.

5.2 Pelagic fish abundance and distribution

Text by H. Gjøsæter and D.Prozorkevich
Figures by Alvarez J and Røttingen B.

5.2.1 Capelin (Mallotus villosus)

Distribution

The geographical density distribution of capelin at age 1 and for the total stock are shown in Figs. 5.2.1.1 and 5.2.1.2. The total distribution area of capelin was very similar to that found in 2008-2011. No capelin were detected in the areas to the west and north of Svalbard/Spitsbergen archipelago. However, the distribution area reached north of 81ºN to the areas east of 35ºE. In contrast to 2011, practically no concentrations were found south of Franz Josef Land east of 55°E. However, quite large capelin concentrations were found along the coastal waters of Franz Josef Land (Fig. 5.2.1.2). The main dense concentrations were found to the north-east of the Hopen Island and northwards beyond the King Karls Land, and stretching eastward to about 52ºE. Young capelin were mainly found to the south of 77ºN, and dense concentrations were located eastward of the Hopen island stretching south-eastwards in the Central Bank. Sample echograms of capelin distribution in the northern area are shown in Figures 5.2.1.3-5.2.1.5

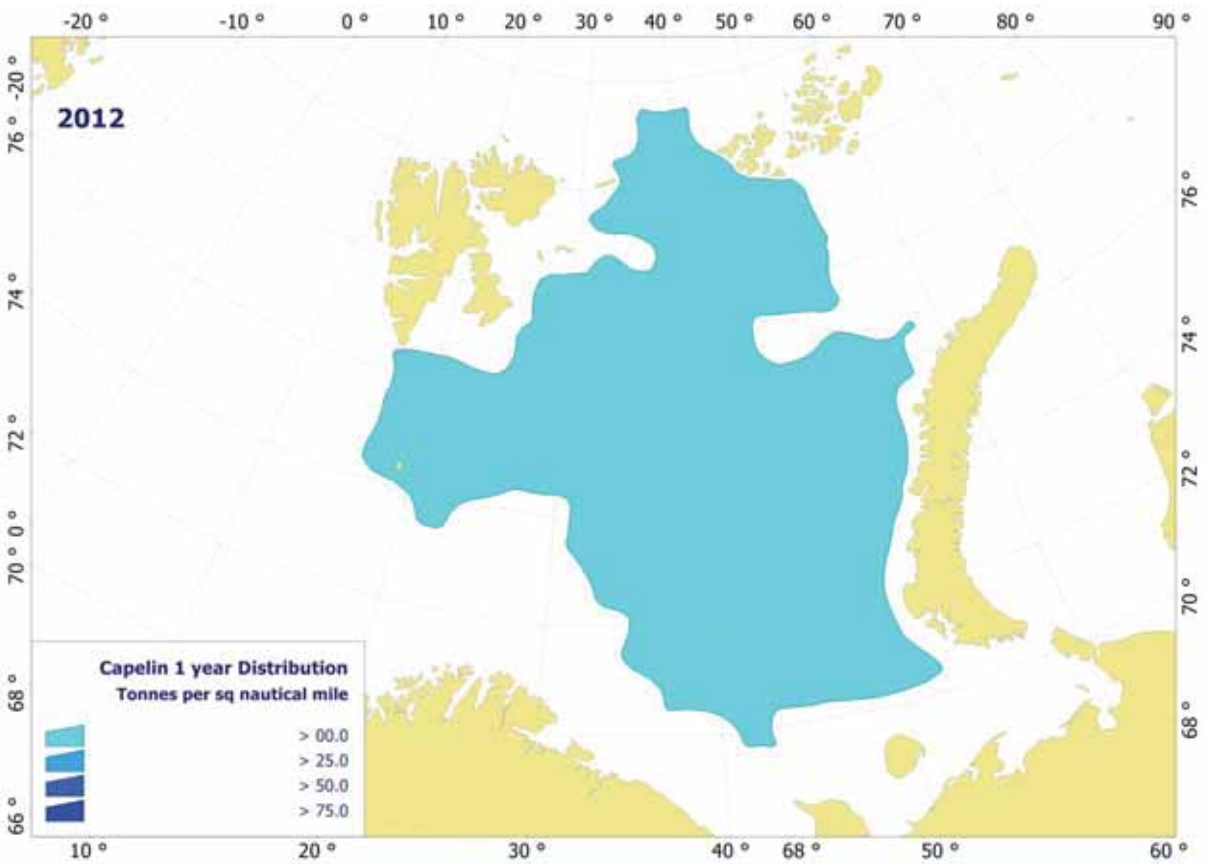


Figure 5.2.1.1. Estimated density distribution of one-year-old capelin (tonnes/nm^2), August-September 2012.

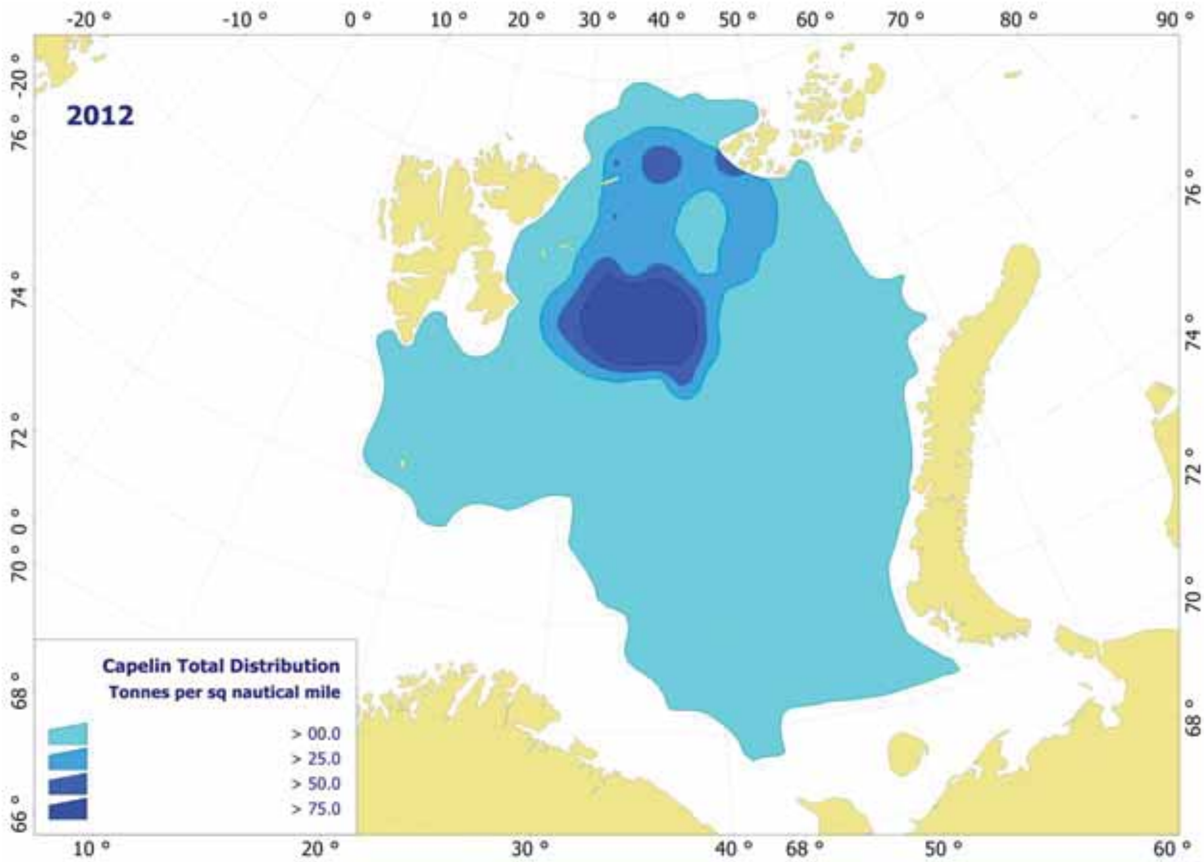


Figure 5.2.1.2. Estimated total density distribution of capelin (tonnes/nm^2), August-September 2012.

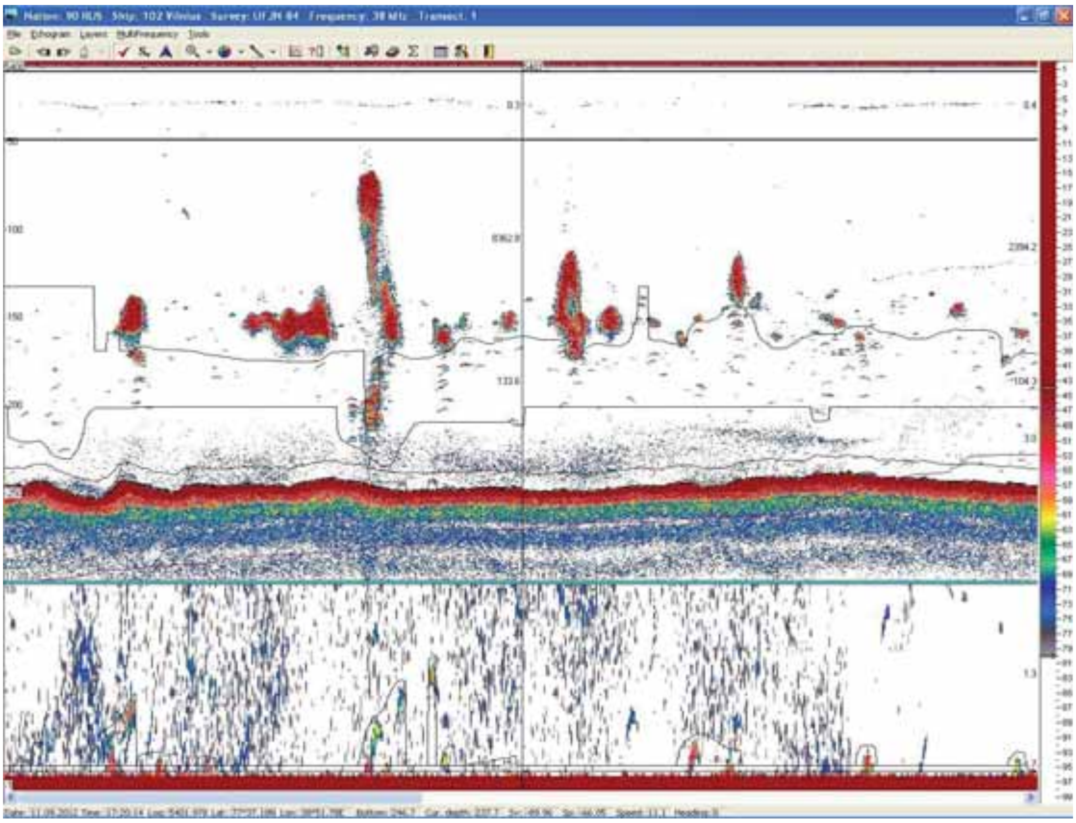


Figure 5.2.1.3. Acoustic registration of capelin and cod in the 77.37N 38.51E. Intensive cod feeding area.

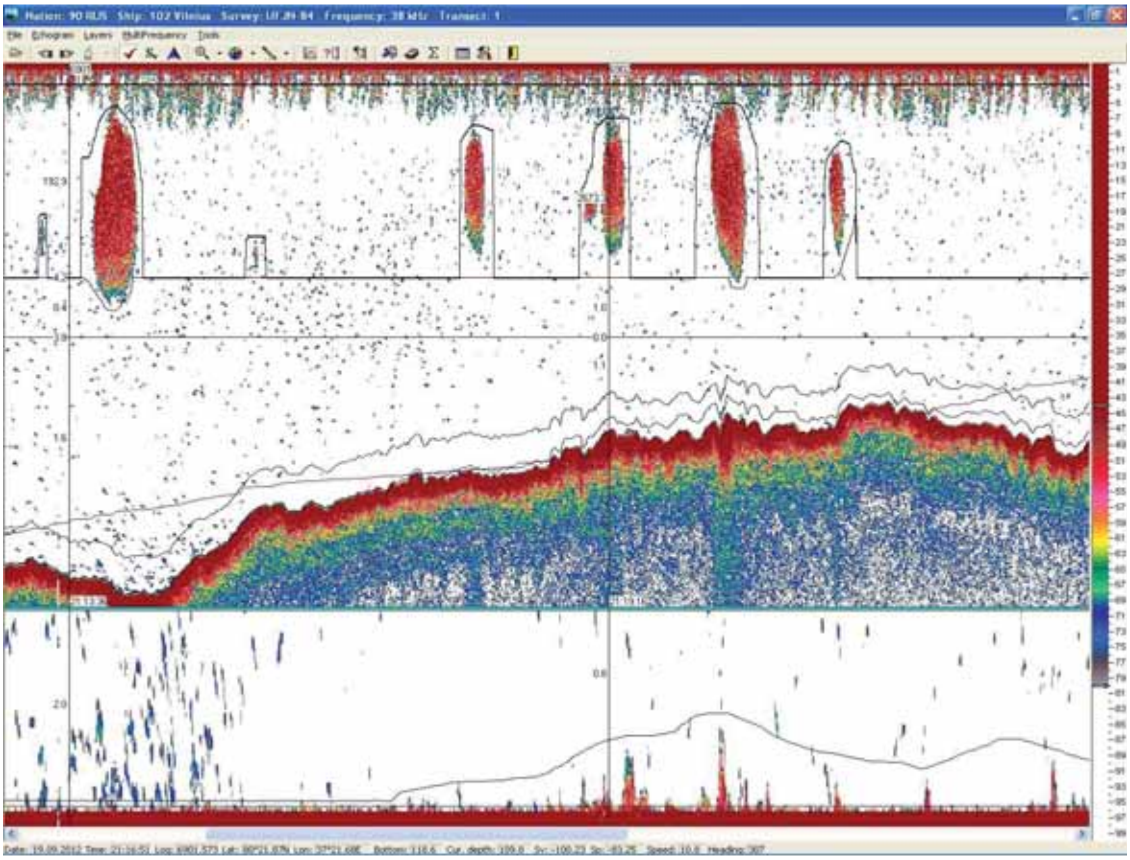


Figure 5.2.1.4. Echograms of capelin schools in area 80.23N 37.22E.

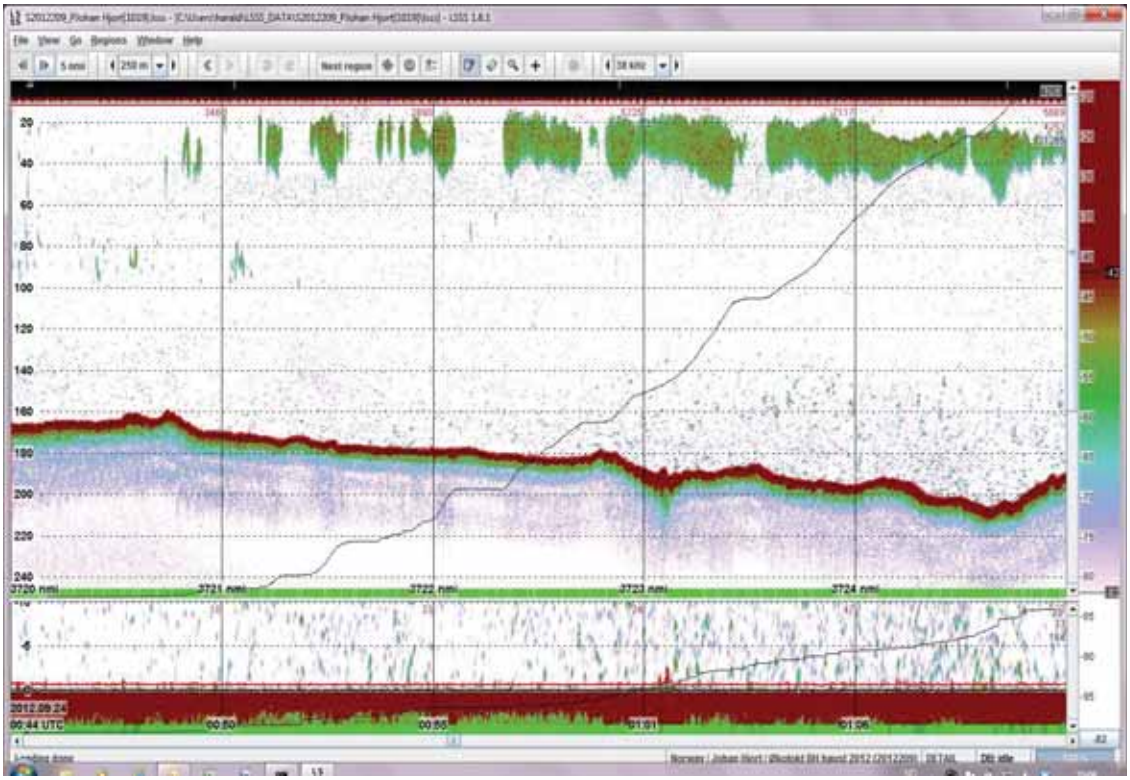


Figure 5.2.1.5. Echogram sampled from the area between King Karlsland and White island, showing dense capelin schools in upper water and dense concentrations of cod near the sea floor.

Abundance estimate and size by age

A detailed stock size estimate is given in Table 5.2.1.1, and the time series of abundance estimates is summarized in Table 5.2.1.2. The capelin stock size estimate is used as input to the stock assessment and prognosis model for capelin (CapTool). The mature part of the stock is basis for the prognosis of spawning stock in spring 2013, where also mortality induced by predation enters into the calculations. The work concerning assessment and quota advice for capelin is dealt with in a separate report that will form part of the ICES Arctic Fisheries Working Group report for 2013.

The main results of the abundance estimation in 2011 are summarized in table 5.2.1.3. The 2011 estimate is shown on a shaded background for comparison. The total stock is estimated at about 3.6 million tonnes. It is about 3% lower than the stock estimated in 2011 but higher than the long term mean level (about 3 million tonnes). About 56 % (2.0 million tonnes) of this stock has length above 14 cm and considered to be maturing. The 2011 year class (1-year group) consists, according to this estimate, of about 145 billion individuals. This estimate is somewhat lower than that obtained for the 1- year group last year, and is below the long-term mean (about 200 billion). The mean weight (3.7 g) is 1.3 g higher than that measured last year, and at the long-term average. The biomass of the 2011 year class is about 0.5 million tonnes, which is at the same level as the one-year-olds in 2011, but below the long term mean. It should be kept in mind that, given the limitations of the acoustic method concerning mixed concentrations of small capelin and 0-group fish and near-surface distribution, the 1-year group estimate might be more uncertain than that for older capelin.

The estimated number for the 2010 year class (2-year group) is about 160 billion, which is about 15% lower than the size of the 2009 year class measured in 2011. The mean weight of this group in 2012 is 8.8 g. This mean weight is lower than in 2011 (9.7 g), and is two grams below the long-term average (Table 5.2.1.2). However, the biomass of the 2-year group is about 1.4 million tonnes in 2012; a value which is identical to the long term average.

The 2009 year class is estimated at about 90 billion individuals; a figure that is higher than the estimated size of three-year-olds in 2011. This age group with mean weight 18.5 g (about 1 g below the long-term average) has a biomass of about 1.7 million tonnes, which is about twice as high as the long-term average. The 2008 year class (now 4 years old) is estimated at about 2 billion individuals. With a mean weight of 25.0 g, this age group makes up about 60 thousand tonnes, constitutes only ¼ of the estimate last year, and ¼ of the long term average. Practically no capelin older than four years was found.

Total mortality calculated from surveys

Table 5.2.1.4 shows the number of fish in the various year classes, and their “survey mortality” in transition from age one to two.

As there has been no fishing on these age groups, the figures for total mortality constitute only natural mortality (M). The estimates of M have varied considerably, but give quite good indications of the predation on capelin, given the constraints of survey uncertainties. In 2008 and 2010, M was estimated to a small negative value. This shows that either the one-year group was underestimated or the two-year group was overestimated in those years. It is known that the measurement of the 1-year group is more uncertain than the older age groups due to limitations in the acoustic method. Hence underestimation of the one-year old group is the most probable explanation for the anomaly in the estimation of M. In 2011 and in 2012 the survey mortality was estimated at 27% and 25% respectively.

Table 5.2.1.1. Barents Sea capelin. Acoustic estimate in August-October 2012

Length (cm)	Age/Year class				Sum	Biomass	Mean weight
	1	2	3	4			
	2011	2010	2009	2008	(10^9)	(10^3 t)	(g)
6.5 - 7.0	2.540				2.540	3.048	1.2
7.0 - 7.5	5.482				5.482	6.578	1.2
7.5 - 8.0	8.817				8.817	14.107	1.6
8.0 - 8.5	11.736				11.736	23.472	2.0
8.5 - 9.0	13.283	0.054			13.337	33.343	2.5
9.0 - 9.5	17.982	0.000			17.982	53.946	3.0
9.5 - 10.0	15.782	0.096			15.878	52.397	3.3
10.0 - 10.5	21.092	0.951			22.043	83.763	3.8
10.5 - 11.0	18.077	4.841			22.918	103.131	4.5
11.0 - 11.5	14.363	10.298			24.661	128.237	5.2
11.5 - 12.0	7.909	16.599			24.508	149.499	6.1
12.0 - 12.5	6.977	28.824	0.160		35.961	251.727	7.0
12.5 - 13.0	1.283	24.929	0.755		26.967	210.343	7.8
13.0 - 13.5	0.303	24.508	3.017		27.828	244.886	8.8
13.5 - 14.0	0.042	17.968	4.423		22.433	228.817	10.2
14.0 - 14.5	0.071	10.954	6.780		17.805	204.758	11.5
14.5 - 15.0	0.079	6.359	9.968		16.406	221.481	13.5
15.0 - 15.5	0.075	3.457	10.149	0.011	13.692	212.226	15.5
15.5 - 16.0	0.012	2.474	12.695	0.396	15.577	277.271	17.8
16.0 - 16.5	0.002	2.208	13.234	0.224	15.668	310.226	19.8
16.5 - 17.0		0.979	10.101	0.086	11.166	255.701	22.9
17.0 - 17.5		0.759	7.440	0.742	8.941	224.419	25.1
17.5 - 18.0		0.099	4.968	0.458	5.525	156.910	28.4
18.0 - 18.5			3.110	0.119	3.229	102.036	31.6
18.5 - 19.0			0.707	0.234	0.941	31.053	33.0
19.0 - 19.5			0.051		0.051	1.811	35.5
19.5 - 20.0					0.000	0.000	31.8
20.0 - 20.5			0.013		0.013	0.533	41.0
TSN (10^9)	145.907	156.357	87.571	2.270	392.105		
TSB (10^3 t)	536.1	1373.3	1619.6	56.7		3585.7	
Mean length (cm)	9.82	12.95	15.79	17.17	12.45		
Mean weight (g)	3.67	8.78	18.49	24.99			9.1
SSN (10^9)	0.239	27.289	79.216	2.270	109.014		
SSB (10^3 t)	3.3	397.4	1541.0	56.7		1998.4	

Table 5.2.1.2. Barents Sea capelin. Acoustic estimates of the stock by age in autumn. Biomass (B) in 10^6 tonnes, average weight (AW) in grams. All estimates based on TS = 19.1Log L -74.0 dB

Year	Age										Sum 1+
	1		2		3		4		5		
	B	AW	B	AW	B	AW	B	AW	B	AW	B
1973	1.69	3.2	2.32	6.2	0.73	18.3	0.41	23.8	0.01	30.1	5.14
1974	1.06	3.5	3.06	5.6	1.53	8.9	0.07	20.8	+	25	5.73
1975	0.65	3.4	2.39	6.9	3.27	11.1	1.48	17.1	0.01	31	7.81
1976	0.78	3.7	1.92	8.3	2.09	12.8	1.35	17.6	0.27	21.7	6.42
1977	0.72	2	1.41	8.1	1.66	16.8	0.84	20.9	0.17	22.9	4.80
1978	0.24	2.8	2.62	6.7	1.20	15.8	0.17	19.7	0.02	25	4.25
1979	0.05	4.5	2.47	7.4	1.53	13.5	0.10	21	+	27	4.16
1980	1.21	4.5	1.85	9.4	2.83	18.2	0.82	24.8	0.01	19.7	6.71
1981	0.92	2.3	1.83	9.3	0.82	17	0.32	23.3	0.01	28.7	3.90
1982	1.22	2.3	1.33	9	1.18	20.9	0.05	24.9			3.78
1983	1.61	3.1	1.90	9.5	0.72	18.9	0.01	19.4			4.23
1984	0.57	3.7	1.43	7.7	0.88	18.2	0.08	26.8			2.96
1985	0.17	4.5	0.40	8.4	0.27	13	0.01	15.7			0.86
1986	0.02	3.9	0.05	10.1	0.05	13.5	+	16.4			0.12
1987	0.08	2.1	0.02	12.2	+	14.6	+	34			0.10
1988	0.07	3.4	0.35	12.2	+	17.1					0.43
1989	0.61	3.2	0.20	11.5	0.05	18.1	+	21.0			0.86
1990	2.66	3.8	2.72	15.3	0.44	27.2	+	20.0			5.83
1991	1.52	3.8	5.10	8.8	0.64	19.4	0.04	30.2			7.29
1992	1.25	3.6	1.69	8.6	2.17	16.9	0.04	29.5			5.15
1993	0.01	3.4	0.48	9.0	0.26	15.1	0.05	18.8			0.80
1994	0.09	4.4	0.04	11.2	0.07	16.5	+	18.4			0.20
1995	0.05	6.7	0.11	13.8	0.03	16.8	0.01	22.6			0.19
1996	0.24	2.9	0.22	18.6	0.05	23.9	+	25.5			0.50
1997	0.42	4.2	0.45	11.5	0.04	22.9	+	26.2			0.91
1998	0.81	4.5	0.98	13.4	0.25	24.2	0.02	27.1	+	29.4	2.06
1999	0.65	4.2	1.38	13.6	0.71	26.9	0.03	29.3			2.77
2000	1.70	3.8	1.59	14.4	0.95	27.9	0.08	37.7			4.27
2001	0.37	3.3	2.40	11.0	0.81	26.7	0.04	35.5	+	41.4	3.63
2002	0.23	3.9	0.92	10.1	1.04	20.7	0.02	35.0			2.21
2003	0.20	2.4	0.10	10.2	0.20	18.4	0.03	23.5			0.53
2004	0.20	3.8	0.29	11.9	0.12	21.5	0.02	23.5	+	26.3	0.63
2005	0.10	3.7	0.19	14.3	0.04	20.8	+	25.8			0.32
2006	0.29	4.8	0.35	16.1	0.14	24.8	0.01	30.6	+	36.5	0.79
2007	0.93	4.2	0.85	15.5	0.10	27.5	+	28.1			1.88
2008	0.97	3.1	2.80	12.1	0.61	24.6	0.05	30.0			4.43
2009	0.42	3.4	1.82	10.9	1.51	24.6	0.01	28.6			3.76
2010	0.74	3.0	1.30	10.2	1.43	23.4	0.02	26.3			3.50
2011	0.50	2.4	1.76	9.7	1.21	21.9	0.23	29.1			3.71
2012	0.54	3.7	1.37	8.8	1.62	18.5	0.06	25.0			3.59
Average	0.66	3.58	1.36	10.69	0.88	19.45	0.22	24.96	0.07	28.05	3.03

Table 5.2.1.3. Table on summary of stock size estimates for capelin

Year class		Age	Number (10^9)		Mean weight (g)		Biomass (10^3 t)	
2011	2010	1	145.9	209.6	3. 7	2.4	536.1	495.9
2010	2009	2	156.4	181.2	8.8	9.7	1373.3	1764.0
2009	2008	3	87.6	55.3	18.5	21.9	1619.6	1213.9
2008	2007	4	2.3	8.0	25.0	29.1	56.7	233.7
Total stock in:								
2012	2011	1-4	392.1	454.1	9.1	8.2	3585.7	3707.7

Based on TS value: 19.1 log L – 74.0, corresponding to $\sigma = 5.0 \cdot 10^7 \cdot L^{1.91}$

Table 5.2.1.4. Barents Sea capelin. Survey mortalities from age 1 to age 2

Year	Year class	Age 1 (10^9)	Age 2 (10^9)	Total mort. %	Total mort. Z
1984-1985	1983	154.8	48.3	69	1.16
1985-1986	1984	38.7	4.7	88	2.11
1986-1987	1985	6.0	1.7	72	1.26
1987-1988	1986	37.6	28.7	24	0.27
1988-1989	1987	21.0	17.7	16	0.17
1989-1990	1988	189.2	177.6	6	0.06
1990-1991	1989	700.4	580.2	17	0.19
1991-1992	1990	402.1	196.3	51	0.72
1992-1993	1991	351.3	53.4	85	1.88
1993-1994	1992	2.2	3.4	-	-
1994-1995	1993	19.8	8.1	59	0.89
1995-1996	1994	7.1	11.5	-	-
1996-1997	1995	81.9	39.1	52	0.74
1997-1998	1996	98.9	72.6	27	0.31
1998-1999	1997	179.0	101.5	43	0.57
1999-2000	1998	155.9	110.6	29	0.34
2000-2001	1999	449.2	218.7	51	0.72
2001-2002	2000	113.6	90.8	20	0.22
2002-2003	2001	59.7	9.6	84	1.83
2003-2004	2002	82.4	24.8	70	1.20
2004-2005	2003	51.2	13.0	75	1.39
2005-2006	2004	26.9	21.7	19	0.21
2006-2007	2005	60.1	54.8	9	0.09
2007-2008	2006	221.7	231.4	-	-
2008-2009	2007	313.0	166.4	47	0.63
2009-2010	2008	124.0	127.9	-	-
2010-2011	2009	247.7	181.1	27	0.31
2011-2012	2010	209.6	156.3	25	0.29

5.3.3 Polar cod (*Boreogadus saida*)

Distribution

There was probably partial survey coverage of the polar cod distribution in the Barents Sea in 2012. This may be the consequence of the polar cod population being distributed far to the northeast. On the other hand, polar cod concentrations were observed in the same locations as in previous years, but in much lower densities. The polar cod stock was widely distributed in the northern and eastern parts of the Barents Sea and probably also extended into areas not covered by the survey. The geographical density distribution for fish at age 1 and for the total stock are shown in Figs. 5.2.2.1 and 5.2.2.2.

The main concentrations of adult fish were found along the west coast of Novaja Zemlja and northward toward and beyond Franz Josef Land. Small areas of scattered concentrations were observed to the west and to the east of Svalbard/Spitsbergen archipelago. Figure 5.2.2.3 shows a typical acoustic registration of polar cod near the Novaja Zemlja

Abundance estimation

The stock abundance estimate by age, number, and weight was calculated using the same computer program as for capelin. A detailed estimate is given in Table 5.2.2.1, and the time series of abundance estimates is summarized in Table 5.2.2.2. The main results of the abundance in 2012 are summarized in table 5.2.2.3. The 2011 estimate is shown on a shaded background for comparison.

The number of individuals in the 2011 year-class (the one-year-olds) is only 40% the size of the one-group measured in 2011. The mean weight is similar, and therefore, the biomass of one-year-olds is also 40% of that estimated for the one-group in 2011. The abundance of the 2010 year class (the two-year-olds) is only 4.7 billions, one-third of the corresponding age groups found in 2011, while the mean weight was similar to that in 2011. The biomass, therefore, was reduced significantly compared to the 2009 year-class estimated in 2011. Also the three-years-old fish (2009 year class) is reduced by more than 50% by number compared to the three-group estimated in 2011. The mean weight is also lower, and the biomass of this age group is only one fifth of that for the corresponding age group during the 2011 survey. The four-year-olds (2008 year class) were scarce, and have a lower mean weight than for the four-year-olds in 2011. No fish of age 5 or higher were found. The total stock, estimated at 0.3 million tonnes, is reduced by more than 60% compared to that found in 2011.

This sudden decrease in stock size for all age groups suggests that either the population numbers were underestimated in 2012 or that there has been an enormous consumption of polar cod by cod in the last 4 years, leading to a significant increase in natural mortality and stock size reduction.

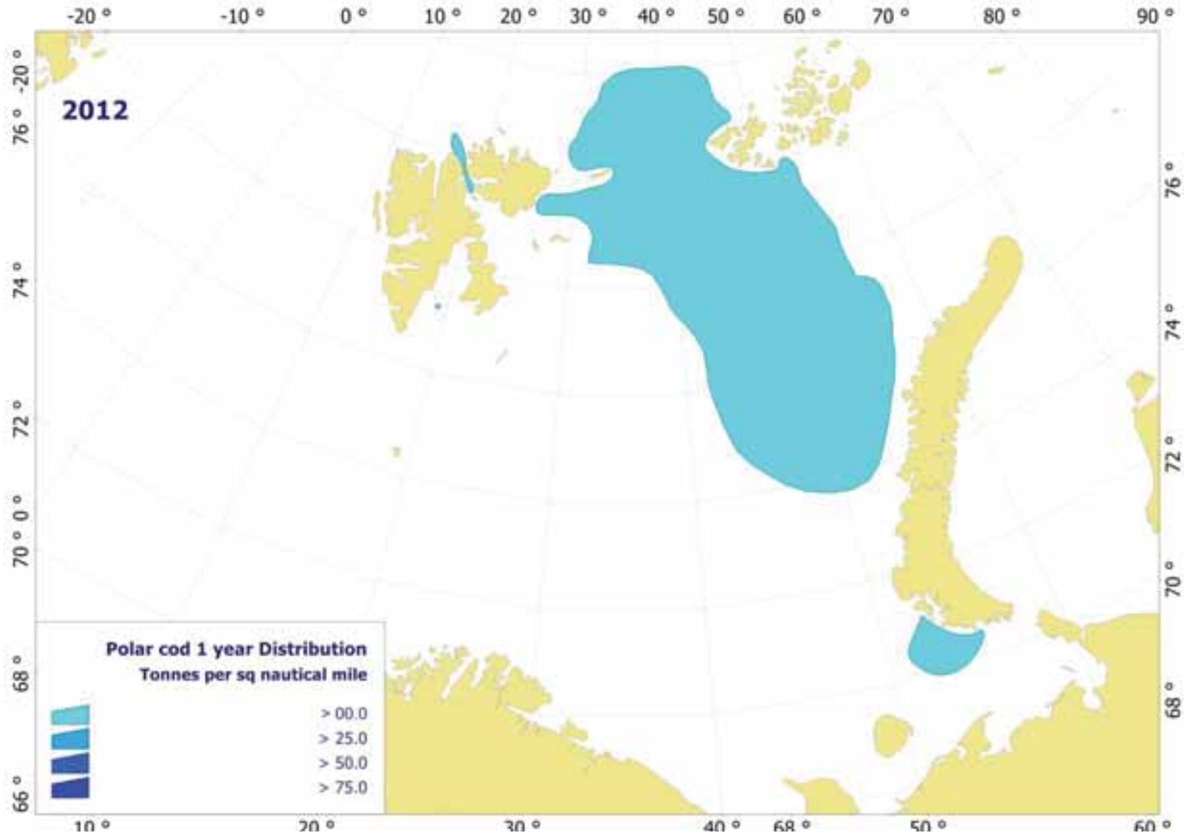


Figure 5.2.2.1. Estimated density distribution of one year old polar cod (tonnes/nm^2), August-October 2012.

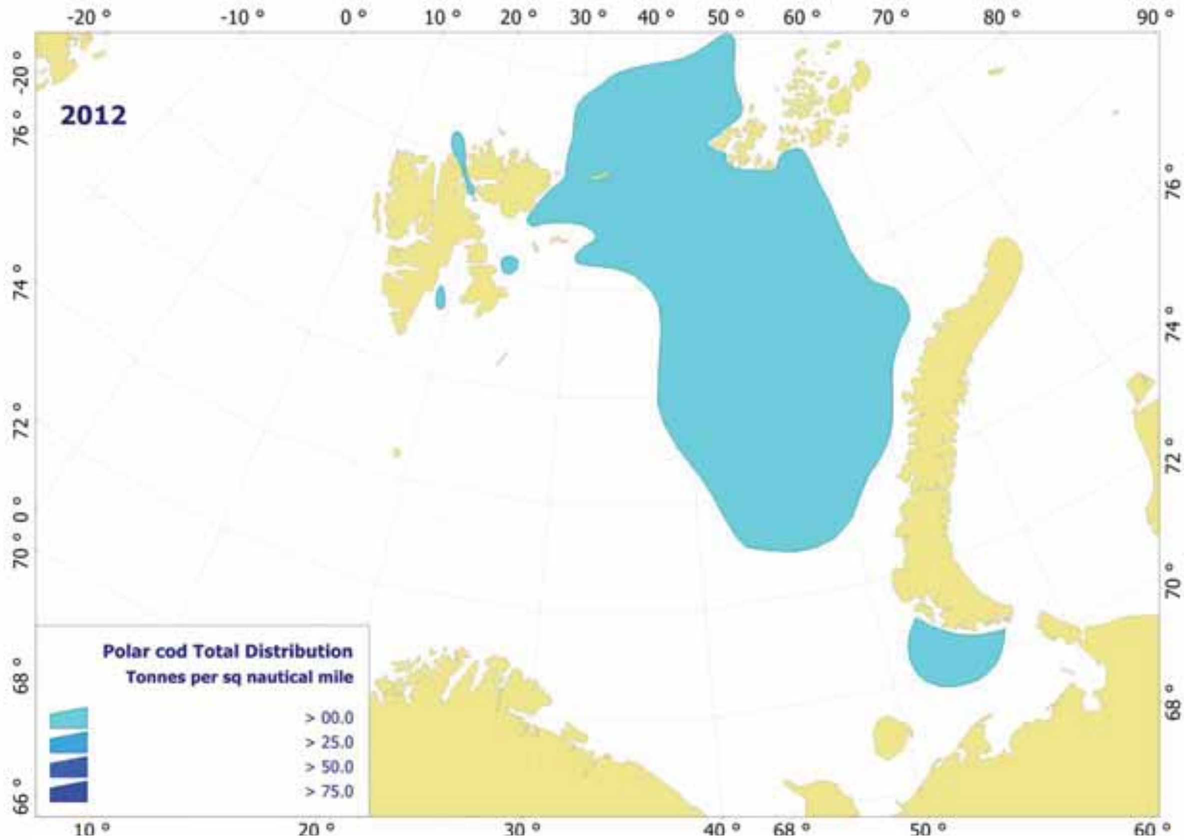


Figure 5.2.2.2. Estimated total density distribution of polar cod (tonnes/nm^2), August-October 2012

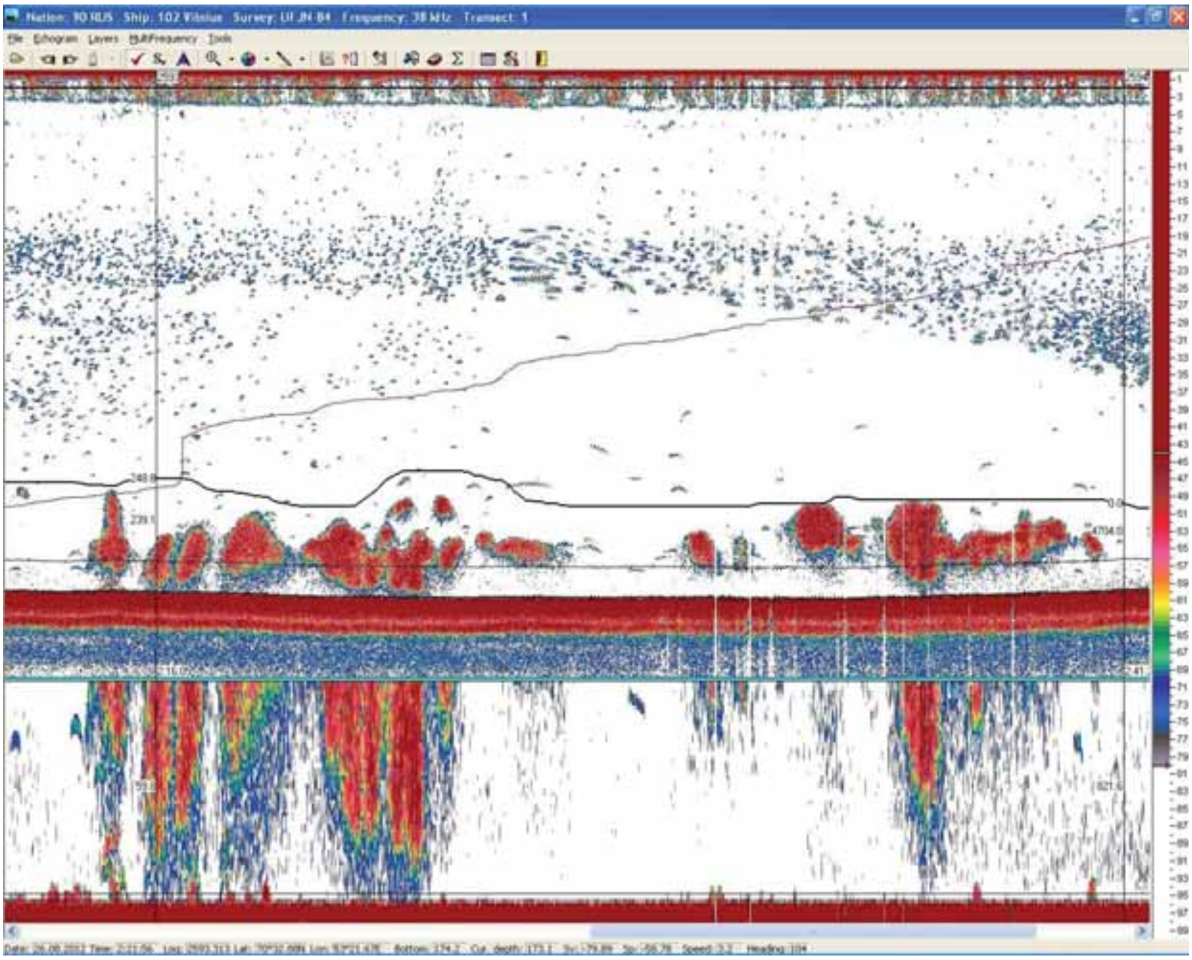


Figure 5.2.2.3. Echogram of polar cod to the south of Novaja Zemlja (70º32´ N, 53º21´ E), 26.08.2012.

Table 5.2.2.1. Barents Sea polar cod. Acoustic estimate in August-September 2012

Length (cm)	Age/Yearclass 1 2011	2 2010	3 2009	4 2008	Sum (10^6)	Biomass (10^{-3} t)	Mean weight (g)
7.0 - 7.5	15				15	0.0	2.4
7.5 - 8.0	33				33	0.1	3.0
8.0 - 8.5	137				137	0.5	3.6
8.5 - 9.0	400				400	1.6	4.1
9.0 - 9.5	786				786	3.9	5.0
9.5 - 10.	1421	2			1423	8.4	5.9
10.0 - 10.	2314	1			2315	16.2	7.0
10.5 - 11.	2486	6			2492	19.2	7.7
11.0 - 11.	2194	30	1		2225	20.2	9.1
11.5 - 12.	1751	153	0		1904	19.8	10.4
12.0 - 12.	801	215	0		1016	11.3	11.1
12.5 - 13.	685	129	2		816	10.5	12.9
13.0 - 13.	338	418	3		759	11.4	15.0
13.5 - 14.	127	478	25		630	10.0	15.9
14.0 - 14.	17	485	9		511	9.6	18.8
14.5 - 15.	8	559	10		577	12.4	21.5
15.0 - 15.	6	588	11		605	14.0	23.1
15.5 - 16.	1	525	13		539	14.0	26.0
16.0 - 16.	1	445	25		471	13.7	29.0
16.5 - 17.		263	91		354	11.1	31.3
17.0 - 17.		68	246		314	10.8	34.3
17.5 - 18.		166	181		347	12.0	34.7
18.0 - 18.		148	305		453	18.5	40.8
18.5 - 19.		8	333		341	15.2	44.5
19.0 - 19.		1	281	29	311	15.1	48.4
19.5 - 20.		8	249	0	257	12.7	49.5
20.0 - 20.			93	27	120	6.6	54.6
20.5 - 21.			119	3	122	7.1	57.9
21.0 - 21.			58	3	61	3.8	61.7
21.5 - 22.			34	4	38	2.5	66.2
22.0 - 22.			15	6	21	1.4	65.2
22.5 - 23.			14	6	20	1.4	71.8
23.0 - 23.			1	9	10	0.8	77.2
23.5 - 24.			0	7	7	0.6	85.7
24.0 - 24.			0	9	9	0.8	90.7
24.5 - 25.			0	9	9	0.8	94.0
25.0 - 25.			1	2	3	0.3	97.5
25.5 - 26.			1	1	2	0.2	79.6
26.0 - 26.				2	2	0.2	109.1
26.5 - 27.				1	1	0.1	113.5
27.0 - 27.				1	1	0.1	113.0
TSN(10^6)	13521	4696	2121	119	20457		
TSB(10^3 t)	113.6	104.3	93.0	8.0		318.9	
Mean length	10.9	14.9	18.7	0.0	12.7		
Mean weight	8.4	22.2	43.8	0.0			15.6

Based on TS value: 21.8 log L - 72.7,
corresponding to $\sigma = 6.7 \cdot 10^{-7} \cdot L^{2.18}$

Table 5.2.2.2. Barents Sea polar cod. Acoustic estimates by age in August-October. TSN and TSB is total stock numbers (10^6) and total stock biomass (10^3 tonnes) respectively.

Year	Age 1		Age 2		Age 3		Age 4+		Total	
	TSN	**TSB**	**TSN**	**TSB**	**TSN**	**TSB**	**TSN**	**TSB**	**TSN**	**TSB**
1986	24038	169.6	6263	104.3	1058	31.5	82	3.4	31441	308.8
1987	15041	125.1	10142	184.2	3111	72.2	39	1.2	28333	382.8
1988	4314	37.1	1469	27.1	727	20.1	52	1.7	6562	86.0
1989	13540	154.9	1777	41.7	236	8.6	60	2.6	15613	207.8
1990	3834	39.3	2221	56.8	650	25.3	94	6.9	6799	127.3
1991	23670	214.2	4159	93.8	1922	67.0	152	6.4	29903	381.5
1992	22902	194.4	13992	376.5	832	20.9	64	2.9	37790	594.9
1993	16269	131.6	18919	367.1	2965	103.3	147	7.7	38300	609.7
1994	27466	189.7	9297	161.0	5044	154.0	790	35.8	42597	540.5
1995	30697	249.6	6493	127.8	1610	41.0	175	7.9	38975	426.2
1996	19438	144.9	10056	230.6	3287	103.1	212	8.0	33012	487.4
1997	15848	136.7	7755	124.5	3139	86.4	992	39.3	28012	400.7
1998	89947	505.5	7634	174.5	3965	119.3	598	23.0	102435	839.5
1999	59434	399.6	22760	426.0	8803	286.8	435	25.9	91463	1141.9
2000	33825	269.4	19999	432.4	14598	597.6	840	48.4	69262	1347.8
2001	77144	709.0	15694	434.5	12499	589.3	2271	132.1	107713	1869.6
2002	8431	56.8	34824	875.9	6350	282.2	2322	143.2	52218	1377.2
2003	15434	114.1	2057	37.9	2038	63.9	1545	64.4	21074	280.2
2004	99404	627.1	22777	404.9	2627	82.2	510	32.7	125319	1143.8
2005	71675	626.6	57053	1028.2	3703	120.2	407	28.3	132859	1803.3
2006	16190	180.8	45063	1277.4	12083	445.9	698	37.2	74033	1941.2
2007	29483	321.2	25778	743.4	3230	145.8	315	19.8	58807	1230.1
2008	41693	421.8	18114	522.0	5905	247.8	415	27.8	66127	1219.4
2009	13276	100.2	22213	492.5	8265	280.0	336	16.6	44090	889.3
2010	27285	234.2	18257	543.1	12982	594.6	1253	58.6	59777	1430.5
2011	34460	282.3	14455	304.4	4728	237.1	514	36.7	54158	860.5
2012	13521	113.6	4696	104.3	2121	93.0	119	8.0	20457	318.9
Average	31417	250.0	15701	359.1	4758	182.2	572	30.6	52486	824.0

Based on TSvalue = 21.8 Log L - 72.7 dB

Table 5.2.2.3. Summary of stock size estimates for polar cod.

Year class		Age	Number (10^9)		Mean weight (g)		Biomass (10^3 t)	
2011	2010	1	13.5	34.5	8.4	8.2	113.6	282.3
2010	2009	2	4.7	14.5	22.2	21.1	104.3	304.4
2009	2008	3	2.1	4.7	43.8	50.1	93.0	237.1
2008	2007	4	0.1	0.5	67.2	71.3	8.0	36.7
Total stock in								
2012	2011	1-4	20.5	54.2	15.6	15.9	318.9	860.5

Based on TS value: 21.8 log L – 72.7, corresponding to $\sigma = 6.7 \cdot 10^{7} \cdot L^{2.18}$

Table 5.2.2.4. Barents Sea polar cod. Survey mortalities for age transitions 1-2 (top) and 2-3 (bottom).

Year	Year class	Age 1 (10^9)	Age 2 (10^9)	Total mort. %	Total mort Z
1986-1987	1985	24.0	10.1	58	0.87
1987-1988	1986	15.0	1.5	90	2.30
1988-1989	1987	4.3	1.8	58	0.87
1989-1990	1988	13.5	2.2	84	1.81
1990-1991	1989	3.8	4.2	-11	-0.10
1991-1992	1990	23.7	14.0	41	0.53
1992-1993	1991	22.9	18.9	17	0.19
1993-1994	1992	16.3	9.3	43	0.56
1994-1995	1993	27.5	6.5	76	1.44
1995-1996	1994	30.7	10.1	67	1.11
1996-1997	1995	19.4	7.8	60	0.91
1997-1998	1996	15.8	7.6	52	0.73
1998-1999	1997	89.9	22.8	75	1.37
1999-2000	1998	59.4	20.0	66	1.09
2000-2001	1999	33.8	15.7	54	0.77
2001-2002	2000	77.1	34.8	55	0.80
2002-2003	2001	8.4	2.1	75	1.39
2003-2004	2002	15.4	22.7	-47	-0.39
2004-2005	2003	99.4	57.1	43	0.55
2005-2006	2004	71.7	45.1	37	0.46
2006-2007	2005	16.2	25.8	-59	-0.47
2007-2008	2006	29.5	18.1	39	0.49
2008-2009	2007	41.7	22.2	47	0.63
2009-2010	2008	13.2	18.3	-39	-0.33
2010-2011	2009	27.3	14.5	47	0.63
2011-2012	2010	34.4	4.6	87	2.01
Year	Year class	Age 2 (10^9)	Age 3 (10^9)	Total mort. %	Total mort Z
1986-1987	1984	6.3	3.1	51	0.71
1987-1988	1985	10.1	0.7	93	2.67
1988-1989	1986	1.5	0.2	87	2.01
1989-1990	1987	1.8	0.7	61	0.94
1990-1991	1988	2.2	1.9	14	0.15
1991-1992	1989	4.2	0.8	81	1.66
1992-1993	1990	14.0	3.0	79	1.54
1993-1994	1991	18.9	5.0	74	1.33
1994-1995	1992	9.3	1.6	83	1.76
1995-1996	1993	6.5	3.3	49	0.68
1996-1997	1994	10.1	3.1	69	1.18
1997-1998	1995	7.8	4.0	49	0.67
1998-1999	1996	7.6	8.8	-16	-0.15
1999-2000	1997	22.8	14.6	36	0.45
2000-2001	1998	20.0	12.5	38	0.47
2001-2002	1999	15.7	6.4	59	0.90
2002-2003	2000	34.8	2.0	94	2.86
2003-2004	2001	2.1	2.6	-24	-0.21
2004-2005	2002	22.8	3.7	84	1.82
2005-2006	2003	51.7	12.1	77	1.45
2006-2007	2004	45.1	3.2	93	2.65
2007-2008	2005	25.8	5.9	77	1.48
2008-2009	2006	18.1	8.3	54	0.78
2009-2010	2007	22.2	13.0	41	0.54
2010-2011	2008	18.3	4.7	74	1.36
2011-2012	2009	14.5	2.1	85	1.92

5.3.4 Herring (*Clupea harengus*)

Although some older herring may be found outside the coast of western Finnmark, only young Norwegian spring spawning (NSS) herring is present in the Barents Sea. At age 3-4 the Barents Sea herring migrates to the Norwegian Sea, where it spends the rest of its adult life. Thus the number of young herring in the Barents Sea is characterized by large fluctuations and abrupt changes.

In some cases it is difficult to assess the young herring stock size during autumn. The main problem is with the distribution of herring schools close to the surface, being above the range of the echo sounders. This however, has not posed problems to stock measurements of herring in recent years. It is also problematic to get representative samples of fish schooling near the surface, which causes uncertainty in the age distribution of the stock size estimate.

Distribution

In 2002, only very scattered concentrations of herring were found along the coast of Finnmark (Figure 5.2.3.1), in addition to some few scattered concentrations along the western coast of Svalbard/Spitsbergen archipelago. Herring of ages between 1 and 3 was registered, with 3-year-olds being dominant.

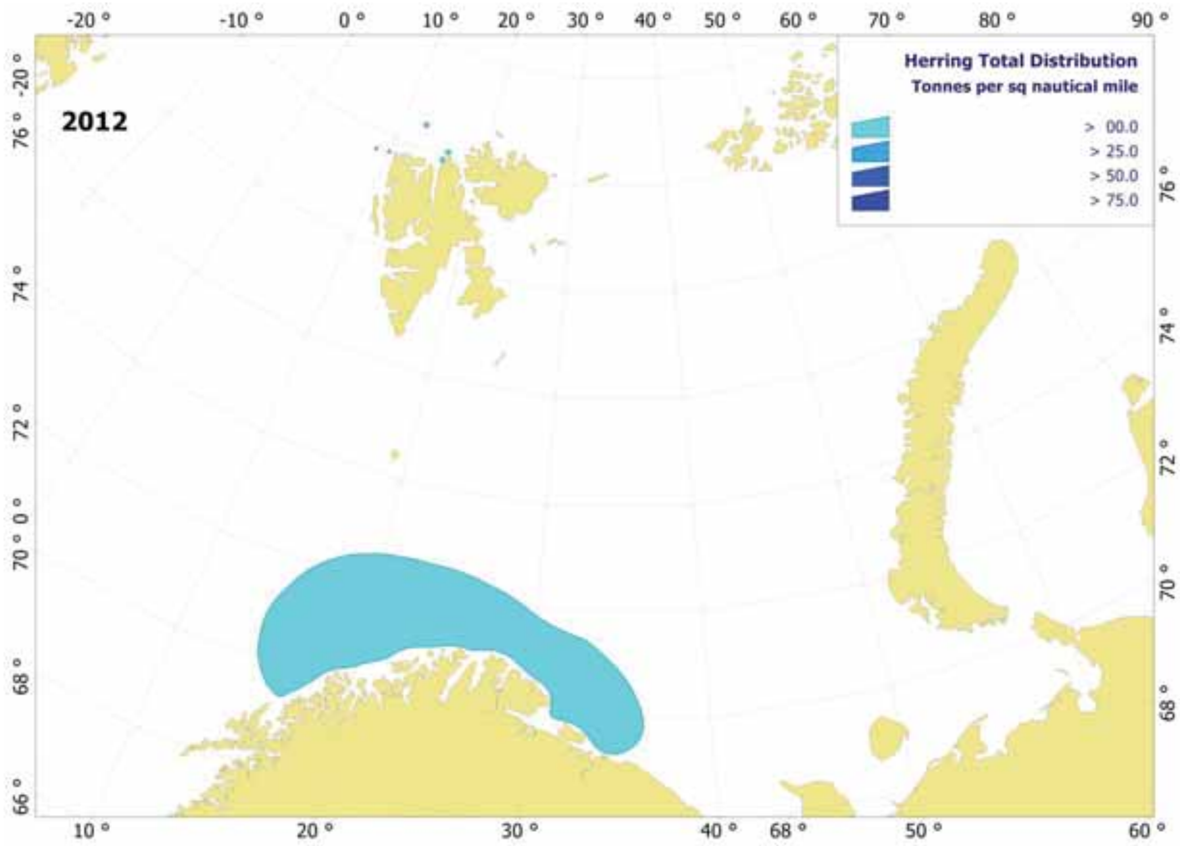


Figure 5.2.3.1. Estimated total density distribution of herring (tonnes/nm^2), August-October 2012.

Abundance estimation

The estimated number and biomass of NSS herring for total age- and length groups are given in Table 5.2.3.1. The time series of estimates is shown in Table 5.2.3.2. Table 5.2.3.3 summarizes the main results of the abundance estimates of 1-4 years old herring for 2012 compared to 2011. The 2011 estimates are shown on a shaded background for comparison. It must be noted that due to insufficient sampling of herring, this lumped estimate for 2012 should be considered as uncertain.

The total abundance of herring aged 1-4 years covered during the survey was estimated at 4.4 billion individuals (about 2.7 times higher than the value estimated in 2011). The biomass of 0.3 thousand tonnes is also 2.7 times higher than in 2011, since the overall mean weight in both years are similar. The dominant year class in 2009 accounts for the largest proportion of the biomass both in 2011 and in 2012. During recent years, the amount of young herring entering the Barents Sea has been low (table 5.2.3.2), and the estimated stock size in 2012, though being almost three times as high as last year, is less than one third of the average stock size during the period 1999 to 2012.

Table 5.2.3.1. Norwegian spring spawning herring. Acoustic estimate in the Barents Sea in August-October 2012

Length (cm)	Age / Year class							Sum (10^6)	Biomass (10^3 t)	Mean weight (g)
	1	2	3	4	5	6	7+			
	2011	2010	2009	2008	2007	2006	2005-			
11.5 - 12.0	17							17	0.1	8.0
12.0 - 12.5	66							66	0.7	11.0
12.5 - 13.0	366							366	4.6	12.5
13.0 - 13.5	323							323	4.5	13.9
13.5 - 14.0	278							278	4.3	15.6
14.0 - 14.5	324							324	5.9	18.3
14.5 - 15.0	247							247	5.3	21.3
15.0 - 15.5	175							175	4.2	24.1
15.5 - 16.0	134							134	3.4	25.5
16.0 - 16.5	69							69	2.0	29.7
16.5 - 17.0	18							18	0.5	30.0
17.0 - 17.5	14	14						28	0.9	32.7
17.5 - 18.0		3						3	0.1	38.0
18.0 - 18.5		55						55	2.1	38.5
18.5 - 19.0		45						45	2.2	47.9
19.0 - 19.5		105						105	5.2	49.5
19.5 - 20.0		140						140	7.7	54.9
20.0 - 20.5		212						212	12.4	58.3
20.5 - 21.0		219						219	13.7	62.6
21.0 - 21.5		139						139	9.7	69.8
21.5 - 22.0		53						53	4.0	76.0
22.0 - 22.5		33						33	2.7	82.6
22.5 - 23.0		47	3					50	4.2	84.3
23.0 - 23.5			22					22	2.1	96.2
23.5 - 24.0			18					18	1.8	99.0
24.0 - 24.5		13	102					115	12.3	107.0
24.5 - 25.0			98					98	10.9	111.7
25.0 - 25.5			78					78	9.3	119.5
25.5 - 26.0			186					186	26.1	140.3
26.0 - 26.5			194					194	29.7	153.1
26.5 - 27.0			133					133	21.6	162.3
27.0 - 27.5			200					200	34.9	174.6
27.5 - 28.0			104					104	18.2	174.9
28.0 - 28.5			83					83	16.2	194.9
28.5 - 29.0			46					46	9.1	198.5
29.0 - 29.5			9					9	1.5	172.0
TSN(10^6)	2031	1078	1285					4394		
TSB(10^3 t)	36.1	65.6	194.6						296.4	
Mean length (cm)	14.0	20.4	26.3					19.2		
Mean weight (g)	17.8	60.9	151.5							67.4

$TS = 20.0 \cdot \log(L) - 71.9$

Table 5.2.3.2. Norwegian spring spawning herring. Acoustic estimates by age in autumn 1999-2012. TSN and TSB are total stock numbers (10^6) and total stock biomass (10^3 t)

Age	1		2		3		4+		Sum	
Year	TSN	TSB	TSN	TSB	TSN	TSB	TSN	TSB	TSN	TSB
1999	48759	716	986	31	51	2			49795	749
2000	14731	383	11499	560					26230	943
2001	525	12	10544	604	1714	160			12783	776
2002									0	0
2003	99786	3090	4336	220	2476	326			106597	3636
2004	14265	406	36495	2725	901	107			51717*	3251.9*
2005	46380	984	16167	1055	6973	795			69520	2833
2006	1618	34	5535	398	1620	211			8773	643
2007	3941	148	2595	218	6378	810	250	46	13164	1221
2008	30	1	1626	77	3987*	287.3*	3222.6*	373.1*	8866	738
2009	2	48	433	52	1807	287	1686	393	5577	815
2010	1047	35	215	34	234	37	428	104	2025	207
2011	95	3	1504	106	6	1			1605	109
2012	2031	36	1078	66	1285	195			4394	296
Average	17939.1	453.5	7154.9	472.7	2131.3	266.3	788.0	181.0	23794.5	997.5

- including older age groups not shown in the table

** - including Kanin herring

Table 5.2.3.3. Summary of abundance estimates of the portion of the herring stock found in the Barents Sea

Year class		Age	Number (10^9)		Mean weight (g)		Biomass (10^3 t)	
2011	2010	1	2.03	0.09	17.8	30.4	36.1	2.9
2010	2009	2	1.08	1.50	60.9	70.2	65.6	105.5
2009	2008	3	1.29	0.01	151.5	126.0	194.6	0.8
2008	2007	4	0	-	0	-	0.0	0
Total stock in:								
2012	2011	1-4	4.39	1.61	67.4	68.0	296.4	109.2

Based on TS value: 20.0 log L – 71.9, corresponding to σ = 8.1·10-7 · L2.00

5.3.5 Blue whiting (*Micromesistius poutassou*)

As in previous years, blue whiting was observed in the western part of the Barents Sea. The target strength used for blue whiting is uncertain. Consequently, the estimates should, to a greater extent than the other estimates, be considered as a relative measure.

Distribution

The distribution of blue whiting (all age groups) is shown in Figure 5.2.4.1. As in previous years the distribution area stretches eastward from the western boarder of the covered area up to 30˚E and from northern coast of Norway up to 77°N to the west of Spitsbergen/Svalbard archipelago. Observe however, that the distribution area this year is somewhat bigger than in previous years.

Abundance estimation

The estimated number and biomass of blue whiting per age- and length group is given in Table 5.2.4.1 Total abundance was estimated to be 4.2 billion individuals and the biomass to 0.44 thousand tones. The stock in 2012 is totally dominated by fish aged 1-year. The total abundance and biomass are respectively, 7.0 and 3.4 times higher than in 2011. Since 2003-2004, when more than one million tonnes of blue whiting was found in this area, there has been a steady decline in biomass (Table 5.2.4.2), and the age distribution has been shifted towards older fish. This trend appears to be reversed in 2012, with the four youngest age groups and in particular, the 1-year-old fish, being more abundant in 2012 than during the four previous years.

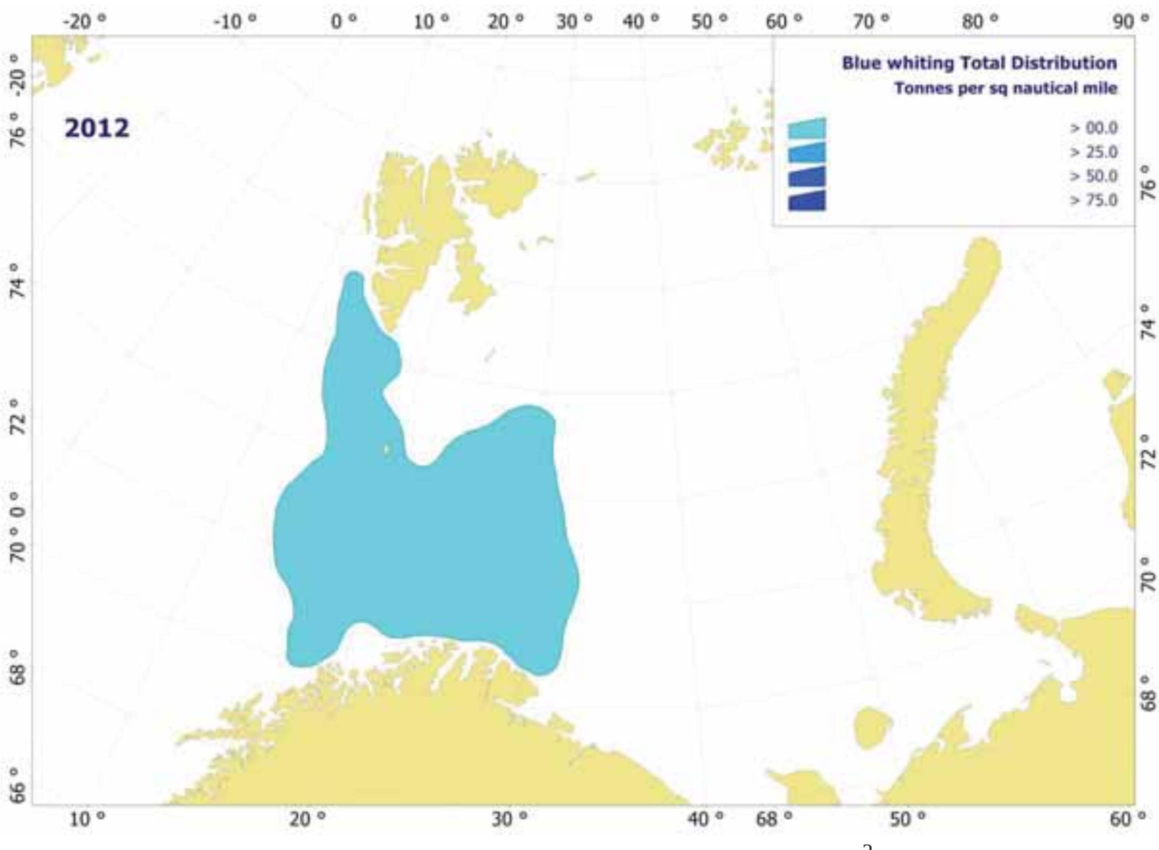


Figure 5.2.4.1. Estimated total density distribution of blue whiting (tonnes/nm^2), August-October 2012.

Table 5.2.4.1. Blue whiting. Acoustic estimate in the Barents Sea in August-October 2012

Length (cm)	Age/Yearclass									Sum	Biomass	Mean
	1	2	3	4	5	6	7	8	9	(10^6)	(10^3 t)	weigt(g)
	2011	2010	2009	2008	2007	2006	2005	2004	2003			
15.0 - 15.5	1									1	0.0	20.0
15.5 - 16.0	1									1	0.0	19.0
16.0 - 16.5	3									3	0.1	21.2
16.5 - 17.0	15									15	0.3	23.0
17.0 - 17.5	27									27	0.6	23.8
17.5 - 18.0	59									59	1.6	26.7
18.0 - 18.5	178									178	5.4	30.2
18.5 - 19.0	180									180	6.0	33.5
19.0 - 19.5	344									344	12.7	37.1
19.5 - 20.0	310									310	12.7	41.1
20.0 - 20.5	317									317	14.2	44.6
20.5 - 21.0	329									329	15.8	48.0
21.0 - 21.5	260									260	13.5	51.7
21.5 - 22.0	199									199	11.3	56.5
22.0 - 22.5	153									153	9.1	59.2
22.5 - 23.0	126	36								162	10.2	63.0
23.0 - 23.5	77									77	5.3	68.3
23.5 - 24.0	61									61	4.3	71.6
24.0 - 24.5	18	16								35	2.7	77.3
24.5 - 25.0	22	2								23	1.9	82.1
25.0 - 25.5		25								25	2.2	86.6
25.5 - 26.0		20	1							21	2.0	95.3
26.0 - 26.5	5	20								26	2.8	107.7
26.5 - 27.0		36	7							43	4.9	115.1
27.0 - 27.5		25	2							27	3.2	117.5
27.5 - 28.0		30	1		7					38	4.9	129.6
28.0 - 28.5		28	23							51	6.9	135.7
28.5 - 29.0		15	19	12						46	6.8	147.3
29.0 - 29.5		39	28		10					78	11.7	150.2
29.5 - 30.0		30	25	2				8		64	10.4	162.0
30.0 - 30.5		27	7	20	4					58	9.5	163.9
30.5 - 31.0		6	12	27		11	8	5		68	11.4	169.1
31.0 - 31.5				13	28		19	2	5	67	12.3	183.7
31.5 - 32.0			5	11	35	1	20			72	13.5	187.9
32.0 - 32.5			7			54		4		64	12.5	195.4
32.5 - 33.0					16	12	51	9		87	19.4	223.0
33.0 - 33.5			15		20	8	12	28		83	17.8	214.9
33.5 - 34.0					3	29	64	9	17	122	30.9	254.0
34.0 - 34.5				1		26	20	46		93	22.7	243.4
34.5 - 35.0					9	2	49	24	3	88	22.4	254.9
35.0 - 35.5			6	16	15	17	20	8	22	105	28.4	271.3
35.5 - 36.0						20	14	19	2	54	15.2	279.3
36.0 - 36.5					28	6	13	7	5	58	17.3	297.1
36.5 - 37.0						10		13	5	28	9.1	324.8
37.0 - 37.5						3	2	2	12	20	7.2	360.6
37.5 - 38.0				3				8		11	3.6	328.9
38.0 - 38.5									6	6	2.0	322.0
38.5 - 39.0										1	0.2	384.0
39.0 - 39.5									1	1	0.4	310.3
39.5 - 40.0												
40.0 - 40.5					3				2	5	2.2	412.1
TSN(10^6)	2686	354	157	105	178	201	290	190	82	4242		
TSB(10^3 t)	124.7	42.9	25.7	19.9	39.2	47.9	69.8	47.8	23.5		441.3	
Mean length	20.5	27.2	29.9	31.5	32.9	33.8	33.7	34.4	35.5	24.6		
Mean weight (g)	46.4	121.1	163.	189.6	220.6	238.9	240.2	251.1	288.6			104.0
TS=21.8· log(L) - 72.7												

Table 5.2.4.2. Blue whiting. Acoustic estimates by age in autumn 2004-2012. TSN and TSB are total stock numbers (10^6) and total stock biomass (10^3)

Age	1		2		3		4+		Sum	
Year	TSN	TSB	TSN	TSB	TSN	TSB	TSN	TSB	TSN	TSB
2004	5787	219	3801	286	2878	265	4780	607	17268	1377
2005	4871	132	2770	180	4205	363	3213	410	15058	1084
2006	371	21	2227	159	2665	238	2491	331	7754	749
2007	3	0	245	23	2934	292	2221	315	5666	658
2008	3	0	2	0	11	1	604	95	620	97
2009	2	0	2	0	2	0	1513	261	1519	261
2010	0	0	0	0	13	3	884	179	897	183
2011	30	2	16	2	79	15	462	109	587	129
2012	2685	125	355	43	158	26	1046	248	4244	441
Average	1528.0	55.5	1046.4	77.0	1438.3	133.7	1912.7	283.9	5957.0	553.1

6 Monitoring the demersal community

6.1 Fish community

Text by P. Krivoshey, P. Murashko and H.Gjøsæter
Figures by P. Krivosheya

Figures 6.1.1.1-6.1.15.1 shows the distribution of demersal fish. The numbers of fish sampled during the survey are presented in Appendix 1.

6.1.1 Cod (Gadus morhua)

The distribution area of cod in the Barents Sea (Fig. 6.1.1.1) was completely covered. At this time of the year, towards the end of the feeding period, the distribution of cod is wide. Cod reach the limits of its natural habitat and spread far north, east and northeast. The total distribution of cod was similar to 2011, but it stretched even further northwards. There were several observations north of Franz Josef Land and such high abundance has never been observed north of 82°30 N. The main concentrations were observed in the north-east of the Barents Sea. The main biomass of cod (80%) was concentrated in the depth range from 100 m down to 400 m.

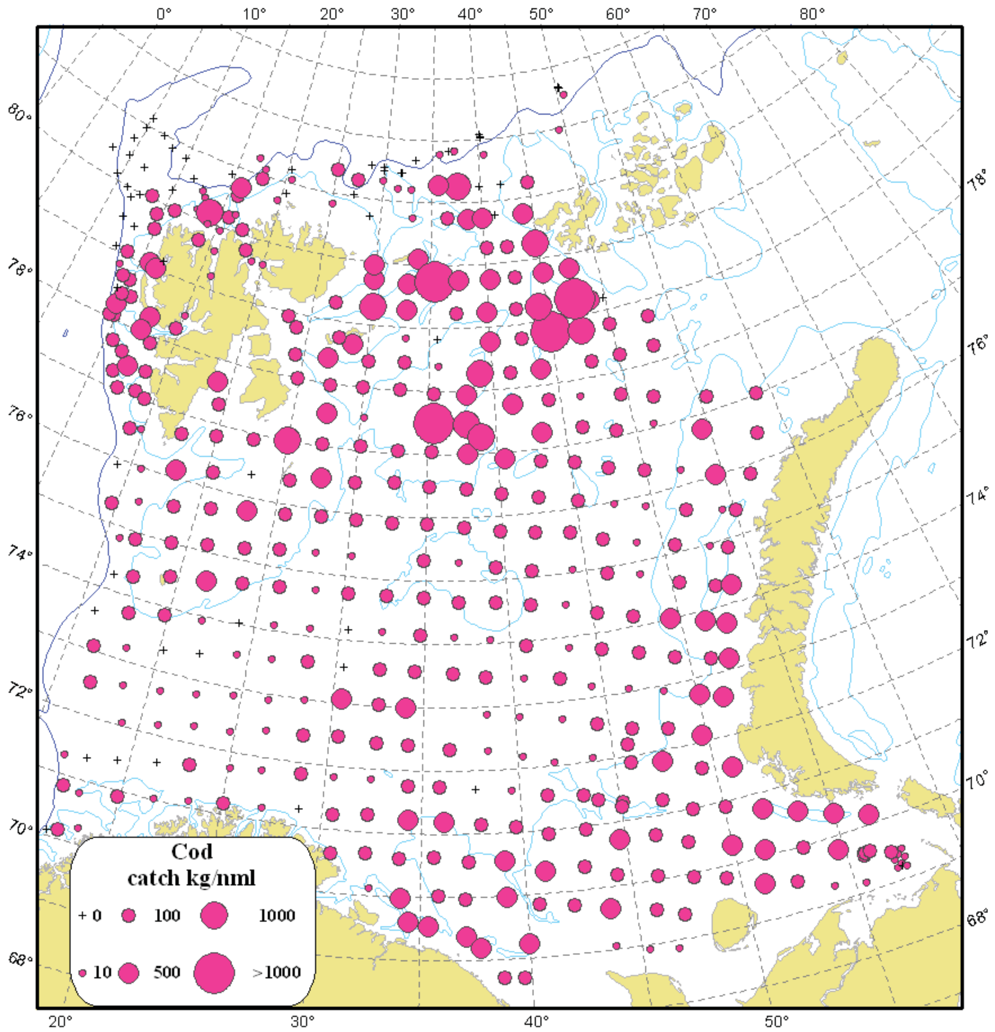


Figure 6.1.1.1. Distribution of cod (*Gadus morhua*) August-September 2012.

6.1.2 Haddock (*Melanogrammus aeglefinus*)

Haddock were distributed (Fig. 6.1.2.1) in a large area from the Norwegian and Russian coast to 82°N and as far east as 57°E in the southern Barents Sea. The main concentrations of haddock were found in shallow areas in the south-eastern part of the Barents Sea which coincide with the distribution in 2011 and 2010. Haddock is widely distributed in the north-east, compared to previous years. The biomass of haddock tends to decline from last year (see table below). The greatest concentrations (85 % of total) were distributed in depths down to 150 m.

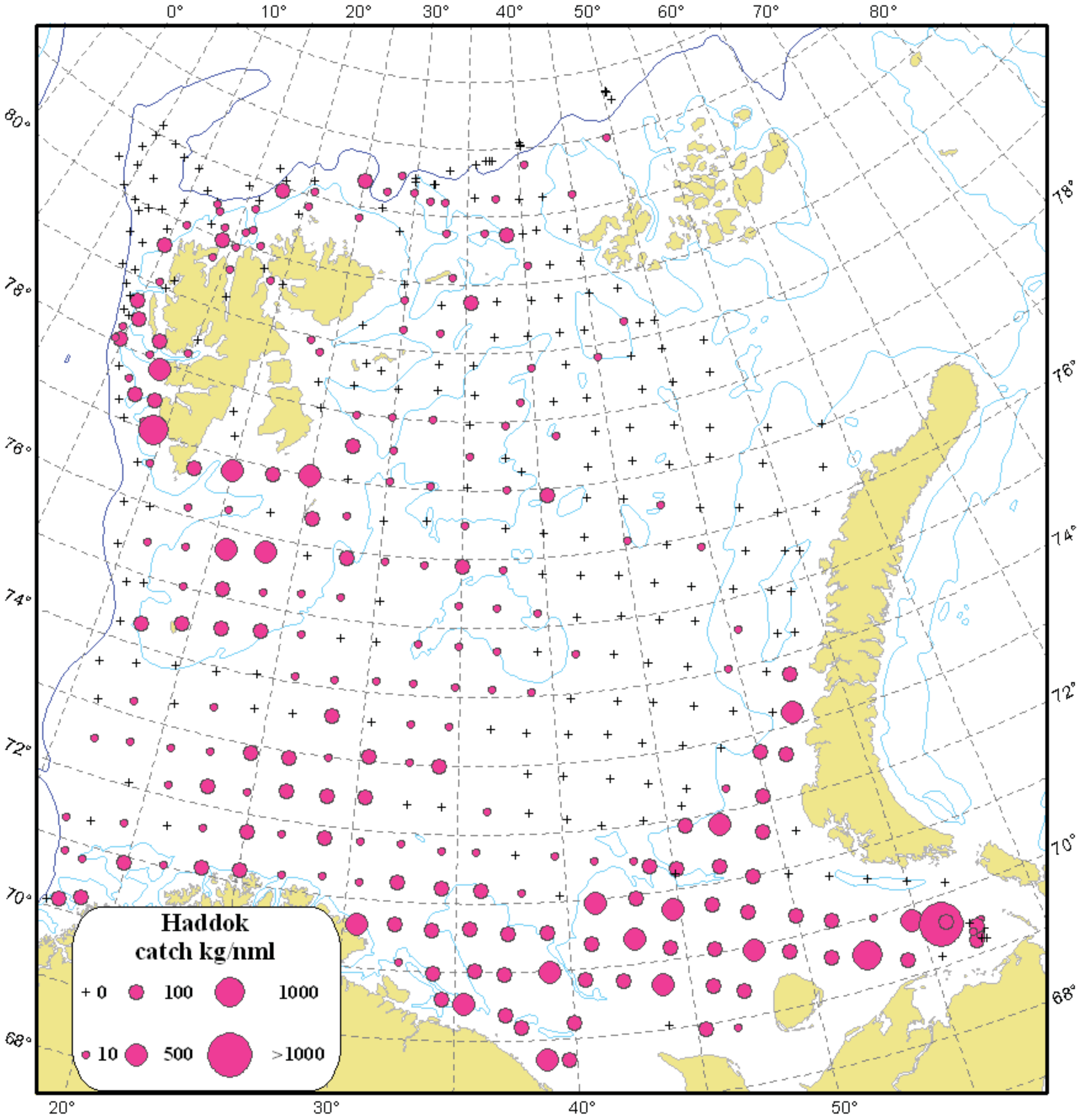


Figure 6.1.2.1. Distribution of haddock *(Melanogrammus aeglefinus)*, August-September 2012.

6.1.3 Saithe (*Pollachius virens*)

The survey has captured only a small part of distribution of saithe off the coast of Norway (Figure 6.1.3.1). Saithe were distributed in the warm waters east to 45°E. The main catches of saithe were obtained from the coast of the North Cape. The main distribution of saithe in 2012 coincides with the distributions in 2011 and 2010. 66 % of the observations were found in the depth range 150 to 200 m.

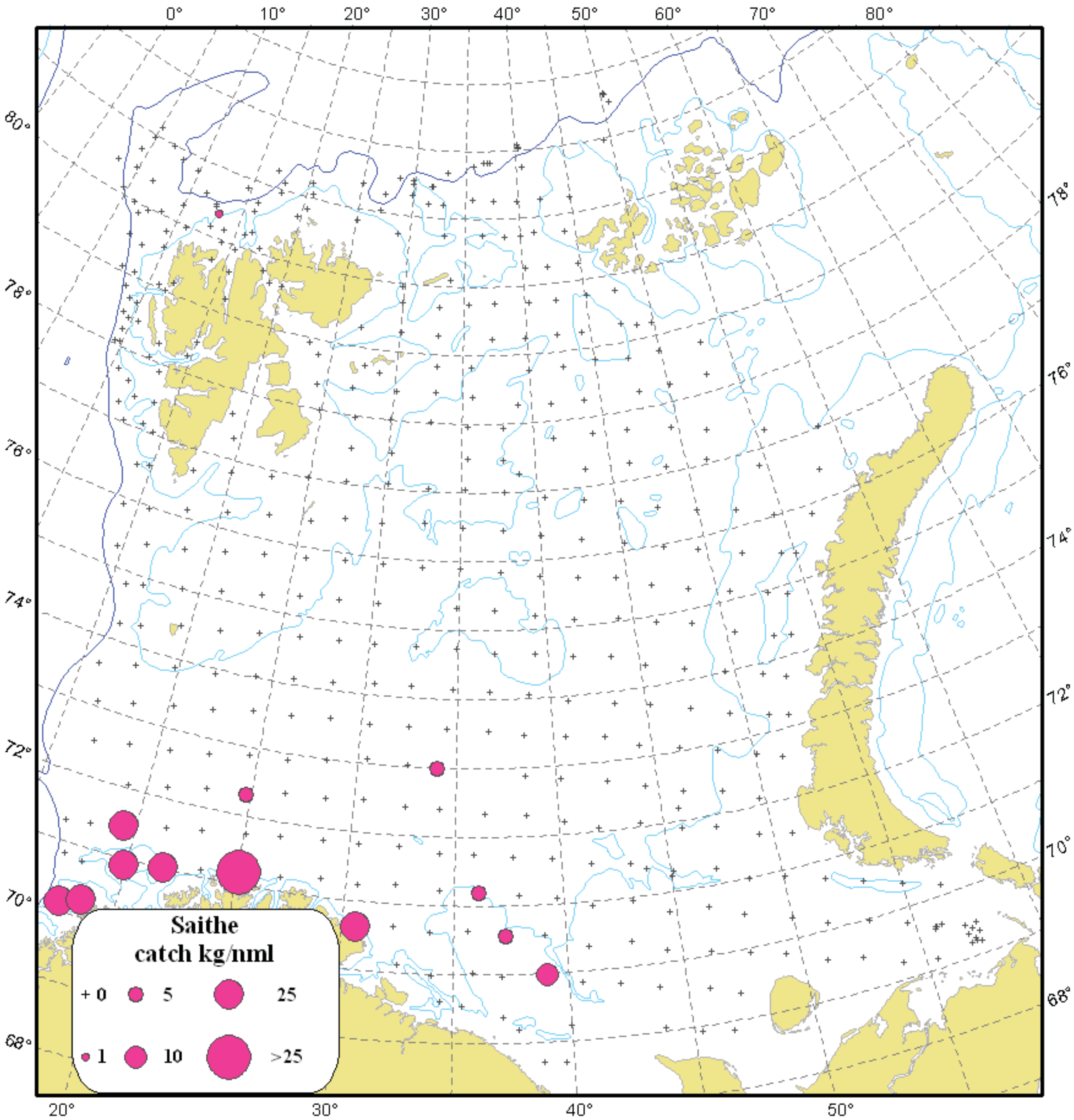


Figure 6.1.3.1. Distribution of saithe *(Pollachius virens)*, August-September 2012

6.1.4 Greenland halibut (*Reinhardtius hippoglossoides*)

During the survey, mainly young age groups of Greenland halibut were observed (Fig. 6.1.4.1). The adult part of the stock was distributed outside of the survey area. Greenland halibut were distributed in traditional areas along the shelf slope in the western Barents Sea, and in deeper areas of the Barents Sea, the deeper part around Svalbard to Franz Josef Land. No research was done on halibut in the Kara Sea this year. The main concentration of Greenland halibut (57 %) was found in the depth range from 250 m to 500 m.

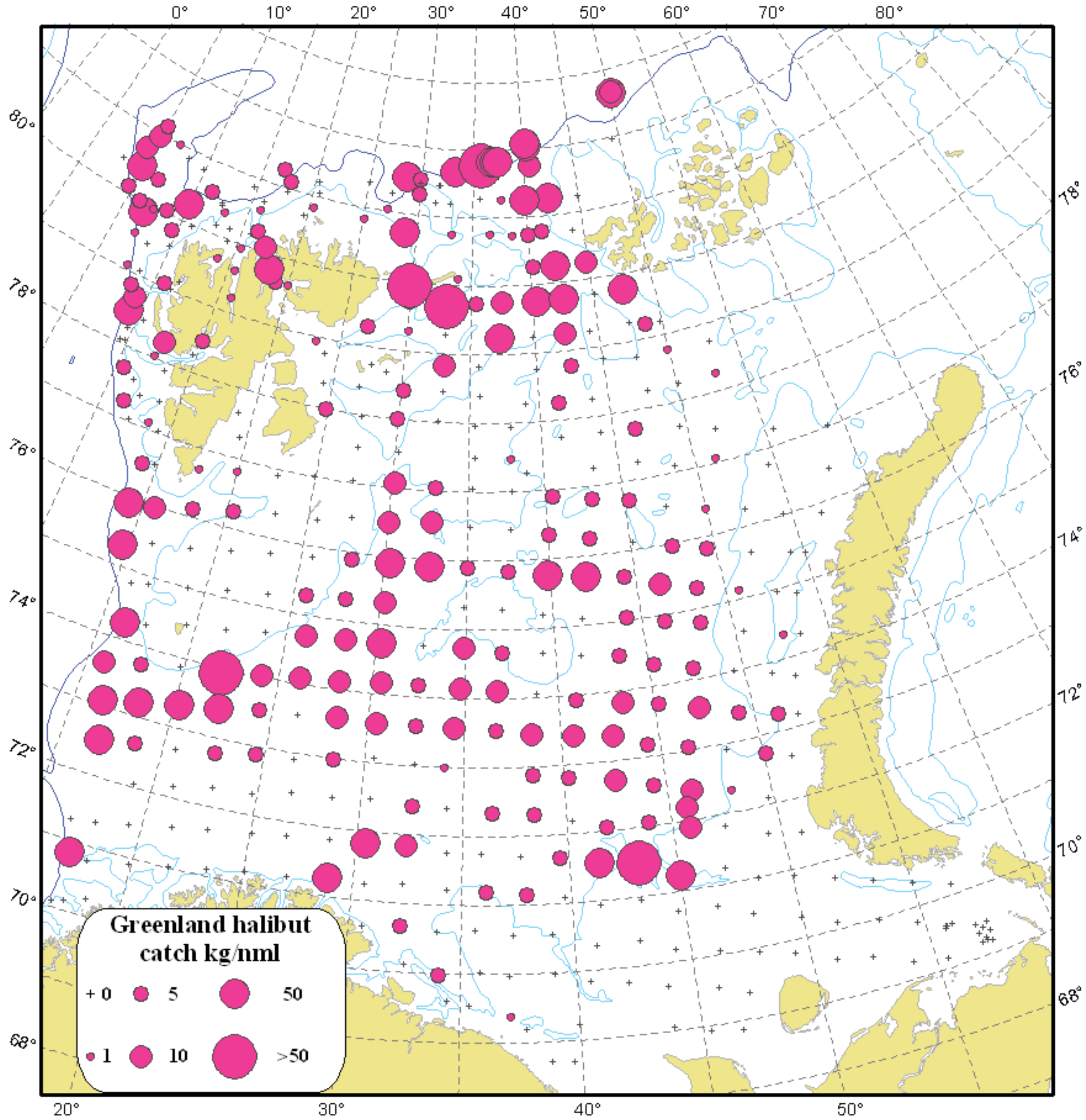


Figure 6.1.4.1. Distribution of Greenland halibut *(Reinhardtius hippoglossoides)* (WCPUE, based on weight of fish), August- September 2012.

6.1.5 Golden redfish (*Sebastes marinus*)

Golden redfish (Fig. 6.1.5.1) were distributed in the same part of the Barents Sea basin as in previous years. The main densities were observed along the shelf slope north and west of Spitsbergen/Svalbard and in deeper waters in the south-eastern part of the Barents Sea. Abundance has doubled, and biomass increased by 62 %. The main part (66 %) was concentrated at depths from 150 down to 300 meters.

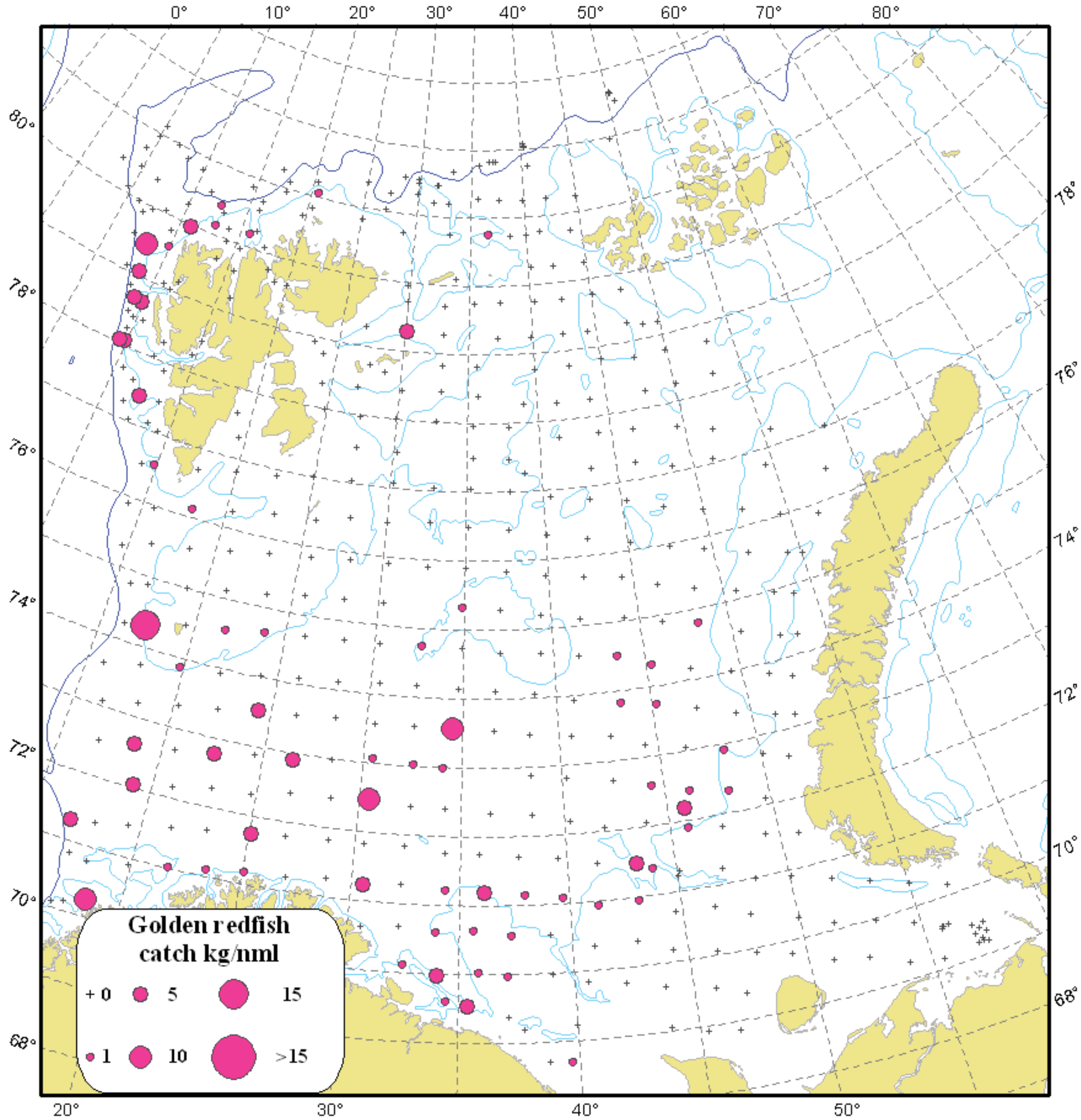


Figure 6.1.5.1. Distribution of golden redfish (*Sebastes marinus)*, August-September 2012.

6.1.6 Deep-water redfish (*Sebastes mentella*)

The main concentrations of deep-water redfish were distributed in traditional areas and were found in western and north-western parts of the Barents Sea, and to the west of Svalbard (Fig. 6.1.6.1). Mainly young age groups of *Sebastes mentella* were found the in deep-water zones in the eastern part of the Barents Sea. The abundance of deep-water redfish estimated over the entire area has increased slightly, but due to the growth of the various age groups the estimated biomass increased almost two-fold from 2011. The main biomass of Deep-water redfish (61 %) was concentrated in the depth range from 250 m down to 550 m.

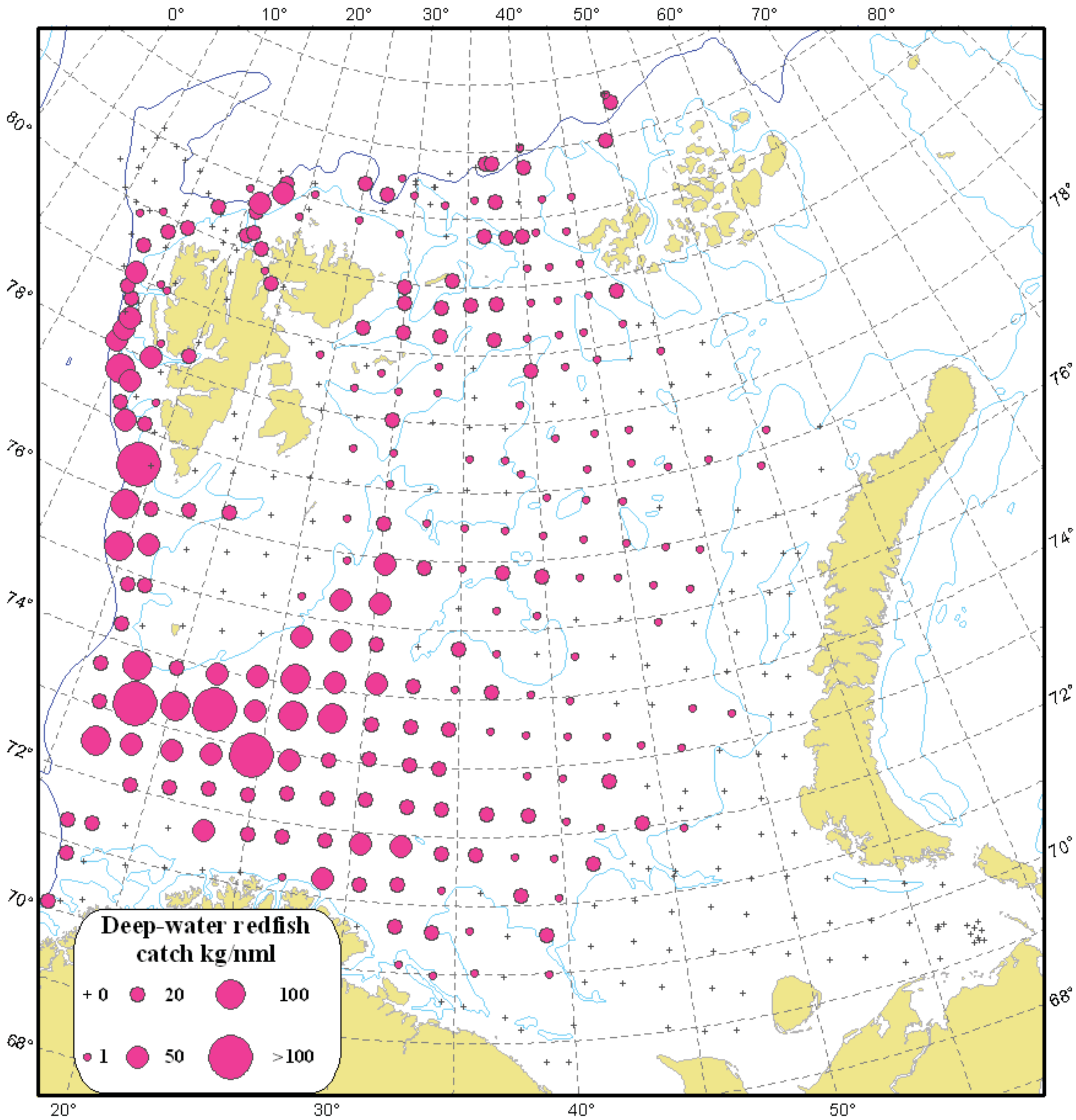


Figure 6.1.6.1. Distribution of deep-water redfish *(Sebastes mentella)*, August-September 2012.

6.1.7 Norway redfish (*Sebastes viviparus*)

Norway redfish (Fig. 6.1.7.1) were distributed in the south-western part of the Barents Sea. Catches were not significant and the average was 6 - 8 kg per nautical mile. The main biomass of Norway redfish (77 %) was concentrated at depths from 200 m down to 250 m.

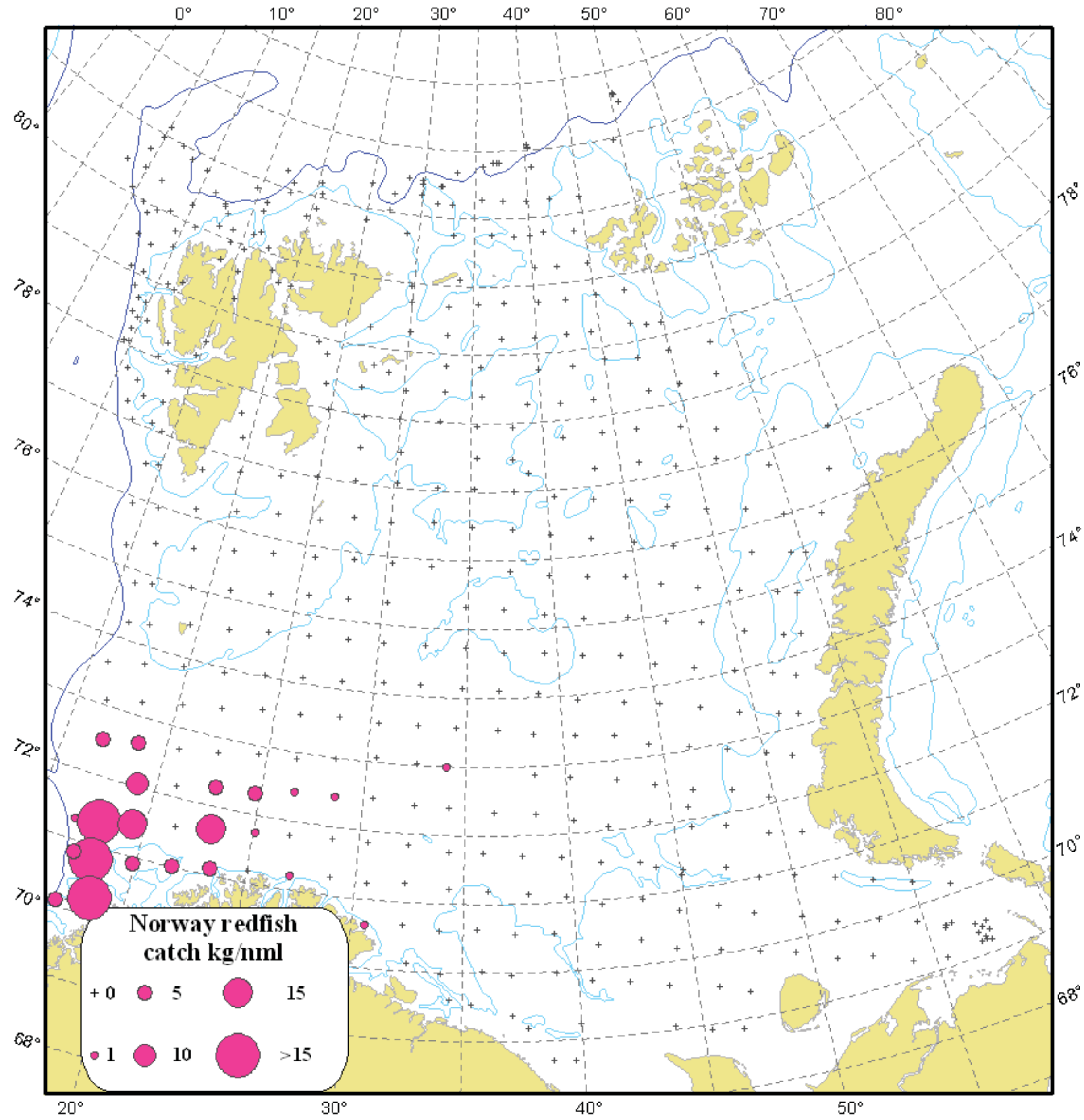


Figure 6.1.7.1. Distribution of Norway redfish *(Sebastes viviparus)*, August-September 2012.

6.1.8 Long rough dab (*Hippoglossoides platessoides*)

As in previous years, long rough dab was found in all surveyed areas and the catches were generally high (Fig. 6.1.8.1). Low concentrations were observed only in the south-western Barents Sea south of Bear Island and along the coast of Norway. Its abundance was $4.6 \cdot 10^{9}$ specimens (this is 15% higher than the number of cod). Average catch of long rough dab was 13 kg per nautical mile and the maximum catch reached 108 kg per nautical mile. Estimated biomass over the entire area of research increased by 82% from 2011 and was $584.4 \cdot 10^{3}$ t. The main biomass of long rough dab (83%) was concentrated in the depth range from 100 m down to 300 m.

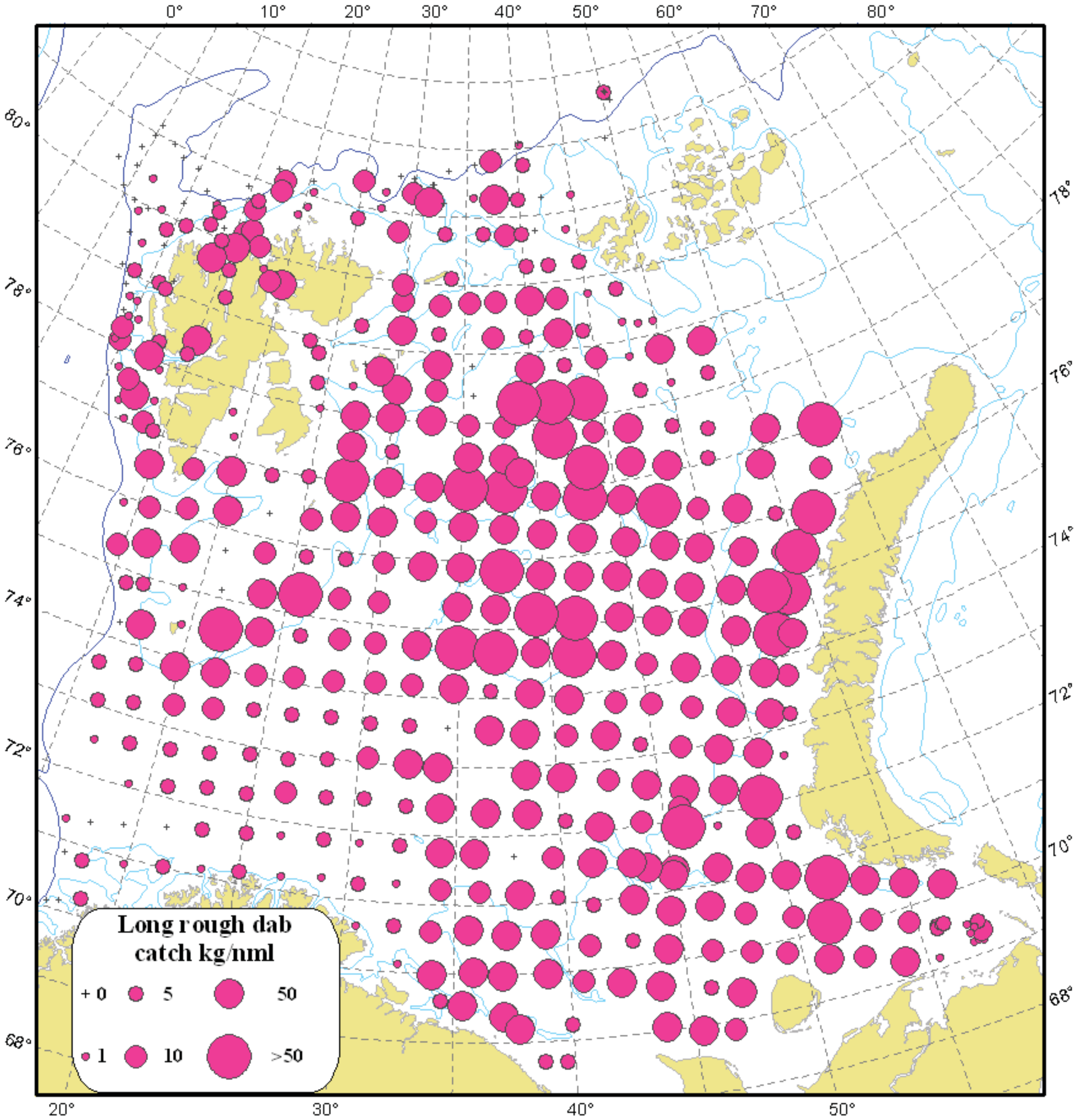


Figure 6.1.8.1. Distribution of long rough dab *(Hippoglossoides platessoides)*, August-September 2012.

6.1.9 Wolffishes (Anarhichas sp.)

Three species; Atlantic wolffish (*Anarhichas lupus*), Spotted wolffish (*Anarhichas minor*) and Northern wolffish (*Anarhichas denticulatus*) had approximately the same catch rates.

The greatest catches of Atlantic wolffish were to the south from Spitsbergen, near Bear Island, and on shallow sites in the southeastern part of the Barents Sea (Fig. 6.1.9.1). The main biomass of Atlantic wolffish (71%) was concentrated in the depth range from 50 m down to 150 m.

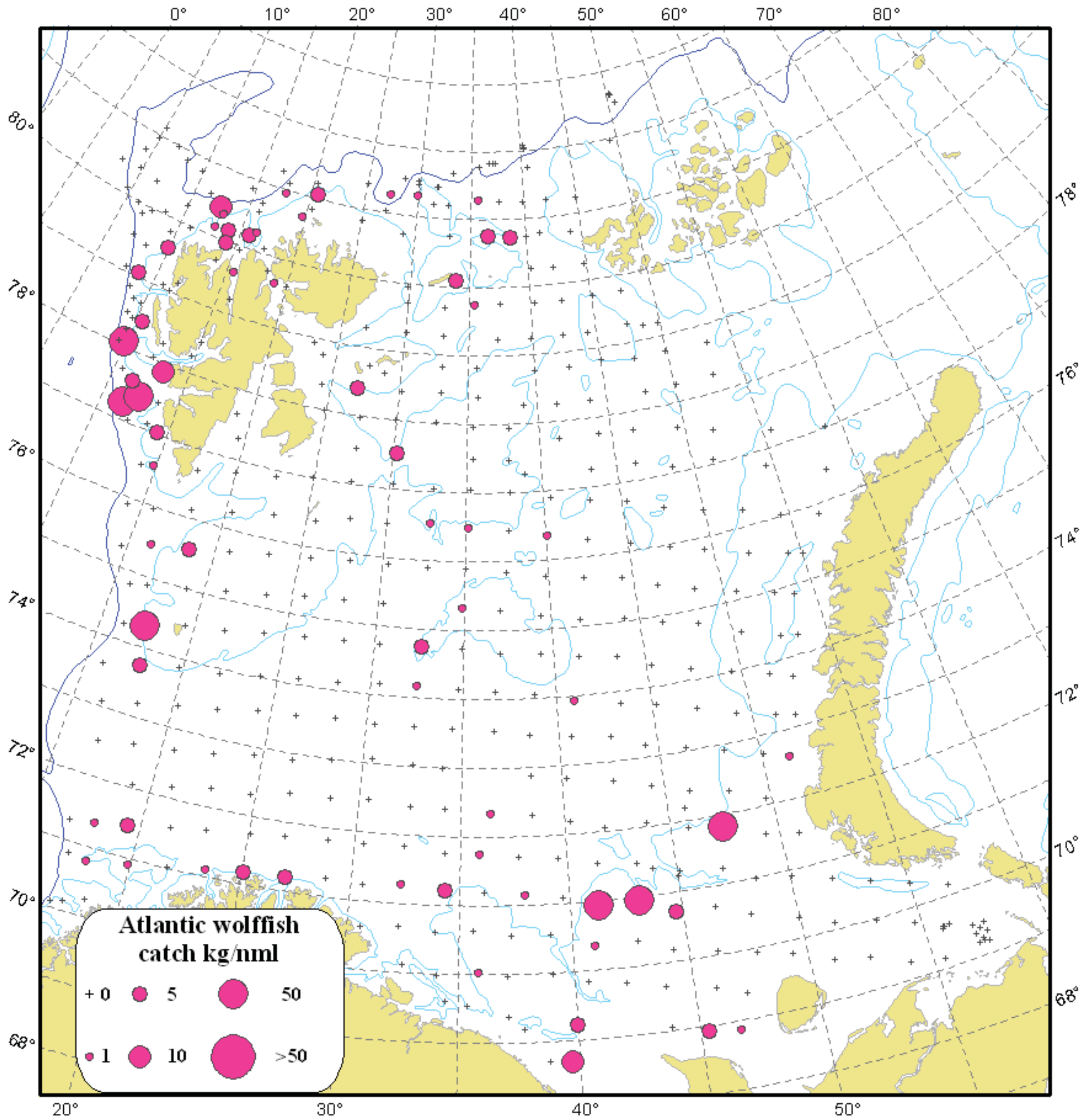


Figure 6.1.9.1. Distribution of Atlantic wolffish (*Anarhichas lupus*), August-September 2012.

Distribution of Spotted wolffish in 2012 was similar to last year (Fig. 6.1.9.2). The greatest catches of Spotted wolffish were to the east from Bear Island, and on shallow sites in the southeastern and in the central part of the Barents Sea. This year Spotted wolffish was detected in catches west and along the shores of the archipelago Novaja Zemlja. The main biomass of Spotted wolffish (78 %) was concentrated in a range of depths from 50 m down to 150 m.

In 2012 the distribution of Northern wolffish was similar to that observed in 2011 with a decrease in the west Spitsbergen area (Fig. 6.1.9.3). Most concentrations were located in the central areas. Northern wolffish was detected in the north between Franz Josef Land and Svalbard. The main part of the catches (60 %) was in the depth range 200-400 m.

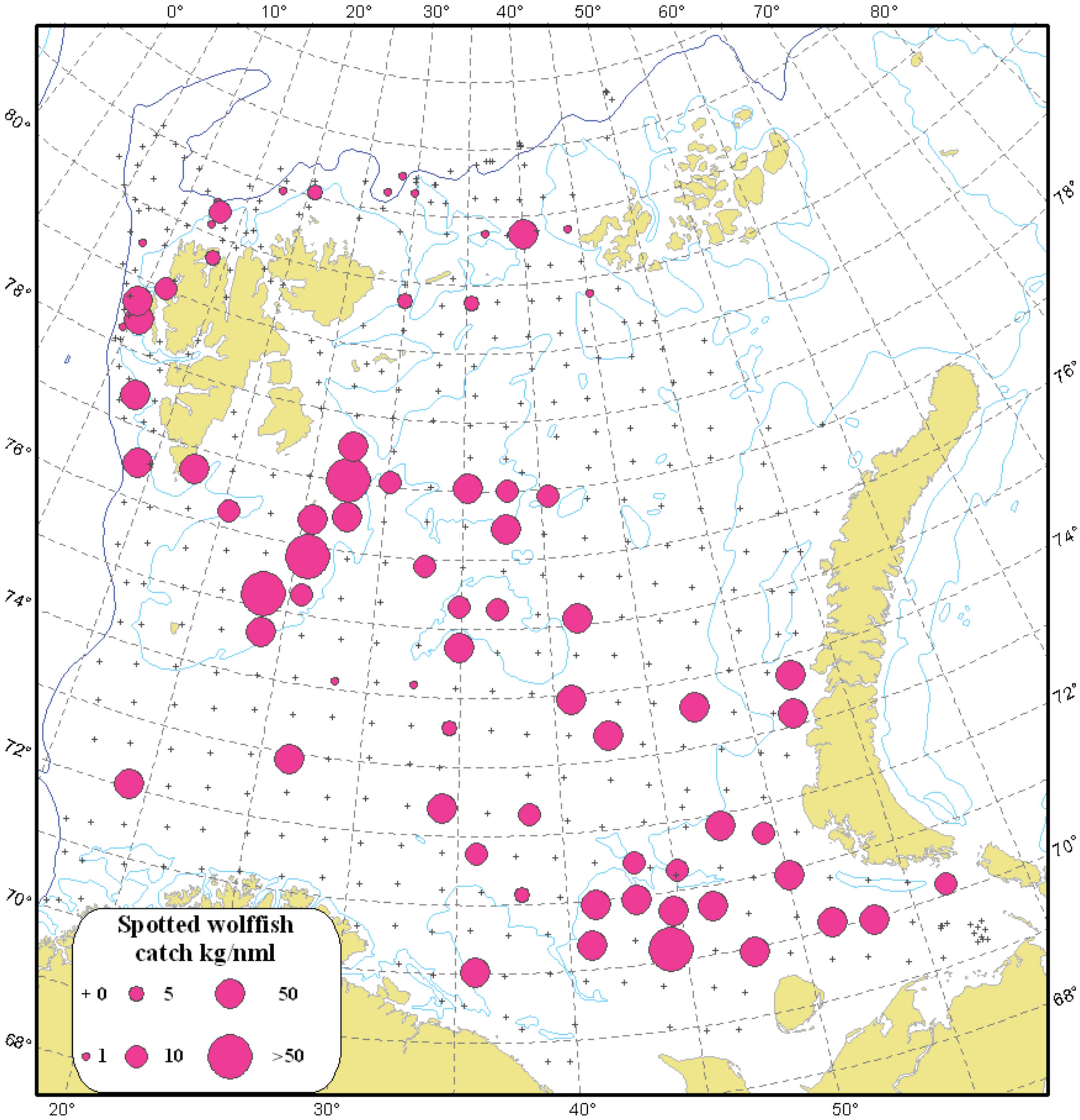


Figure 6.1.9.2. Distribution of spotted wolffish (*Anarhichas minor*), August-September 2012.

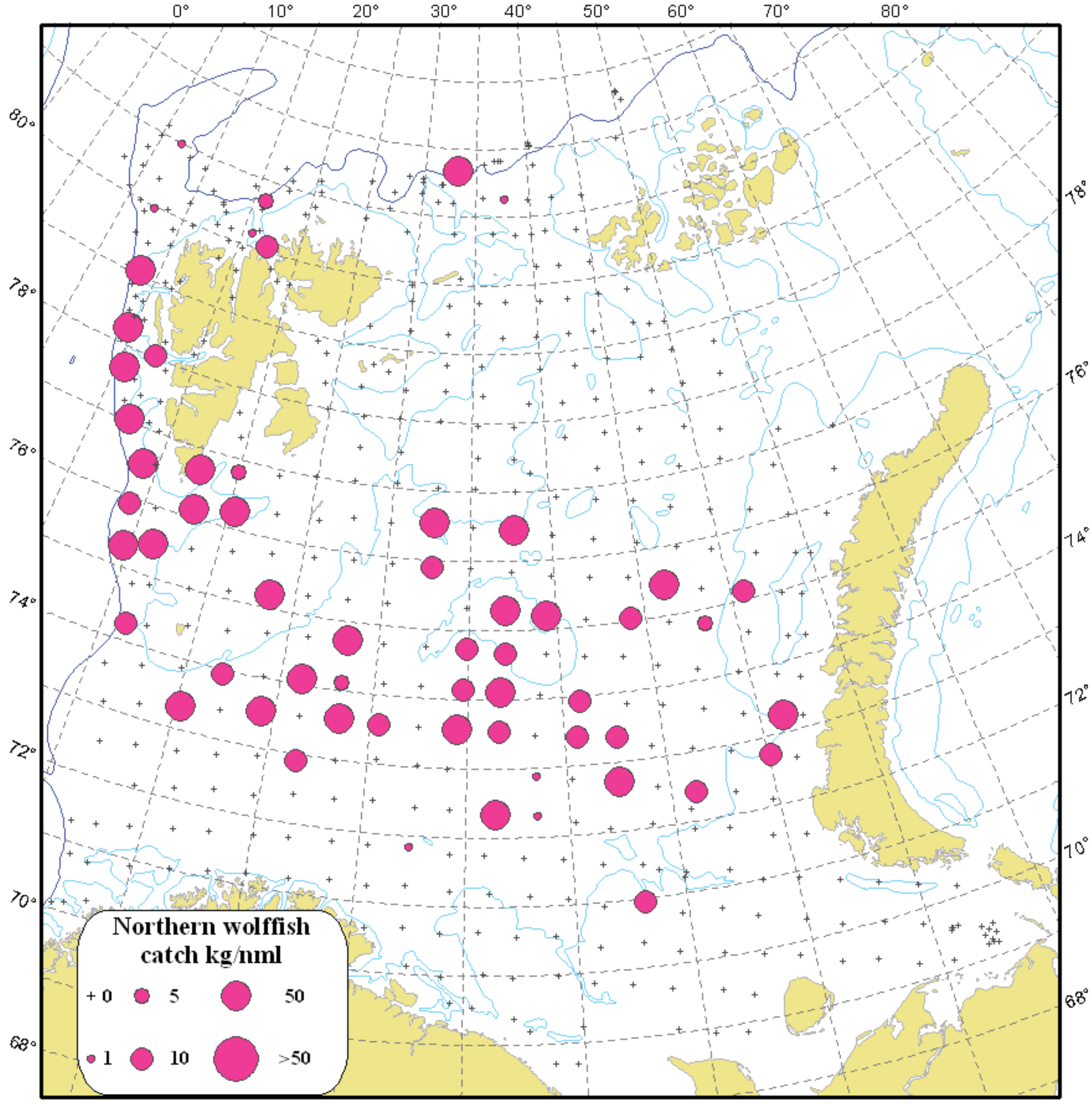


Figure 6.1.9.3. Distribution of Northern wolffish (*Anarhichas denticulatus*), August-September 2012.

6.1.10 Plaice (*Pleuronectes platessa*)

The main catches (48 % of total) were distributed in the depth range from 50 down to 130 m to the north from Kanin peninsula and at the shore of the Kola peninsula (Fig. 6.1.10.1).

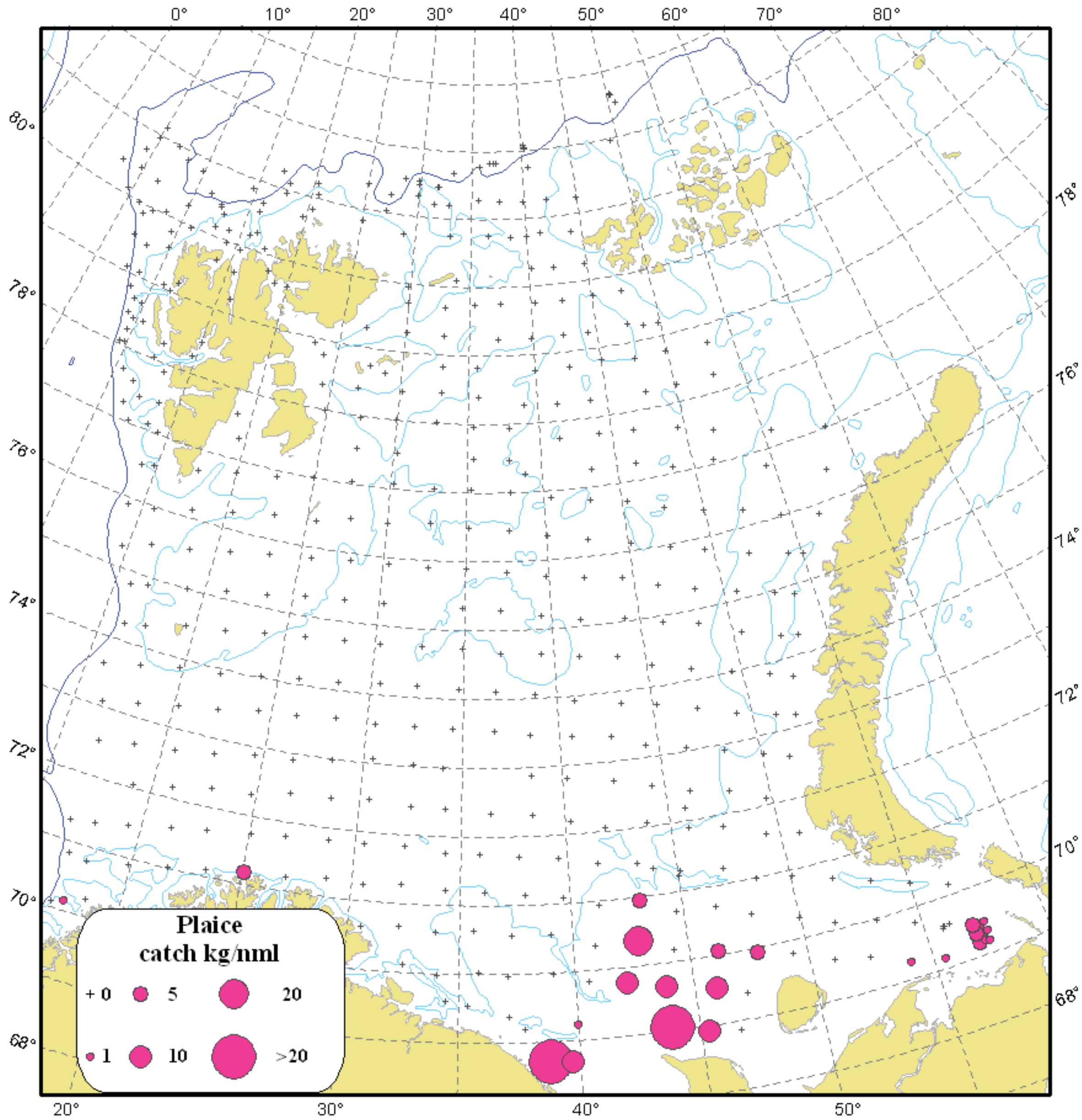


Figure 6.1.10.1. Distribution of plaice (*Pleuronectes platessa*), August-September 2012.

6.1.11 Norway pout (*Trisopterus esmarkii*)

The main concentrations of Norway pout were observed in the south-western Barents Sea (Fig. 6.1.11.1). A few Norway pout were observed west and north of Svalbard, as far north as 81°N. Norway pout were distributed eastward to 49°E in the southern Barents Sea. The main biomass of Norway pout (98 %) was concentrated in the depth range from 150 m down to 300 m.

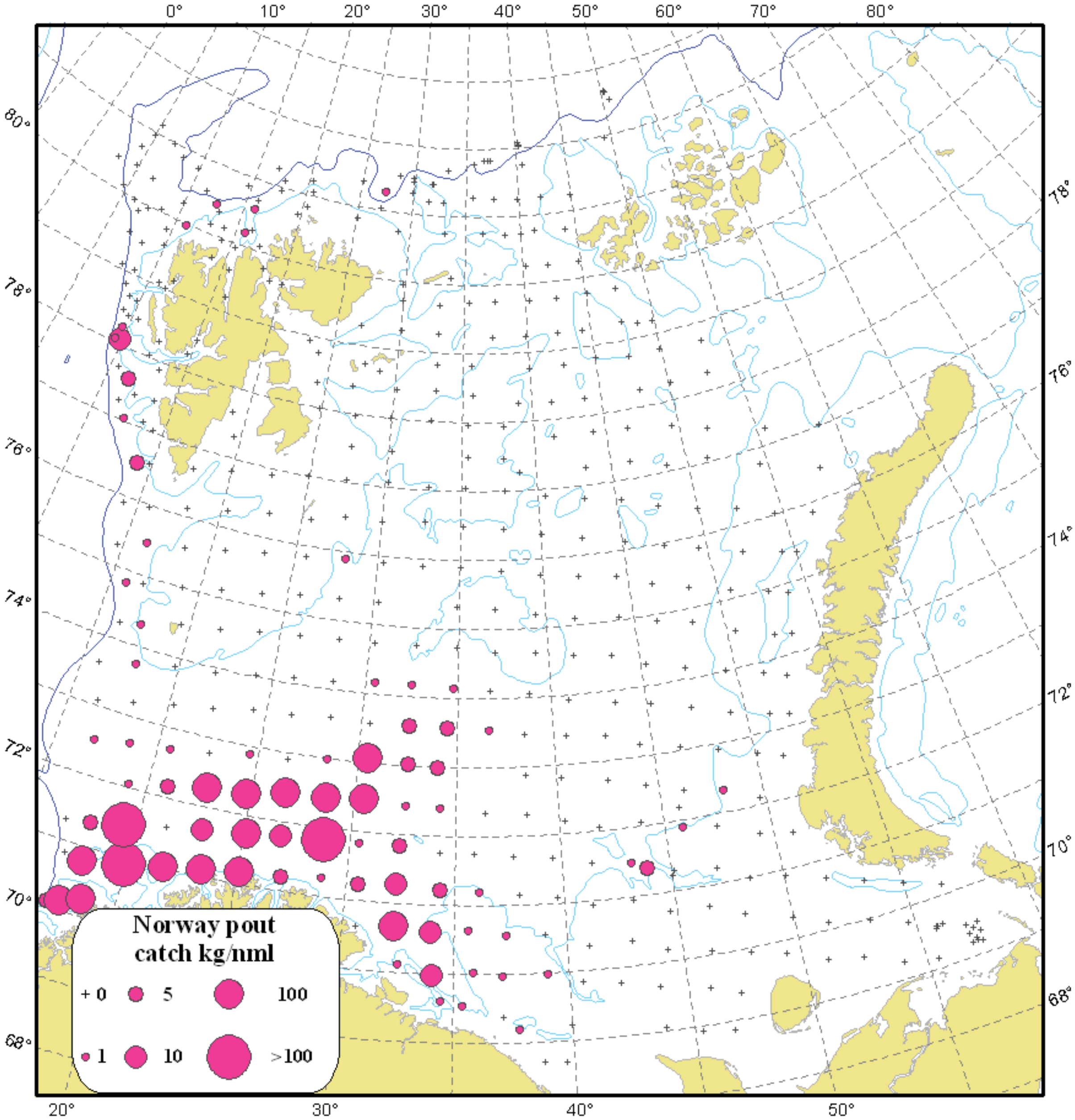


Figure 6.1.11.1. Distribution of Norway pout *(Trisopterus Esmarkii)*, August-September 2012.

Abundance and biomass estimation of demersal fish

Preliminary estimates of the abundance and biomass of demersal fish was done at the end of the survey. Definitive results will be presented after age reading. Preliminary estimates from 2010, 2011 and 2012 are presented in the table below.

In 2012, there is an increase in abundance of almost all demersal species of fish. The greatest increase is observed in the number of long rought dab, saithe and cod. In spite of this, biomass increased only slightly or even decreased. Probably this is due to changes in the structure of stocks, with an increase in the number of individuals in younger age groups.

6.1.12 Preliminary abundance and biomass estimates of demersal fish

Year	Abundance, 10^6			Biomass, 10^3 t		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**
Atlantic wolffish	16.6	↑ 19.5	↑22	17.1	↓ 12.5	↓9.4
Spotted wolffish	6.7	↑ 9.3	↑13	36.5	↑ 47.4	↑82.5
Northern wolffish	3.1	↑ 6.1	↑8	25.1	↑ 42.3	↑45.1
Long rough dab	2520.2	↓ 2506.8	↑4563	355.6	↓ 321.8	↑584.4
Plaice	34.2	↑ 35.5	↓21	21.0	↑ 26.3	↓13.4
Norway redfish	26.1	↑ 82.8	↑114	2.2	↑ 8.9	↑12.0
Golden redfish	22.2	↓ 14.2	↑32	4.3	↑ 4.9	↑8.1
Deep-water redfish	1075.8	↑ 1271.2	↑1587	111.6	↓ 105.3	↑195.9
Greenland halibut	186.3	↓ 174.8	↑209	149.6	↓ 87.7	↓85.8
Haddock	2289.1	↓ 1138.5	↑1263	1406.0	↓ 877.8	↓711
Saithe	5.4	↑ 8.6	↑14	8.9	↑ 9.9	↑12.6
Cod	2231.4	↓ 1837.4	↑3967	2801.0	↓ 2165.2	↓1847
Norway pout	3529.6	↑ 5976.1	↓3089	102.7	↓ 68.3	↑105.3

In 2012 the thorny skate were quite widely distributed, except north-eastern areas of the Barents Sea, similar as in 2009. Thorny skate occupied large areas, from the south-east to the west and north of the Svalbard/Spitsbergen (Fig. 8.8.4). The catches of the thorny skate were similar to last year, with average of XXX kg per nm. While in the south-eastern area catches were much higher than in previous years, partially probable due to warmer temperatures near the bottom. 43 % of all catches, were high catches and were observed in the area with depth of 50 m - 150 m. Total biomass of the thorny skate was estimated to $52.6 \cdot 10^3$ tonnes and abundance to $88 \cdot 10^6$ individuals.

In 2012 the Northern skate were distributed in the north-western and central areas (Fig. 8.3.5). Most catches (70 %) were taken in the deep-waters areas of 200-400 m depths. The highest concentrations were observed near the Svalbard and in the northern part of Barents Sea. In 2012 the total abundance was $6 \cdot 10^6$ individuals and biomass of $7.9 \cdot 10^3$ tonnes.

6.2 Benthos community

6.2.1 Monitoring the Northern shrimp

Text by T. H. Thangstad
Figures by T. H. Thangstad

Northern shrimps are widely distributed in the Barents Sea. Traditionally, the densest shrimp concentrations have been observed in the central parts and round Svalbard. From 2004 to 2012 the distribution has gradually moved eastward (Figure 6.2.1.1). Mean biomass has varied considerably during 2004-2012, increasing by about 66% up to 2006, then decreasing and increasing again to 2006-levels in 2012. Highest shrimp densities were observed at bottom temperatures between zero and 4°C, while the limit of their upper temperature preference appears to lie at about 6-8°C. The warming of the western Barents Sea coincides with the eastward shift in shrimp distribution (Figure 6.2.1.1).

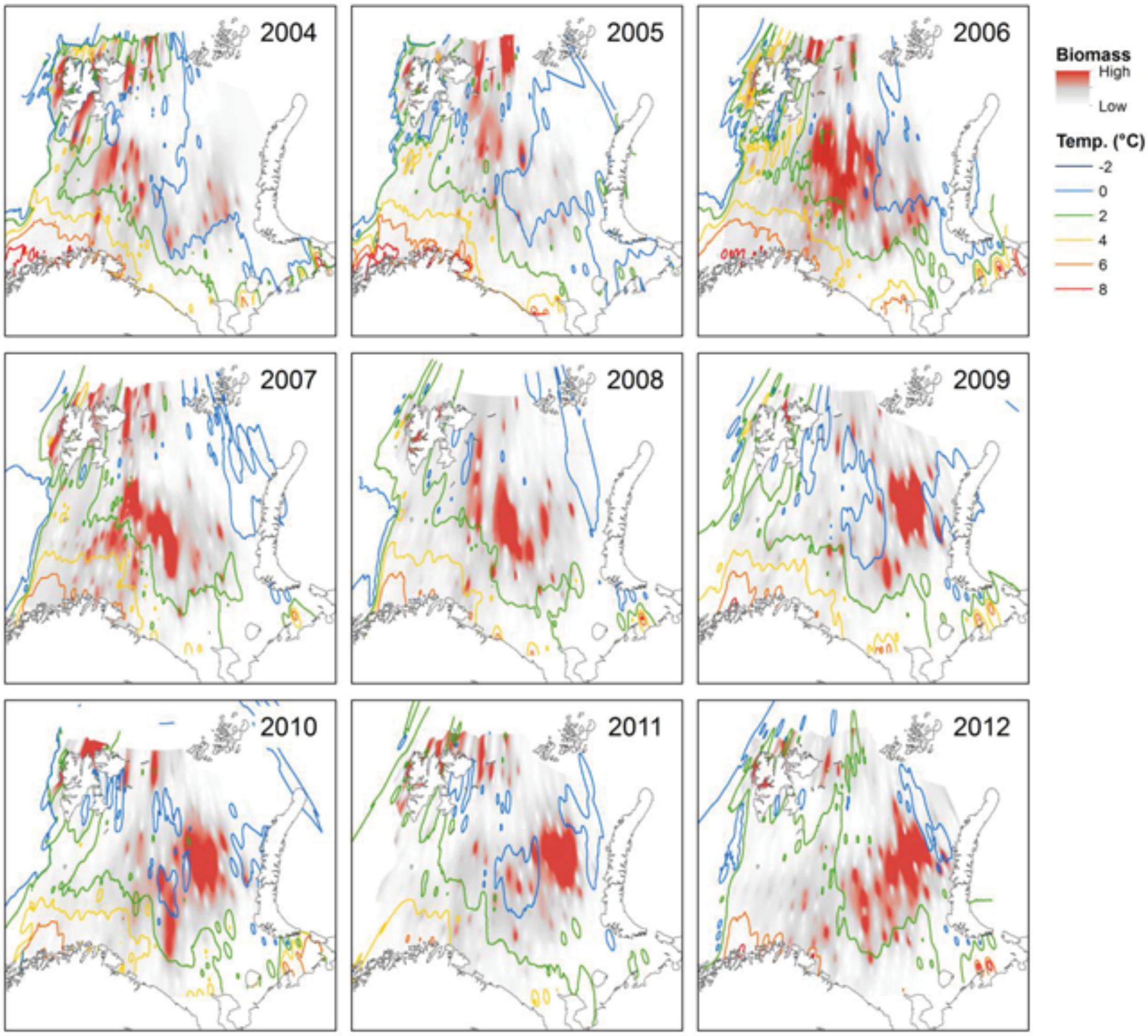
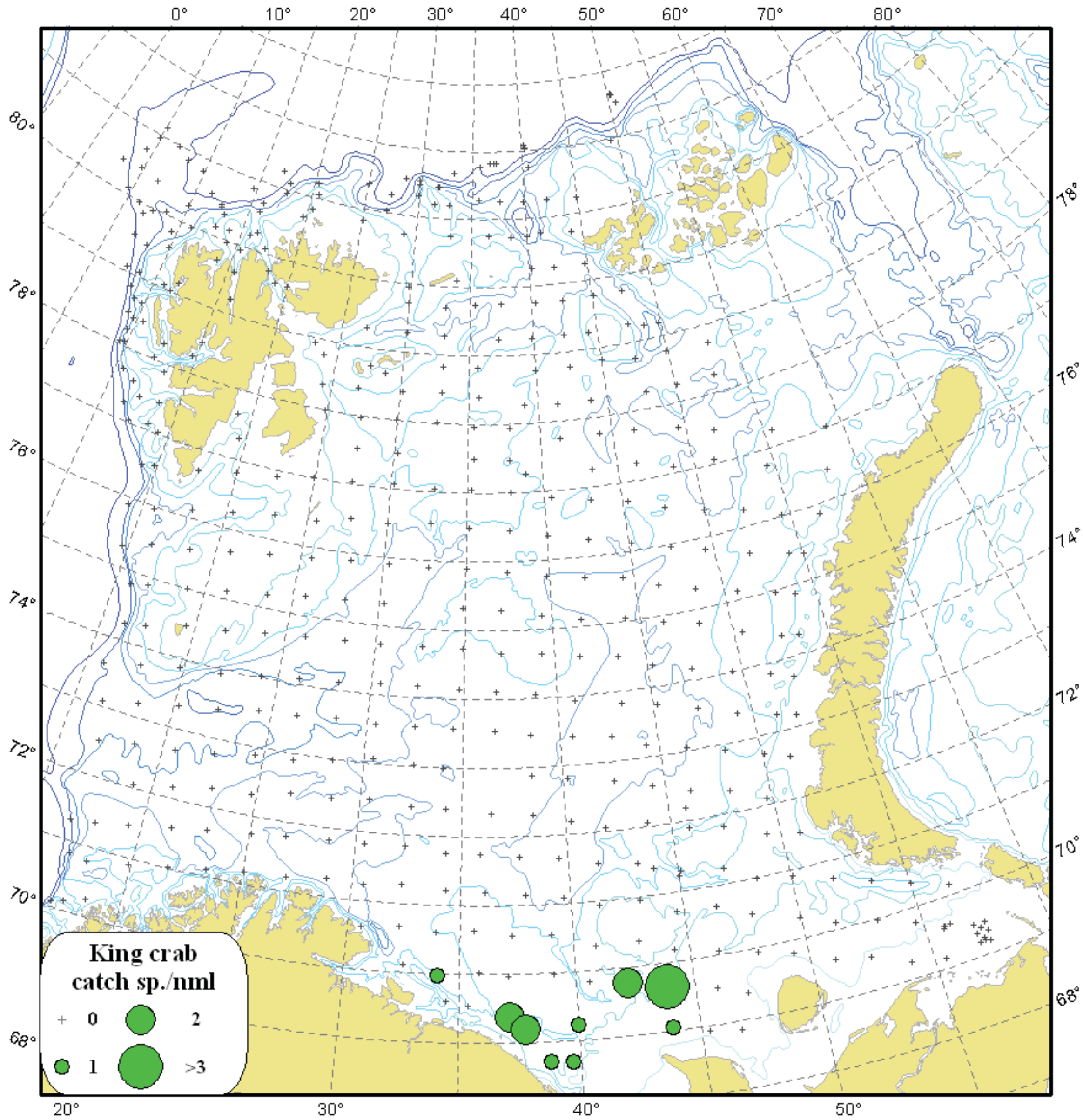


Figure 6.2.1.1. Distribution of Northern shrimps *(Pandalus borealis)*, in 2004-2012.

6.2.2 Distribution of Red King crab

Text by M. Pimchukov and J. Sunde

Figures by P. Krivosheya



6.2.3 Snow crab (*Chionoecetes opilio*)

Text by D. Prozorkevich and P. Lubin

Figures by P. Krivosheya

The number and distribution area of snow crab in the Barents Sea is increasing rapidly (Figure 6.3.3.1). The total number calculated by the swept area method is $15.7*10^9$ individuals. A total number of 118 stations were sampled in 2012, while the number of stations in 2011 and 2010 were 84 and 53, respectively.

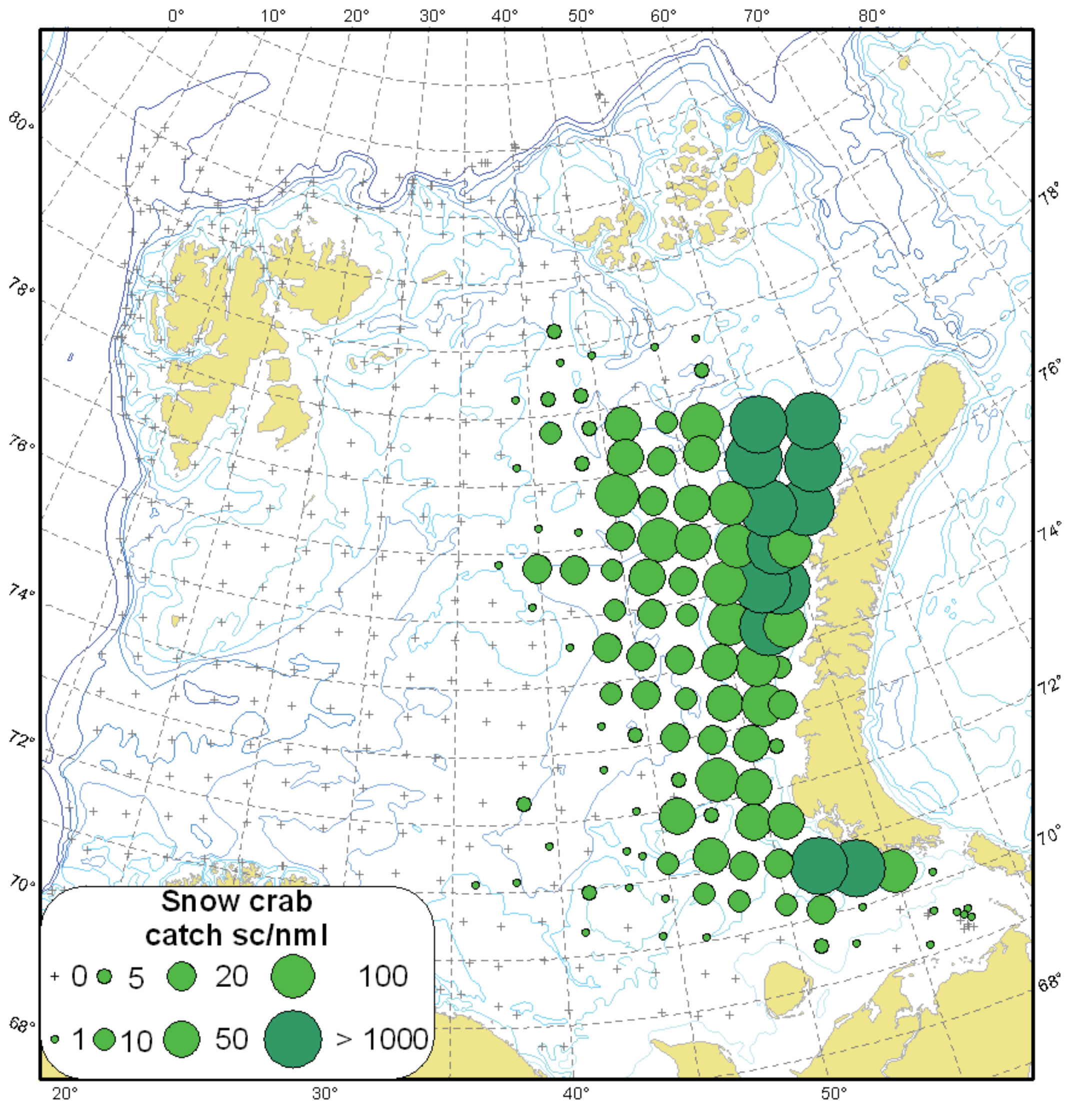


Figure 6.3.3.1. Snow crab (*Chionoecetes opilio*), August-September 2012.

Maximum catch was registered in 6511 sp. (171 kg) per nautical mile. Whereas species with 30-mm width of carapace dominated the samples in 2012, the dominant species in 2011 were those with carapace lengths of 20-mm. (Figure 6.3.3.2). The number of crabs with carapace length in excess of 10 cm did not exceed 1 %.

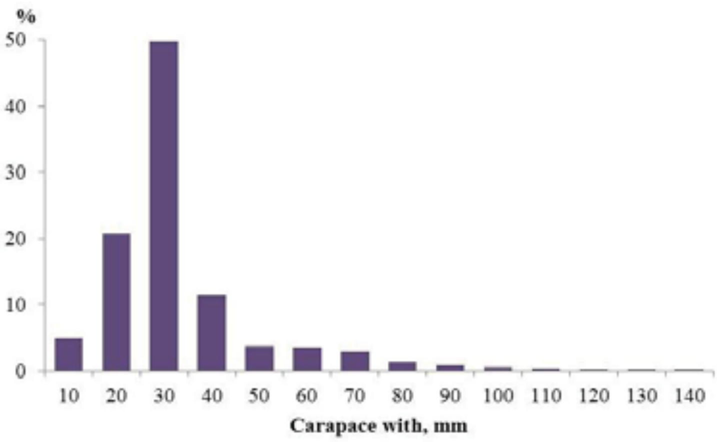


Figure 6.3.3.2. The size composition of the Snow crab (*Chionoecetes opilio*) population recorded by the Ecosystem Survey in August-October 2012.

6.2.4 Distribution and amount of *Gonatus fabricii*

Text by Prozorkevich D. Lubin P. and Eriksen. E.

Figures by Krivosheya P. and Eriksen. E.

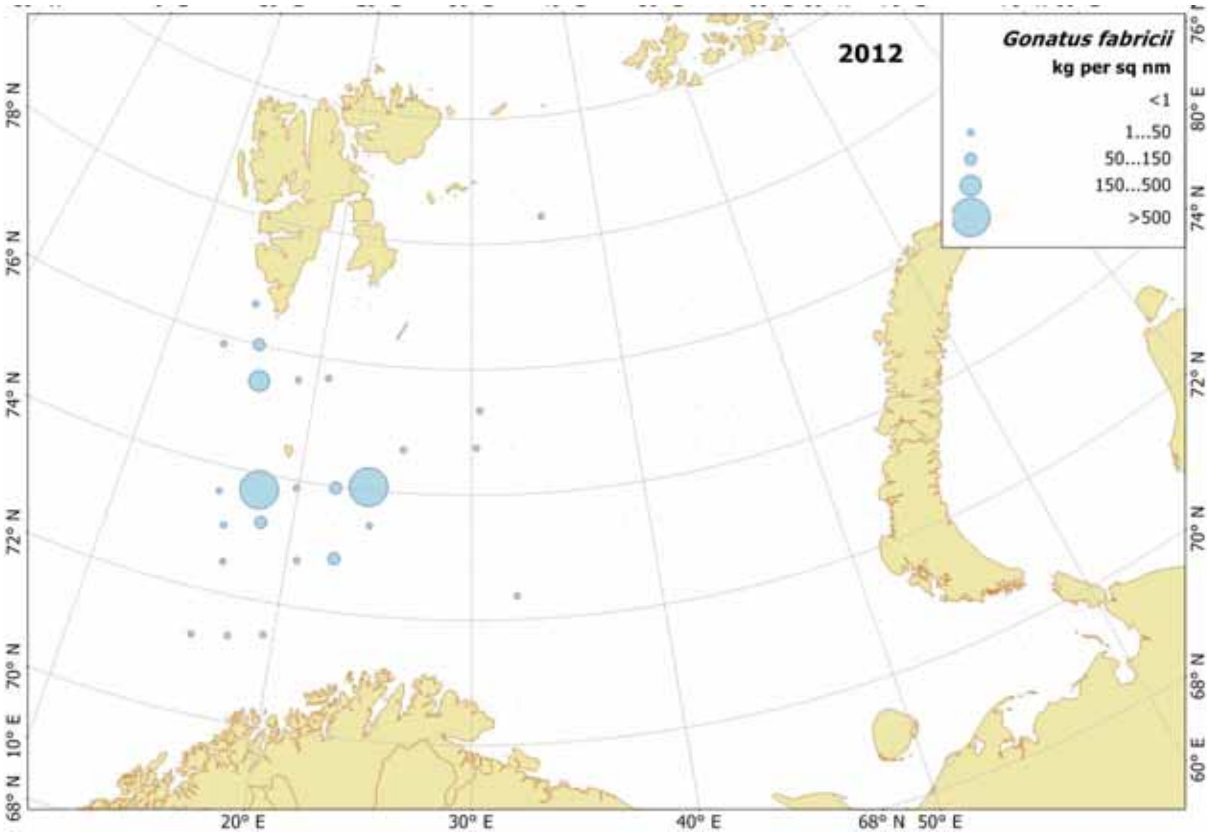


Figure 6.3.3.3. Distribution of *Gonatus fabricii*, August-September 2012.

Gonatus fabricii is a by-catch in the pelagic catches, taken in the 0-group stations. *Gonatus fabricii* was observed in the western parts of the Barents Se. In 2012 *Gonatus* was distributed in the western part of the Barents Sea (Figure 6.3.3.3).

Mean density varied from 1 to 500 kg per sq nautical miles was 13 individuals per trawl haul. The calculated density reached 16.7 thousand individuals per square nautical mile with an average of 357 fish per square nautical mile. No index was calculated for this species.

7 Monitoring of interactions by diet study

7.1 Trophic studies of capelin and polar cod

by Padmini Dalpadado, Emma Orlova, Irina Prokopchuk, Bjarte Bogstad and Alina Rey

In the Barents Sea, diet data for capelin (*Mallotus villosus*) and polar cod (*Boreogadus saida*) (also called Arctic cod) were collected during the Joint Norwegian-Russian ecosystem surveys in August-September respectively during the period 2005-2011 and 2007-2011. IMR generally takes stomach samples from 10 fish at each station, while PINRO samples more fish (up to 50) at fewer stations. Because Russian data on stomach content are in wet weight and Norwegian data in dry weight, a wet weight/dry weight conversion factor of 5.0 was applied. The data are presented in dry weight in the figures.

The size of the capelin ranged from 6.5 to 19.5 cm and for polar cod ranged from 7-27 cm. In the Norwegian data, the fish is measured to the nearest 0.5 cm (rounding downwards), while in the Russian data the fish is measured to the nearest 0.1 cm, but in the data conversion they were rounded to the nearest 0.5 cm (rounding downwards). For analysis of the variation of diet by size, the following size groups were used: for capelin below and above 12 cm, and for polar cod below and above 17 cm. The diet data of capelin from 2005 is based on few stations compared to other years and is mainly from the north central and eastern parts of the Barents Sea.

Seven years of capelin diet was examined from the Barents Sea (Table 7.1.1), where capelin is a key forage species, especially of cod (*Gadus morhua*). In the Barents Sea, a pronounced shift in the diet from copepods to krill, mostly Thysanoessa inermis was observed in larger capelin (>12 cm), with krill being the largest contributor to the diet weight (Figures 7.1.1 and 7.1.2). In the Barents Sea, amphipods contributed a small amount to the diet of capelin except in 2012. The migration of capelin into northerly areas (>80 N) are observed in the recent years due to more ice free area. This may make capelin more accessible to the arctic amphipod, *Themisto libellula*.

Table 7.1.1. Mean Total length, and weight of capelin and polar cod in the Barents Sea. ND=no data.

	Capelin			Polar cod		
year	No. stomachs	Mean length (cm)	mean weight (g)	No. stomachs	Mean length (cmr)	mean weight (g)
2005	250	13,8	14,42	nd	ND	ND
2006	531	14,1	15,76	nd	ND	ND
2007	798	13,6	13,90	379	14,98	27,67
2008	636	14,2	15,56	330	14,56	24,79
2009	685	14,5	17,15	473	13,85	21,13
2010	250	14,6	16,70	335	13,23	19,13
2011	601	13,9	13,75	408	14,69	27,22

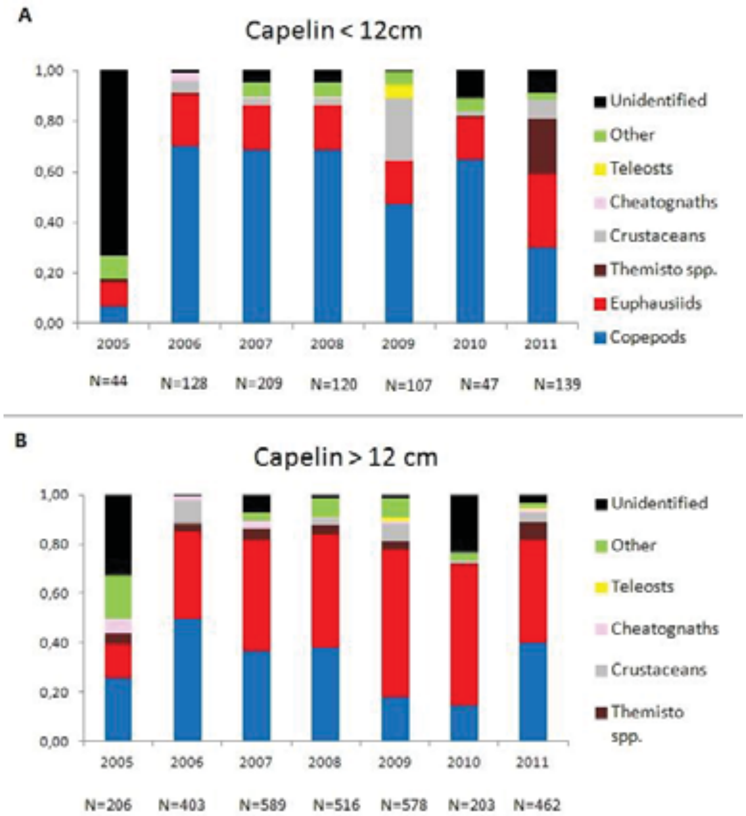


Figure 7.1.1. Inter-annual variation in diet composition (Partial Fullness Index) of capelin (above and below 12cm) in the Barents Sea.

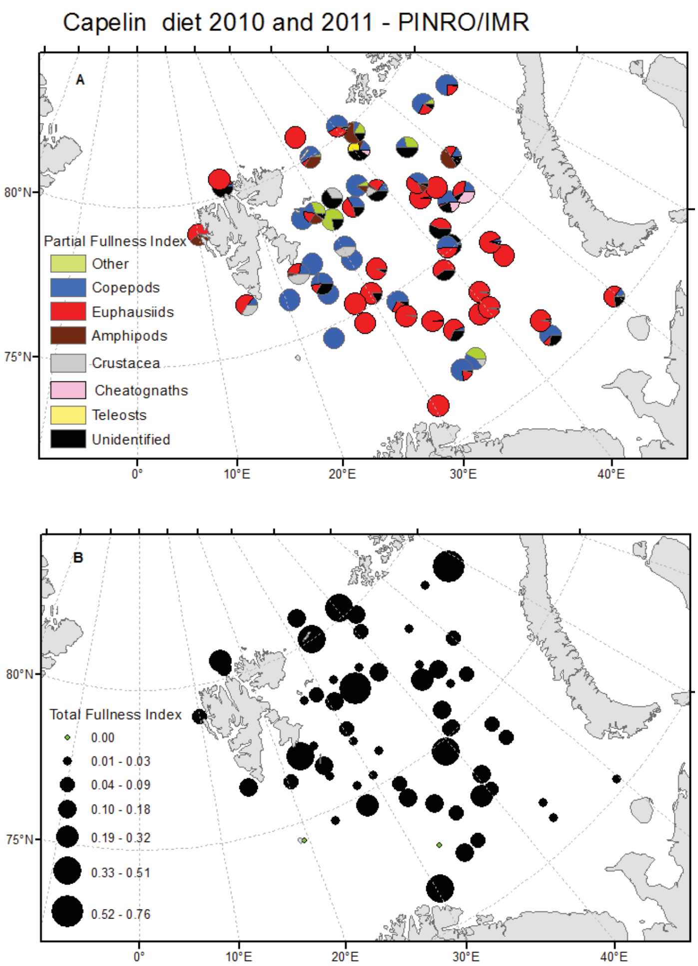


Figure 7.1.2. Distribution of a) Partial Fullness Index and b) Total Fullness Index of capelin in 2010 and 2011 in the Barents Sea.

The diet data from 2005 to 2011 indicate that polar cod mainly feed on amphipods (mainly hyperiids, occasionally gammarids), copepods and euphausiids, and to a lesser degree on other invertebrates. Large polar cod may also prey on fish (Figures 7.1.3 and 7.1.4). The contribution of fish to the diet weight is remarkably large in 2011 compared to previous years.

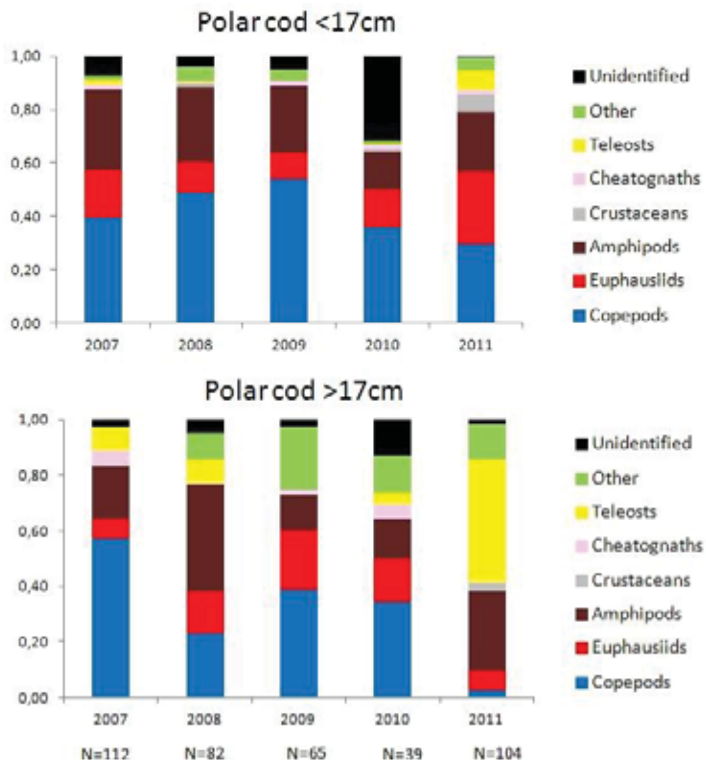


Figure 7.1.3. Inter-annual variation in diet Composition (Partial Fullness Index) of polar cod (above and below 17cm) in the Barents Sea.

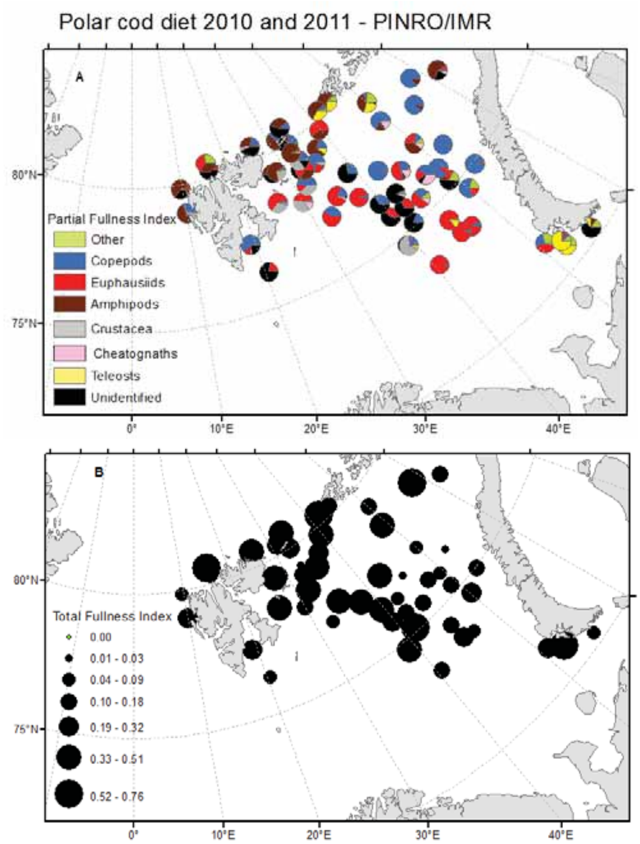


Figure 7.1.4. Distribution of a) Partial Fullness Index and b) Total Fullness Index polar cod in 2010 and 2011 in the Barents Sea.

In general, a short efficient food chain (phytoplankton via *Calanus* or herbivorous krill to capelin). The extent of consumption of carnivorous zooplankton such as hyperiid amphipods and fish in polar cod may lengthen the trophic levels and thus reduce efficiency of energy transfer. The effects of warming and ice free conditions during summer may have impact on the distribution patterns of these two species in the Barents region and hence increase competition for food. In addition, the composition of *in situ* zooplankton may changes if the warming conditions persist. There are evidences already that the biomass of the arctic *Themisto libellula* has decreased during the last decade compared to the 3 preceding and the krill biomass has increased. In this project, we will focus on the climate effects on the trophic interactions between key planktivorous fish and zooplankton in the Barents Sea. We intend to specially focus on northward shifts and overlap in distribution in key predator-prey species, identify main feeding grounds, and explore the degree of diet overlap, and competition for food.

8 Monitoring of biodiversity

8.1 Invertebrate biodiversity

8.1.1 Plankton community

No results available. Take contact with responsible scientific group at IMR and PINRO.

8.1.2 Benthos community

by L. Lindal Jørgensen and P. Lubin

As a part of the Russian – Norwegian benthic expert exchange program, the biodiversity of the benthic fauna and shellfish from the trawl catch was identified down to lowest possible taxon on all the four vessels involved in the ecosystem survey in 2012. The standard bottom trawl (Campelen-trawl) was, as previous years (2005 on ongoing), used on all the vessels to cover the whole Barents Sea.

The spatial benthic biomass (northern shrimp, *Pandalus borealis* excluded) distribution in 2012 was generally the same as in previous years with highest biomass in the south western and north eastern parts the Barents Sea (Figure 8.1.2.1). The biomass varied from 21.4g to 5 tons between trawl hauls (standardised to 15 minutes).

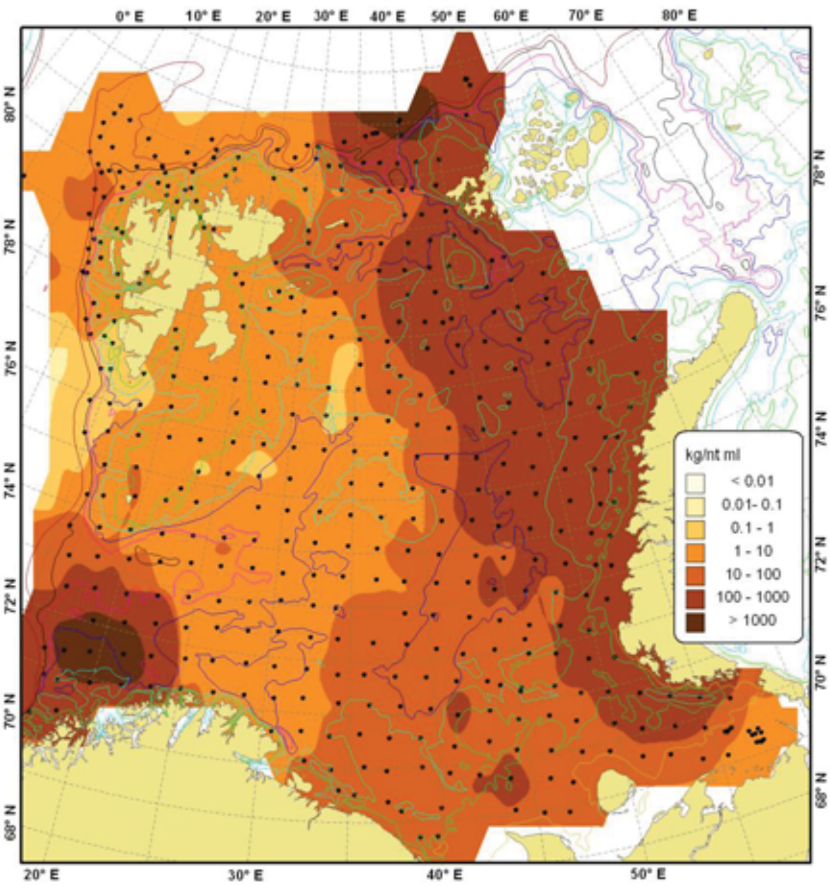


Figure 8.1.2.1. The extrapolated megabenthic biomass (kg/nautical mile) of the Barents Sea for the year 2012.

In the south western part of the Barents Sea (SW= <75°N; <40°E) the trawl catch has usually been dominated in biomass by Porifera (sponges as *Geodia sp, Stelletta sp., Thenea muricata*)

(Fig. 8.1.2.2 and tab 8.1.2.1). Up to 4 tons/15min of the sponge *Geodia* spp was recorded in 2006-2009. These catches were reduced in 2010 and 2011, but increased again in 2012.

In the north western part of the Barents Sea (NW= >75°N; <40°E) the Echinodermata (*Gorgonocephalus* spp, *Ctenodiscus crispatus, Strongylocentrotus pallidus*) was dominating in biomass followed by Mollusca (the sea slug *Buccinidae* g. sp.) and Arthropoda (the snowcrab *Chionoecetes opilio* and *Sabinea septemcarinata*).

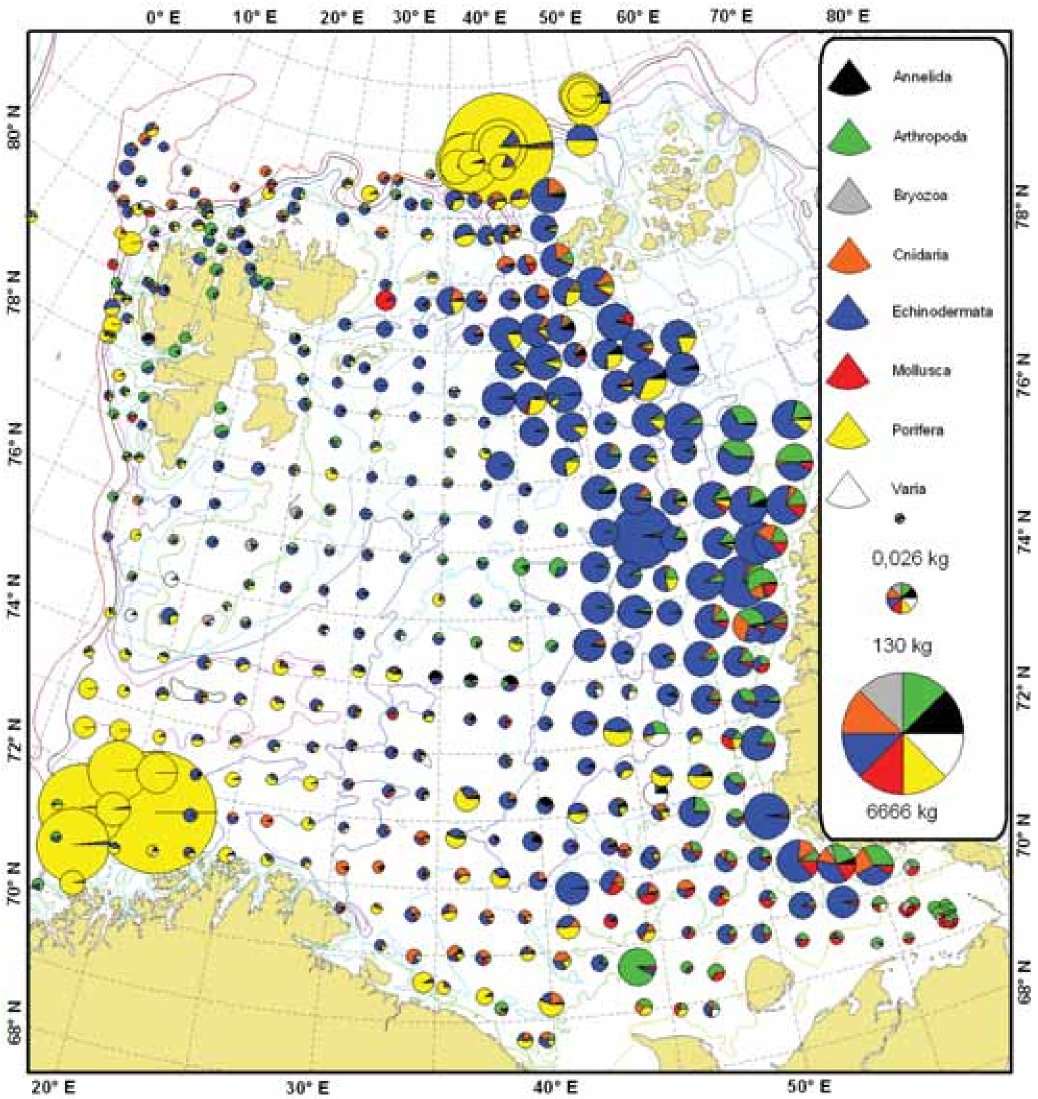


Figure 8.1.2.2. The distribution of invertebrate benthic groups per station. The benthic groups are: Annelida (polychaets), Bryozoa, Coelenterata (cnidarians), Arthropoda (crustaceans), Echinodermata, Mollusca, Porifera (sponges) and Varia.

The south eastern part of the Barents Sea (SE= <75°N; >40°E) was dominated in biomass of Echinodermata (*Strongylocentrotus pallidus, Ctenodiscus crispatus, Urasterias linckii, Ophiacantha bidentata*) followed by Crustacea (*Chionoecetes opilio, Paralithodes camtschaticus, Hyas araneus*) and Cnidaria (Actiniaria g. sp.).

The north eastern part of the Barents Sea (NE= >75°N; >40°E) was dominated in biomass of Echinodermata (*Strongylocentrotus pallidus*, *Ophiopleura borealis*, *Ophiacantha bidentata*, *Ophioscolex glacialis*, *Gorgonocephalus arcticus*, *Molpadia borealis*, and *Heliometra glacialis*), followed by Porifera (*Geodia barrette*).

When comparing the last eight years of benthic biomass in the western Barents Sea, the central and northern part has been steady. But the biomass of the SW part fluctuates due to the temporal varying catches of the *Geodia* sp and other sponges.

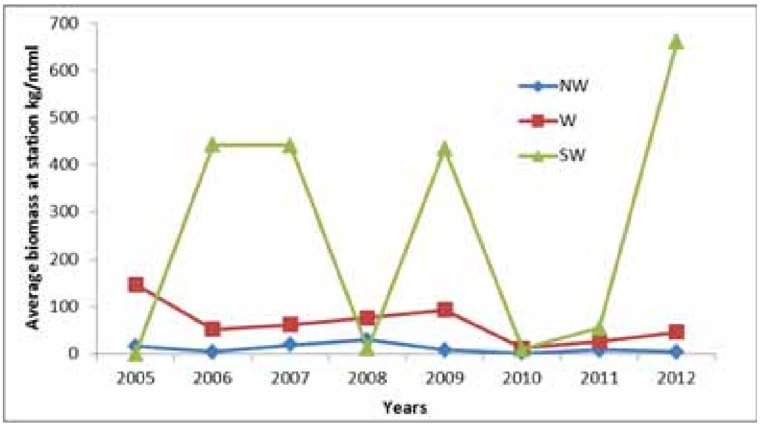


Figure 8.1.2.3. The yearly, averaged biomass in the western part of the Barents Sea. In the eastern part of the Barents Sea the average biomass has been steady from 2005 until 2010. But in 2011 the biomass increased in the NE part, and in 2012 the biomass increased in the other areas to.

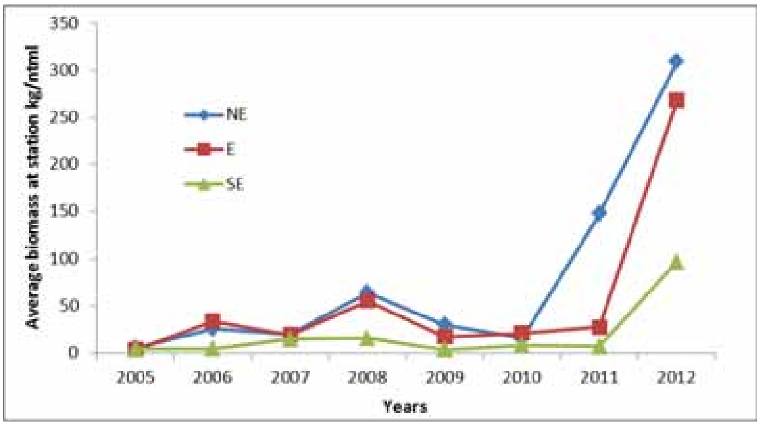


Figure 8.1.2.4. The yearly, averaged biomass in the eastern part of the Barents Sea.

Before any robust conclusion can be made of this large biomass increase in the eastern part, any possible methodical changes (non-standardised Campelen trawling between the research vessels) need to be investigated and clarified.

The number of taxa has, as a consequence of still increasing benthic expertise onboard, increased in many of the Barents Sea areas from 2005 to 2012 (Table 8.1.2.1). The scientific exchange program of benthic expert between Norway and Russia onboard the vessels will be continued in order to increase the knowledge and standardisation of species identification.

The highest species number was per trawl in 2012 was recorded between 72 and 74°Nof the south western area (Figure 8.1.2.5), but also in restricted areas in the northern Barents Sea.

Table 8.1.2.1. Number of taxa per area.

All taxa	2005	2006	2007	2008	2009	2010	2011	2012
C	33	191	163	117	171	169	182	218
E	55	154	168	110	87	105	107	112
N	153	138	112	135	160	186	219	259
NE	52	114	97	126	126	92	108	123
NW	149	170	92	33	293	131	274	395
S	37	202	187	132	146	142	111	163
SE	25	35	164	76	92	91	64	109
StAnna	12		122		134	101	92	
SW		78	107	63	102	49	134	153
W	47	286	206	158	190	155	236	273
Taxa to sp. Level								
C	18	81	62	48	44	36	48	60
E	28	51	52	34	28	27	28	27
N	57	58	51	55	43	47	70	73
NE	28	34	36	39	41	23	31	26
NW	51	45	46	30	59	26	77	109
S	20	64	60	47	44	32	35	46
SE	12	17	53	23	33	29	27	31
StAnna	8		29		41	23	27	
SW		45	48	34	33	13	52	50
W	13	90	87	67	52	32	64	81
Species level								
C	15	110	101	69	127	133	134	158
E	27	103	116	76	59	78	79	85
N	96	80	61	80	117	139	149	186
NE	24	80	61	87	85	69	77	97
NW	98	125	46	3	234	105	197	286
S	17	138	127	85	102	110	76	117
SE	13	18	111	53	59	62	37	78
StAnna	4		93		93	78	65	
SW		33	59	29	69	36	82	103
W	34	196	119	91	138	123	172	192

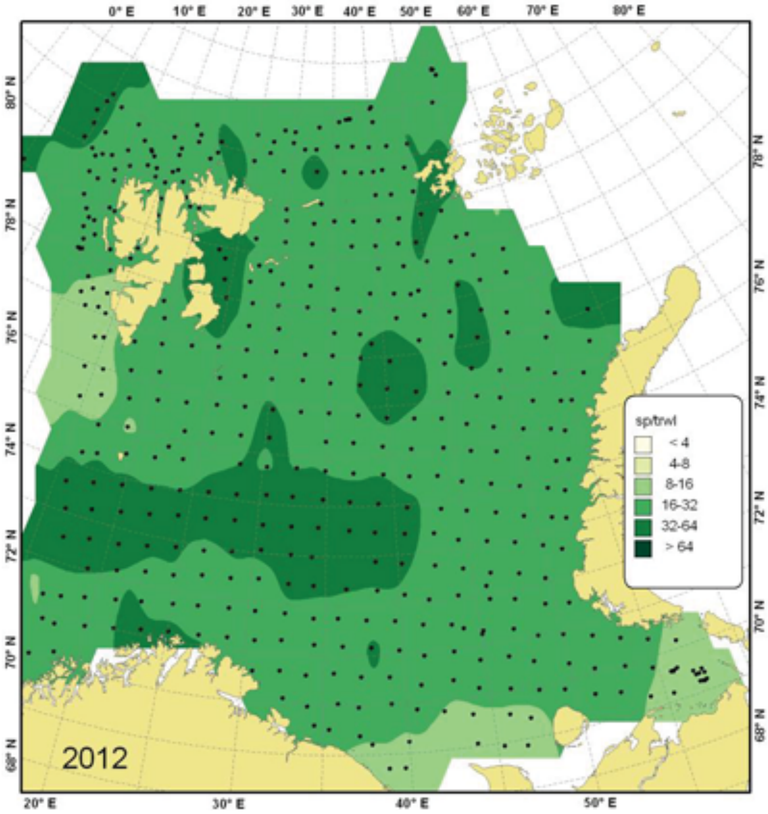


Figure 8.1.2.5. The extrapolated number of species, 2012 in the Barents Sea.

Arctic species are distributed further south in the deeper eastern part of the Barents Sea compared to the western side. The boreal species follows the Atlantic waters and shallow areas of the eastern Barents Sea (Figure 8.1.2.6).

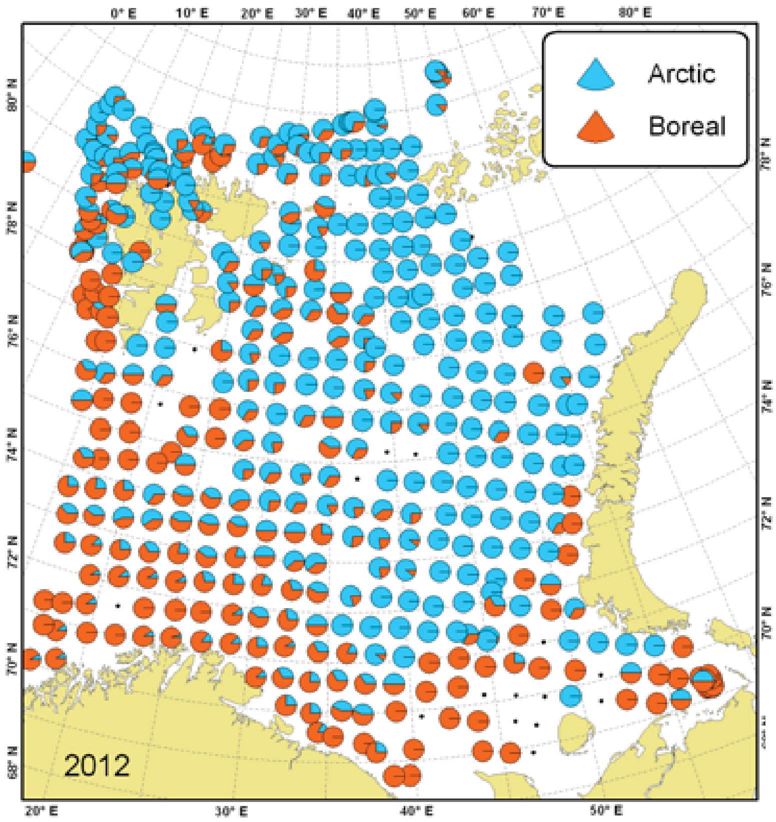


Figure 8.1.2.6. The distribution of the Arctic and the Boreal fauna (Boreal-Arctic fauna not included) per station in 2012.

Comparing the 10 taxa contributing to the largest biomass in the south western part of the Barents Sea (**SW)** for 2010, 2011 and 2012 (the years with benthic experts on all vessels) the sea cucumbers *Parastichopus tremulus* and *Molpadia borealis* entered the top ten, while the king crab *Paralithodes camtschaticus* disappeared (Tab 8.1.2.2). In the south eastern part of the sea (**SE)** the sea cucumber *Cucumaria frondosa* was the primary top rank species in 2010 and 2011, but disappeared in 2012. The snowcrab *Chionoecetes opilio* became more dominant each year, while the king crab *Paralithodes camtschaticus* was low in 2010, disappeared in 2011 and entered the top 10 again in 2012. Sea star *Urasterias linckii* is climbing higher on the top 10 in 2011 and 2012 and *Leptasterias* sp appears in 2012 together with the brittle star *Ophiacantha bidentata* and sea anemones (Actinaria).

In the north western part o the sea (**NW)** the sea lilies *Heliometra glacialis* disappeared from the top 10 after 2012 and *Cucumaria frondosa* became suddenly top ranked (as in the SE) in 2011 while the Ascidian *Microcosmus glacialis* entered the top 10 in 2012. The snow crab climbed from below top 10 in 2010 to top level in 2012.

In the north eastern part of the sea **(NE)** the hydroid *Umbellula encrinus* and sea anemones (Actinaria) disappeared from the top ten after 2010. The octocoral *Gersemia* sp. appeared in 2011 together with the snowcrab. While the snowcrab increased on the top 10 in 2012, the brittle star *Ophioscolex glacialis* entered the top 10 for the first time.

Summary:
The benthic invertebrate biodiversity has been identified down to lowest possible taxon at all stations on all the vessels since 2010. The spatial distribution of the benthic biomass has shown the same pattern as in the 8 previous years with highest biomass in the south west “SW” (but fluctuating between years) and north east “NE” of the Barents Sea. An increase in biomass was recorded in 2011 in NE, and in 2012 it was increased even further, as well as in south east “SE” (but need to be verified toward possible sampling inconsistency).

The SW was dominated in biomass by sponges. The other parts of the sea were dominated by echinoderms, followed by molluscs and crustaceans (NW), crustaceans (SE) and sponges (NE).

The number of taxa might be higher in the west compared to the east (need to be verified). The “front” between arctic and boreal species needs to be identified and temporal followed.
In SW sea cucumbers entered the 10 most dominant taxa from 2010 to 2012 while the king crab disappeared from the top ranked taxa. In SE sea cucumbers dominated in 2010 and 2011, but disappeared in 2012. The snow crab, sea stars and brittle star became increasingly more dominant each year, while the king crab fluctuated between years. In the NW sea lilies disappeared from the top 10 and sea cucumber became top ranked in 2011. The snow crab increasingly dominated from 2011 to 2012. In the NE hydroid and sea anemones disappeared from the top ten while octocoral appeared in 2011 together with the increasing snow crab and brittle star.

Table 8.1.2.2. Biomass top 10 taxa of the south western (SW), north western (NW), the north eastern (NE) and south eastern (SE) parts of the Barents Sea. The southwestern area (SW) are only represented by stations covered by G.O.S., the north western area (NW) covered by Johan Hjort, the norteastern (NE) and southeastern (SE) areas only covered by Vilnus. Blue means species reducing below the top 10, green means incresing.

	SW	**SE**	**NW**	**NE**
2010	*Sabinea septemcarinata*	*Cucumaria frondosa*	*G. arcticus*	*Porifera g. sp.*
	Geodia barretti	*Ciona intestinalis*	*G. eucnemis*	*G. eucnemis*
	Icasterias panopla	*Strongylo. Pallidus*	*Ctenodiscus crispatus*	*G. arcticus*
	Paralit. camtschaticus	*Sabinea septemcarinata*	*Alcyonidium gelatinosum*	*Umbellula encrinus*
	Molpadia borealis	*Balanus sp.*	*Heliometra glacialis*	*Heliometra glacialis*
	Strongylo. Pallidus	*Porifera g. sp.*	*Sabinea septemcarinata*	*Strongylo. Pallidus*
	Hormathia digitata	*Ctenodiscus crispatus*	*Ophiacantha bidentata*	*Anthozoa g. sp.*
	Gorgonocephalus arcticus	*Gorgonocephalus arcticus*	*Urasterias linckii*	*Ophiopleura borealis*
	Ctenodiscus crispatus	*Chionoecetes opilio*	*Molpadia arctica*	*Ophiacantha bidentata*
	Geodia macandrewii	*Paralit. camtschaticus*	*Icasterias panopla*	*Bryozoa g. sp.*
2011	*Geodia macandrewii*	*Cucumaria frondosa*	*Cucumaria frondosa*	*Porifera g. sp.*
	Geodia barretti	*Strongylo. pallidus*	*Gorgonocephalus arcticus*	*Ophiacantha bidentata*
	Molpadia borealis	*Chlamys islandica*	*G. eucnemis*	*G. arcticus*
	Porifera g. sp.	*Sabinea septemcarinata*	*Sabinea septemcarinata*	*Ophiopleura borealis*
	Thenea muricata	*Porifera g. sp.*	*Ctenodiscus crispatus*	*Bryozoa g. sp.*
	Ctenodiscus crispatus	*Chionoecetes opilio*	*Chionoecetes opilio*	*Molpadia borealis*
	Strongylo. Pallidus	*Hyas araneus*	*Porifera g. sp.*	*Ophioscolex glacialis*
	Sabinea septemcarinata	*Spiochaetopterus typicus*	*Strongylo. pallidus*	*Strongylo. Pallidus*
	Parastichopus tremulus	*Ctenodiscus crispatus*	*Alcyonidium sp.*	*Gersemia sp.*
	Ciona intestinalis	*Urasterias linckii*	*Alcyonidium gelatinosum*	*Chionoecetes opilio*
2012	*Geodia macandrewii*	*Strongylo. pallidus*	*Gorgonocephalus arcticus*	*Geodia barretti*
	Geodia barretti	*Ctenodiscus crispatus*	*Buccinidae g. sp.*	*Porifera g. sp.*
	Stelletta sp.	*Chionoecetes opilio*	*G. eucnemis*	*Strongylo. Pallidus*
	Porifera g. sp.	*Urasterias linckii*	*Chionoecetes opilio*	*Ophiopleura borealis*
	Thenea muricata	*Ophiacantha bidentata*	*Microcosmus glacialis*	*Molpadia borealis*
	Parastichopus tremulus	*P. camtschaticus*	*Sabinea septemcarinata*	*G. arcticus*
	Munida bamffica	*Actiniaria g. sp.*	*Ctenodiscus crispatus*	*Ophiacantha bidentata*
	Geodia atlantica	*Leptasterias sp.*	*Strongylo. pallidus*	*Chionoecetes opilio*
	Ctenodiscus crispatus	*Hyas araneus*	*Alcyonidium gelatinosum*	*Ophioscolex glacialis*
	Molpadia borealis	*Porifera g. sp.*	*Buccinum hydrophanum*	*Heliometra glacialis*

8.2 Fish biodiversity

by E. Eriksen and T. Prokhorova
Figures by P. Krivosheya and E.Eriksen

8.2.1 Small non-target fish species

Despite the distribution and biology of the non-commercial fish species of the Barents Sea and their role in the ecosystem being investigated since mid-1990s (e.g. Dolgov, 1995; Wienerrother et al., 2011 etc), their abundance and biomass is largely unknown. Eriksen et al. (2012) calculated abundance and biomass of pelagically distributed juveniles of fish species from the families Agonidae, Ammodytidae, Cottidae, Liparidae, Myctophidae and Stichaeidae (called "small fishes" here) for the period 1980-2009. Table 8.2.1.1. reports abundance/biomass indices for the period 1980-2012. In 2012 the total biomass of small fishes (representing the juveniles from these families) was almost 2 times higher than the long term mean and was approximately 43 thousand tonnes. The average biomass of 0-group fish of the most abundant species (1993-2012) was 1.4 million tonnes, so the small fishes were only 3% of the most abundant 0-group fish. However, small fishes can be locally important in some areas like Svalbard/Spitsbergen or southeastern Barents Sea.

Agonidae were mostly represented by *Leptagonus decagonus*. *L. decagonus* were most abundant and widely distributed in the Barents Sea among other small non-commercial species. During the period 2009-2012 the abundance and biomass of agonids decreased, and were lower than the long term mean in 2011 and 2012. Agonids were found occurred around Svalbard/Spitsbergen and in the northern parts of the Barents Sea in 2012 (Figure 8.2.1.1).

Table 8.2.1.1. Abundance indices (AI) (in millions) and biomass (B) (in tonnes) of pelagically distributed juveniles from families Agonidae, Ammotydae, Liparidae, Cottidae, Myctophidae and Stichaeidae. LTM means long term mean for the period 1980-2012.

Year	***Agonidae***		***Ammodytidae***		***Cottidae***		***Liparidae***		***Myctophidae***		***Stichaeidae***		**Total biomass**
	AIc	B	AIc	B	AIc	B	AIc	B	AIc	B	AIc	B	
1980	758	227	133169	66584	1640	492	1216	426	521	234	4180	2090	70053
1981	855	256	202	101	535	160	521	182	30	14	3482	1741	2455
1982	1048	314	56872	28436	154	46	290	101	8	3	0	0	28902
1983	276	83	24049	12024	762	229	151	53	430	194	39	20	12602
1984	199	60	4030	2015	1337	401	61	21	595	268	4	2	2768
1985	456	137	1733	866	1515	454	697	244	70	32	4576	2288	4022
1986	652	196	51172	25586	1824	547	380	133	77	35	1	0	26497
1987	339	102	103686	51843	1142	343	139	49	153	69	0	0	52405
1988	341	102	39482	19741	3248	974	345	121	1236	556	3877	1939	23433
1989	145	43	48330	24165	14980	4494	471	165	683	307	1878	939	30114
1990	226	68	10819	5409	938	281	1	0	14	6	6193	3096	8862
1991	888	266	8766	4383	17992	5398	2115	740	31	14	10262	5131	15933
1992	425	128	6833	3417	1155	346	178	62	1367	615	3276	1638	6206
1993	58	17	17607	8803	415	125	77	27	7679	3456	1	0	12428
1994	3224	967	165192	82596	18171	5451	55	19	66	30	0	0	89064
1995	188	57	22560	11280	432	130	8	3	1	1	15	8	11477
1996	585	176	40791	20395	1606	482	179	63	1372	617	0	0	21733
1997	178	53	18652	9326	1611	483	1008	353	52	24	11460	5730	15969
1998	564	169	2283	1141	2336	701	778	272	69	31	8707	4354	6668
1999	1794	538	8877	4439	12859	3858	4582	1604	2	1	5312	2656	13095
2000	1671	501	43244	21622	5077	1523	2426	849	1094	492	10036	5018	30007
2001	410	123	6316	3158	1161	348	598	209	767	345	4740	2370	6554
2002	98	29	16180	8090	265	79	330	115	85	38	0	0	8352
2003	150	45	3048	1524	8389	2517	45	16	10	5	278	139	4245
2004	804	241	21472	10736	1127	338	1023	358	0	0	378	189	11862
2005	1823	547	75874	37937	2458	738	19304	6756	209	94	2984	1492	47564
2006	2183	655	110823	55411	465	139	10096	3533	159	72	5995	2997	62808
2007	1237	371	4158	2079	2073	622	423	148	123	55	1430	715	3991
2008	548	164	886	443	48	14	122	43	338	152	1823	912	1728
2009	1787	536	53719	26859	16580	4974	5079	1778	2165	974	23012	11506	46627
2010	1267	380	3603	1802	611	183	1059	371	177	80	21951	10976	13791
2011	749	225	9222	4611	305	92	4690	1642	135	61	21135	10567	17197
2012	745	224	43503	21752	1055	317	4680	1638	585	263	38340	19170	43363
LTM	**808**	**243**	**35065**	**17533**	**3766**	**1130**	**1913**	**670**	**615**	**277**	**5920**	**2960**	**22811**

Ammodytidae were mostly represented by *Ammodytes marinus*. Since 2010, Ammodytidae has increased in abundance and biomass, and were above long term mean in 2012. *A. marinus* biomass was as high as 22 thousand tonnes, which is almost half of the total biomass of all small non-commercial fishes. This increase in the biomass of *A. marinus* may partially be explained by the increase in temperature in the bottom and pelagic layers. *A. marinus* were observed over the larger area in 2012, however the highest concentrations were found in the core area, in the south east (Figure 8.2.1.1).

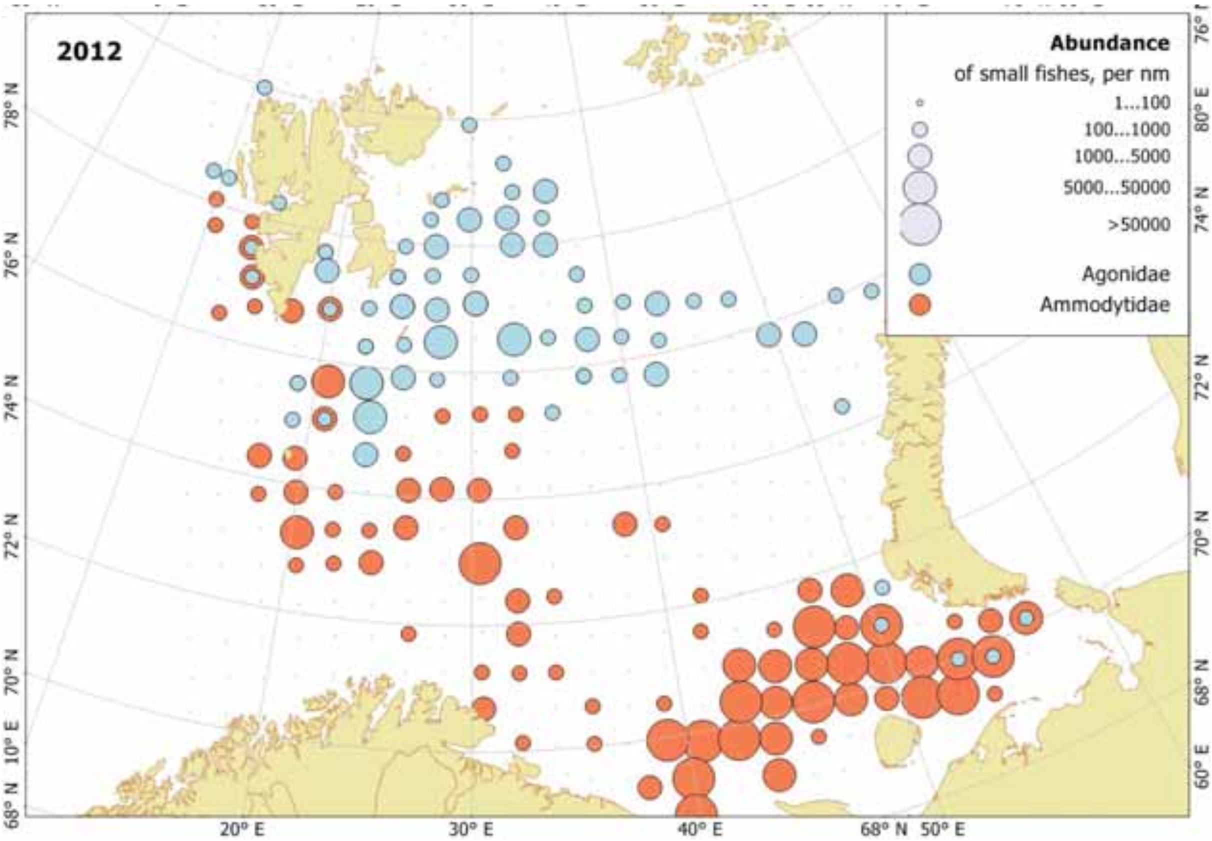


Figure 8.2.1.1. Distribution of *Agonidae and Ammodytidae*, August-September 2012.

Stichaeidae included *Lumpenus lampraetaeformis*, *Leptoclinus maculatus* and *Anisarhus medius*, while *Lumpenus fabricii* is rare in the Barents Sea (Figure 8.2.1.2). Therefore the total biomass only presented for the first three species (Table 8.2.1.1). Biomass/abundance of pelagically distributed stichaeids was record high in 2012, and was 6 times above the long term mean.

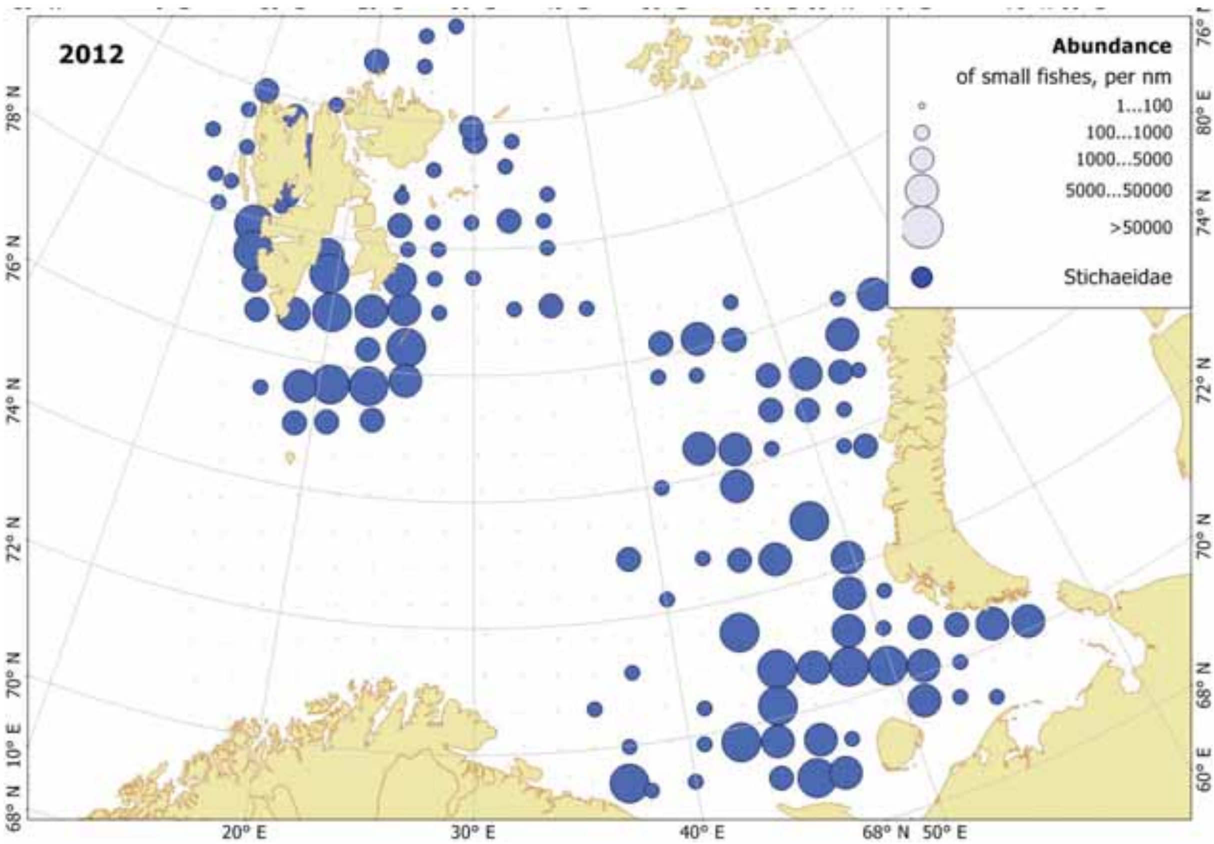


Figure 8.2.1.2. Distribution of *Stichaeidae*, August-September 2012.

Cottidae were represented by *Myoxocephalus scorpius*, *Triglops nybelini*, *Triglops pingelii* and *Triglops murrayi*. The abundance and biomass of observed species increased from 2010 (Table 8.2.1.1). However, in 2012 abundance and biomass of cottids were 3 times below the long term mean. Cottids were found around the Svalbard/Spitsbergen and south to Bear Island, and also along the northern Norwegian coast and south for Novaya Zemlya in 2012 (Figure 8.2.1.3).

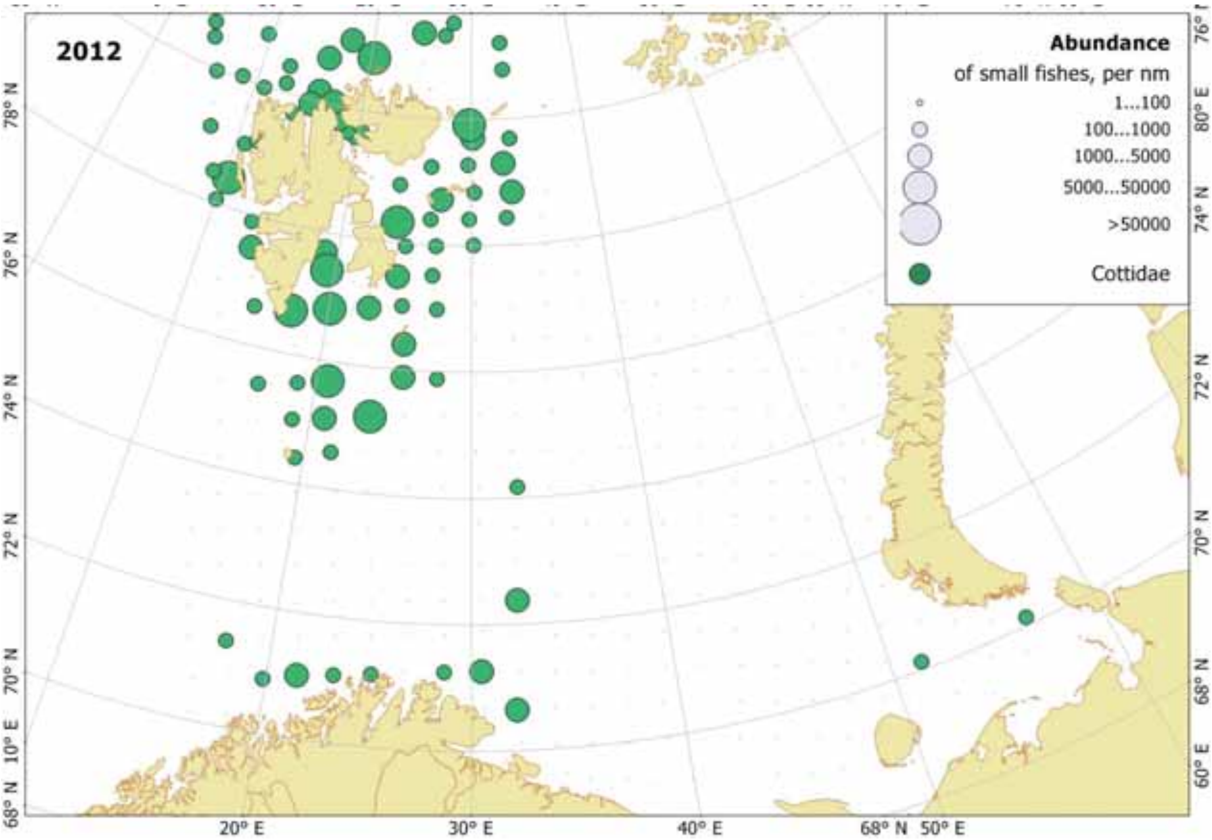


Figure 8.2.1.3. Distribution of *Cottidae*, August-September 2012.

Liparidae were represented by *Liparis fabricii* and *Liparis bathyarcticus* and distributed east and west for Svalbard/Spitsbergen (Figure 8.2.1.4). Biomasses and abundance of pelagically distributed liparids were high in 2011 and 2012, and were approximately 1.6 thousand tonnes in the Barents Sea.

Myctophidae are represented by *Benthosema glaciale*, and was observed south of Svalbard/Spitsbergen, and some catches were observed in the western, southern and eastern areas (Figure 8.2.1.4). Biomass and abundance of pelagically distributed myctophids in 2012 was higher than in 2010 and 2011 and was at avarege level (Table 8.2.1.1).

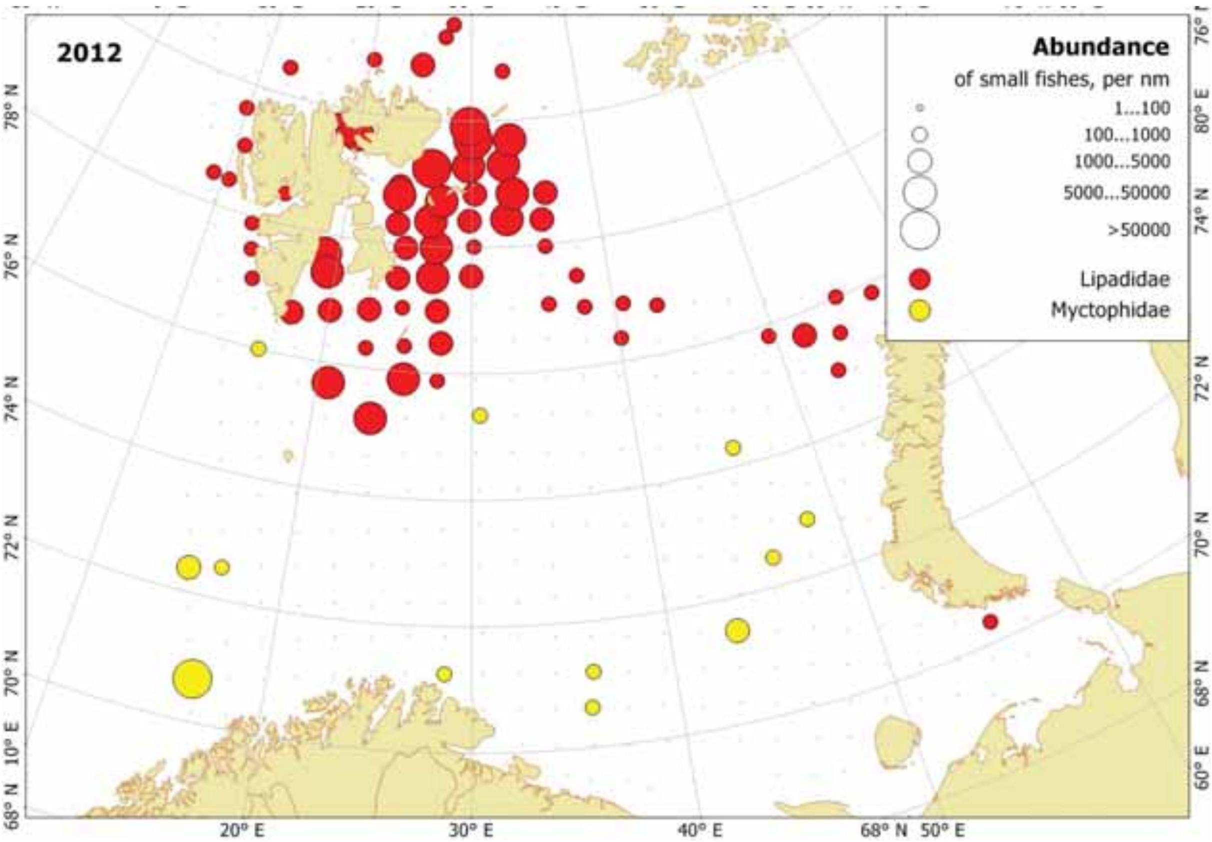


Figure 8.2.1.4. Distribution of *Liparidae, Cottidae and Myctophidae*, August-September 2012.

8.2.2 Species- indicators

The thorny skate (*Amblyraja radiata*) and Arctic skate (*Amblyraja hyperborea*) were chosen as indicator species to study how fishes belonging to different zoogeographic groups, respond to changes of their environment. Thorny skate belongs to the boreal zoogeographic group and is widely distributed in the Barents Sea excluding the most north-eastern areas, while Arctic skate belongs to the arctic zoogeographic group and is distributed in the coldwater northern area.

In 2012 the thorny skate were quite widely distributed, except in the north-eastern areas of the Barents Sea, similar to 2011. Thorny skate occupied large areas from the south-east to the west and north of the Svalbard/Spitsbergen (Figure 8.2.2.1). The catches of the thorny skate were similar to last year, with an average of 3.5 kg per nm. Catches in the south-eastern area were much higher than in previous years, probably partially due to higher near-bottom temperatures. Forty three percent of all catches were high and were observed in the area with a depth of 50 m - 150 m. Total biomass of the thorny skate was estimated at 52.6 thousand tonnes and abundance at 88 million individuals.

In 2012 Arctic skate were distributed in the north-western and central areas (Figure 8.2.2.1). Most catches (70 %) were taken in deep-water areas 200-400 m in depth. The highest concentrations were observed near the Svalbard/Spitsbergen and in the northern Barents Sea. In 2012 the total abundance was 6 million individuals with a biomass of 7.9 thousand tonnes, which is slightly higher than last year.

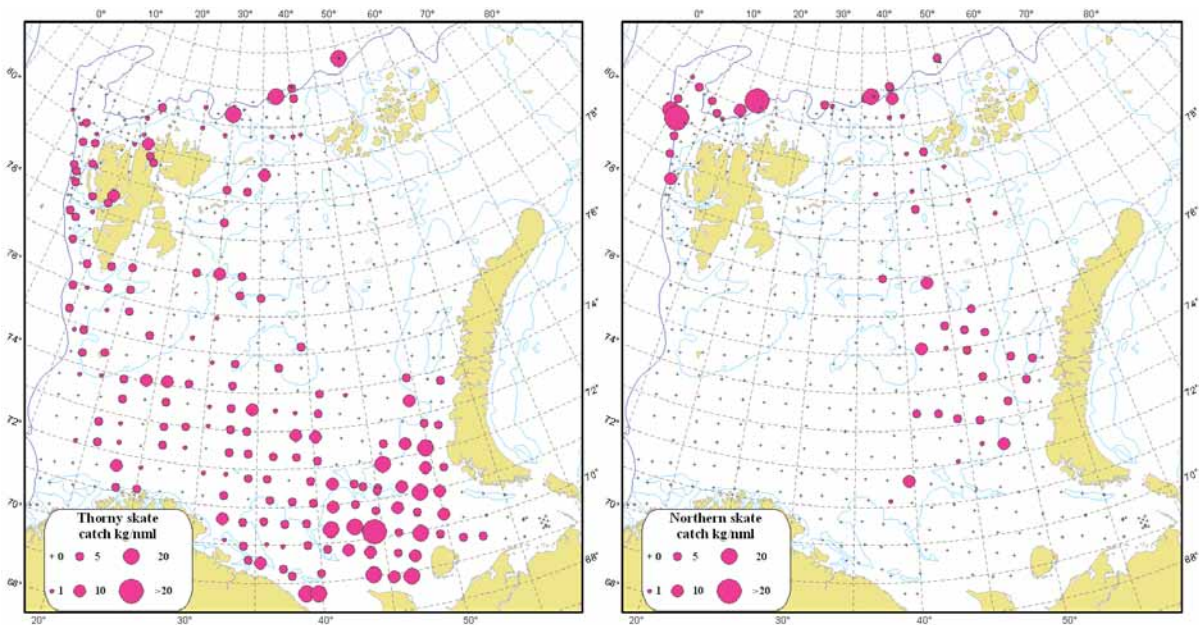


Figure 8.2.2.1. Distribution of thorny skate (*Amblyraja radiata*) and Arctic skate *Amblyraja hyperborean*, August-September 2012.

Ecosystem survey have been started in 2004, and this year northern border of thorny skate and southern border of Arctic skate distribution were located more south. While in 2012, year with highest temperatures anomalies at the bottom, the borders of these species distribution shifted east and northwards (Figure 8.2.2.2)

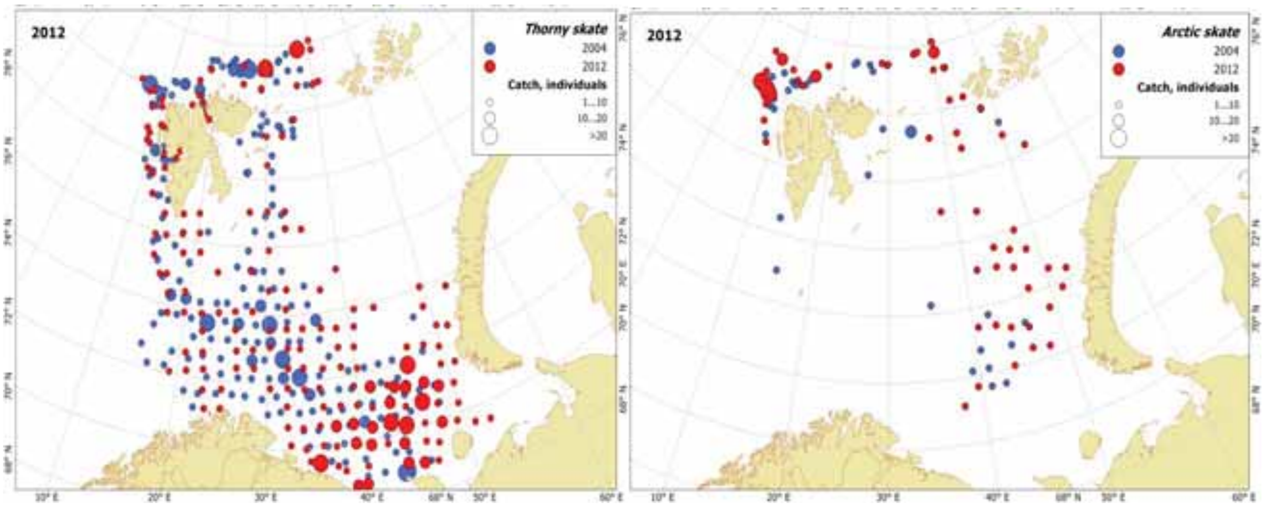


Figure 8.2.2.2. Distribution of thorny skate (*Amblyraja radiata*) and Arctic skate (*Amblyraja hyperborean)*, August-September 2004 (blue circle) and 2012 red circle)

8.2.3 Bio-geographic groups

During the 2012 ecosystem survey 99 fish species were recorded from 27 families, and 12 species were identified up to the higher, family, level (Appendix 2). All recorded species belong to the 3 zoogeographic groups: boreal, arctic and arcto-boreal.

Boreal species (eg Lesser sandeel *Ammodytes marinus*, Greater argentine *Argentina silus* and Vahl's eelpout *Lycodes gracilis*), are distributed over a large area and prefer the warm Atlantic waters. In 2012 higher temperature anomalies were observed near the bottom throughout the Barents Sea. This may probably partially explain an even wider distribution of this species (Figure 8.2.3.1). Catches of the boreal species did not exceed 3.2 thousand individuals per nautical mile.

In the cold Arctic waters in the north arctic species (eg Gelatinous snailfish *Liparis fabricii*, Halvnaken eelpout *Lycodes seminudus*, and Bigeye sculpin *Triglops nybelini*) observed and in the cold of Novaya Zemlja coastal waters in the southwest were Atlantic navaga *Eleginus nawaga*) were observed. Some arctic species were also caught in the warm Atlantic water (eg species of Genus *Cottunculus*). Catches of the Arctic species reached 8.1 thousand individuals per nautical mile. Species of the arctic group dominated in terms of the number caught per station both in the north (eg Bigeye sculpin *Liparis fabricii*, Bigeye sculpin *Triglops nybelini*) as well as in the northeast (eg Atlantic navaga *Eleginus nawaga*) (Figure 8.2.3.1).

Arcto-boreal species, like Atlantic poacher *Leptagonus decagonus* and Ribbed sculpin *Triglops pingelli* were observed over a large areas from the northern area, governed by colder waters, but also in the central and eastern areas, governed by mixed waters. Catches of the arcto-boreal species were not higher than 1.1 thousand individuals per nautical miles (Figure 8.2.3.1).

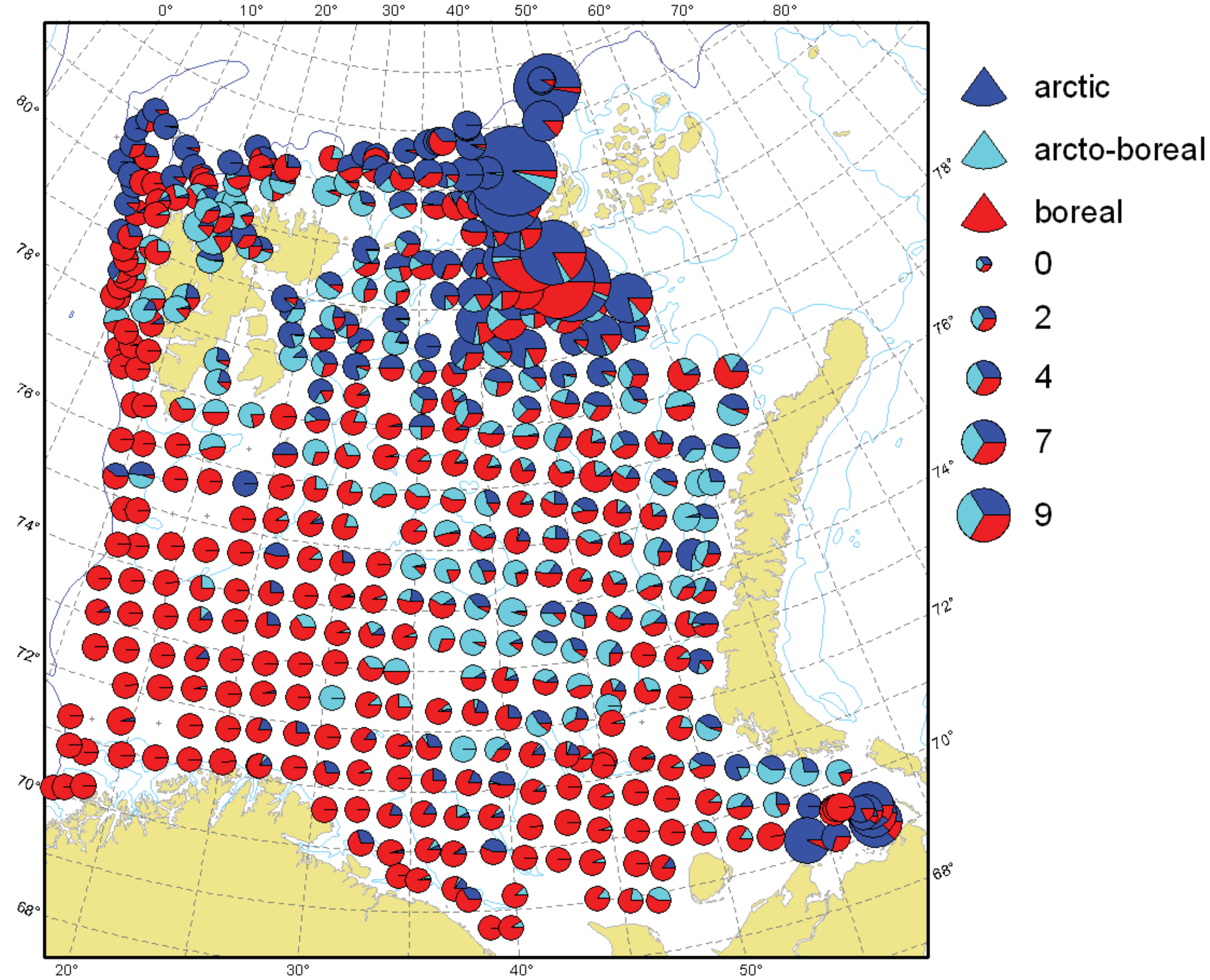


Figure 8.2.3.1. Bio-geographic fish groups distribution of non-commercial species during the ecosystem survey in 2012. Size of circle corresponds to thousand individuals per nautical miles.

8.2.4 Rare fish species

Several rare species were observed in the Barents Sea during the ecosystem survey in 2012 (Figure 8.2.4.1). Since these species were found at the border of the survey area, they may belong to other ecosystems bordering the Barents Sea. Thus the Barents Sea might serve as a border for the distribution range for these species. In particular, a north-easterly distribution for roughhead grenadier was observed, which extended as far as 82°03’N 40°23’E.

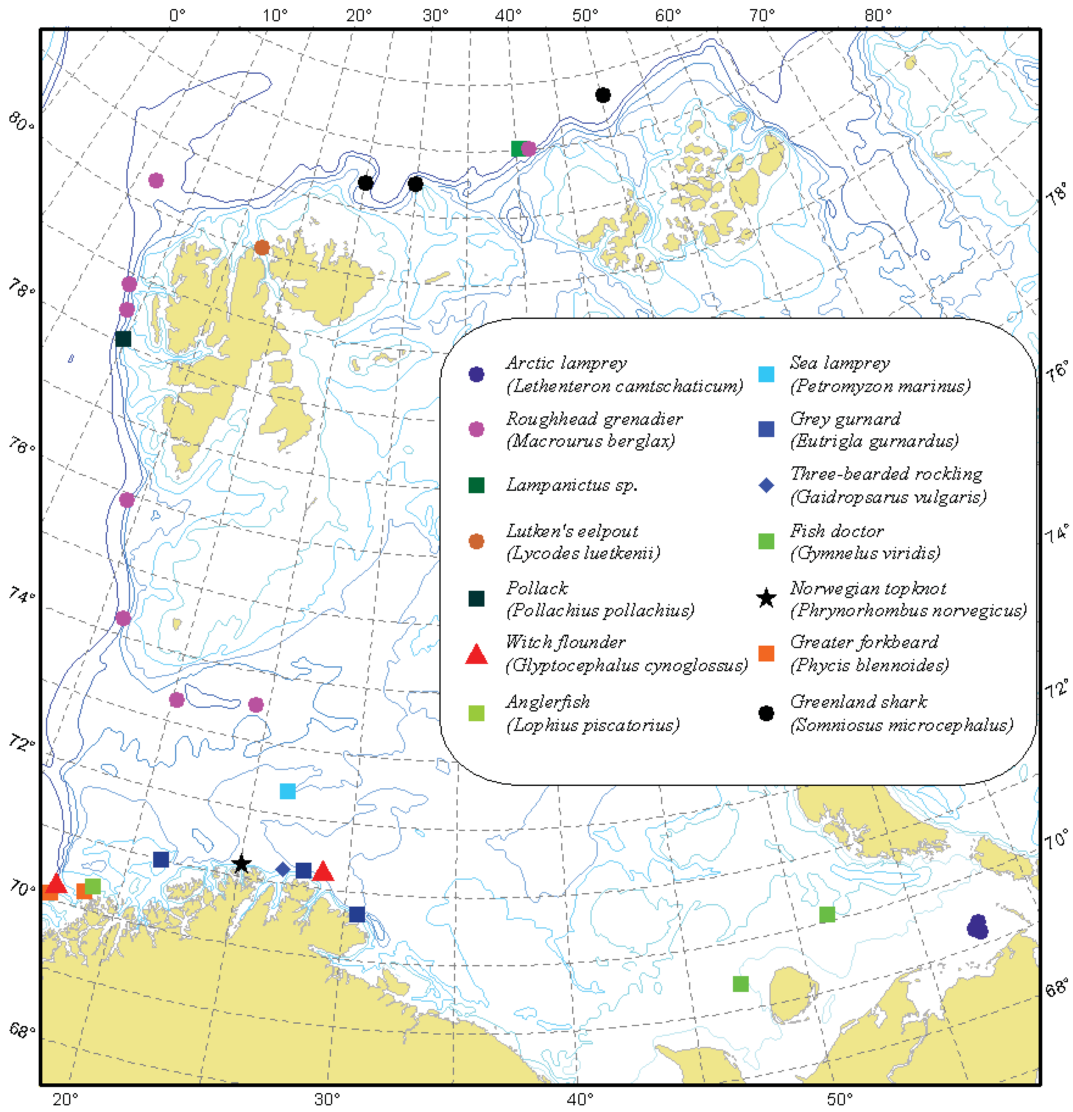


Figure 8.2.4.1. Distribution of some rare fish in the survey area in the 2012.

9 Marine mammals and seabird monitoring

9.1 Marine mammals

by Klepikosky R., Zabavnikon V. and Skern-Mauritzen M.

Marine mammals observations (species and numbers observed) were recorded onboard the Norwegian research vessels "Johan Hjort", "Helmer Hanssen", "G.O. Sars", and the Russian research vessel "Vilnyus".

In total 1591 individuals of 10 identified species of marine mammals were observed in August-September 2012. The results of observations are presented in Table 9.1.1 and Figures 9.1.1-9.1.3.

Like in previous years, the most often observed species was white-beaked dolphin (about 45% of all registrations). The white-beaked dolphins inhabited frontal areas, and some of the dolphins were observed with capelin concentrations, between 74º-78ºN. Individual groups of white-beaked dolphins were registered in the southern coastal areas and to the North-West from Spitsbergen up to 81ºN. However, no white-beaked dolphins were observed in the deeper, southwestern part of the system, inhabited by the dolphins in earlier years (2003-2007).

Besides white-beaked dolphins, toothed whales were presented by harbour porpoises and sperm whales. The sperm whales were recorded in the western part of the Barents Sea along the shelf edge. Three registrations of sperm whales were made on the eastern slope of Bear Island Bank. Small groups of harbour porpoises were observed in the southern and the eastern parts up to 73ºN. The groups of killer whales which were usually observed in previous years in the Barents Sea weren't registered this year.

Among the baleen whales, minke whales, humpback whales and finwales were most frequently observed (about 19% of all observations). There was a lower number of minke whales comparing to previous two years. These whales were generally registered in the north-western and the north-eastern areas, and more rarely in the central and the south-eastern parts of the Barents Sea. In the south-eastern part minke whales were registered with the concentrations of herring, polar cod, sand eel and different young fish. Also, while large concentrations were seen in the northern Barents Sea in previous years, no such large, northern, concentrations of humpback whales were seen this year. Humpback whales were observed both in the southern areas to the northern Barents Sea up to 81º49'N. Fin whales were registered mainly in the western part of the Barents Sea with the largest concentration near Spitsbergen. Only one blue whale was observed not far from the western shore of Spitsbergen.

Among the pinnipeds harp seals, bearded seals and walruses were observed during ecosystem survey. Harp seals were recorded mainly in the north-western part of the research area, north of 81ºN. In the Barents Sea these seals were observed only in the area of Great Bank.

Walruses were single animals registered to the North-West and to the North of Spitsbergen and Franz-Josef Land. Bearded seals were observed near Bear Island.

While the ecosystem survey provide good data on marine mammal distributions within the open water pelagic areas, the ice edge areas, which is an important habitat to marine mammals, is not covered. In these areas, the survey quality and effectiveness will be better if it is carried out airborne observations, as was the practice the first years of the ecosystem surveys (2001-2005). Here was used Russian research aircraft. This reason it will good solution if aerial surveys will continue as part of annual joint Russian-Norwegian ecosystem research.

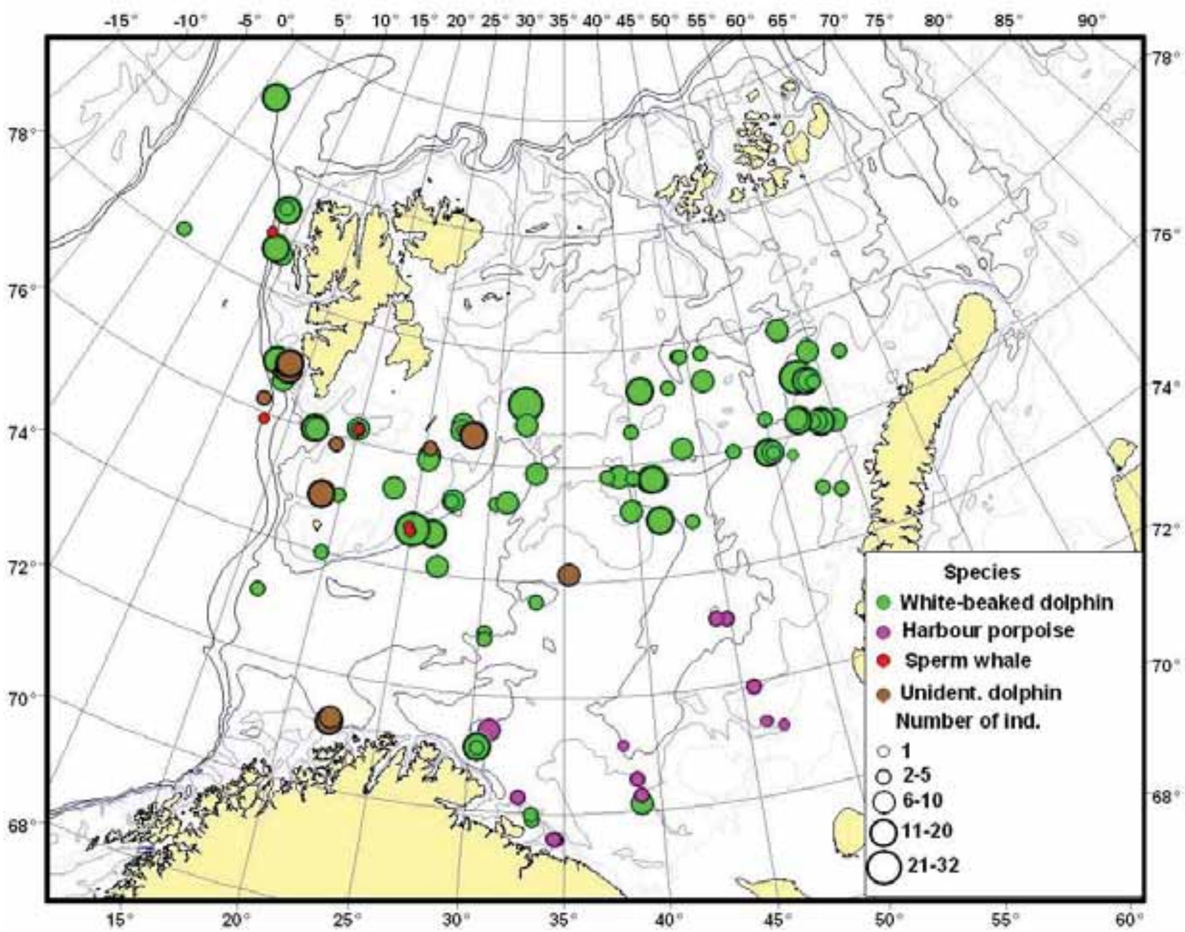


Figure 9.1.1. Distribution of toothed whales observed in August-September 2012.

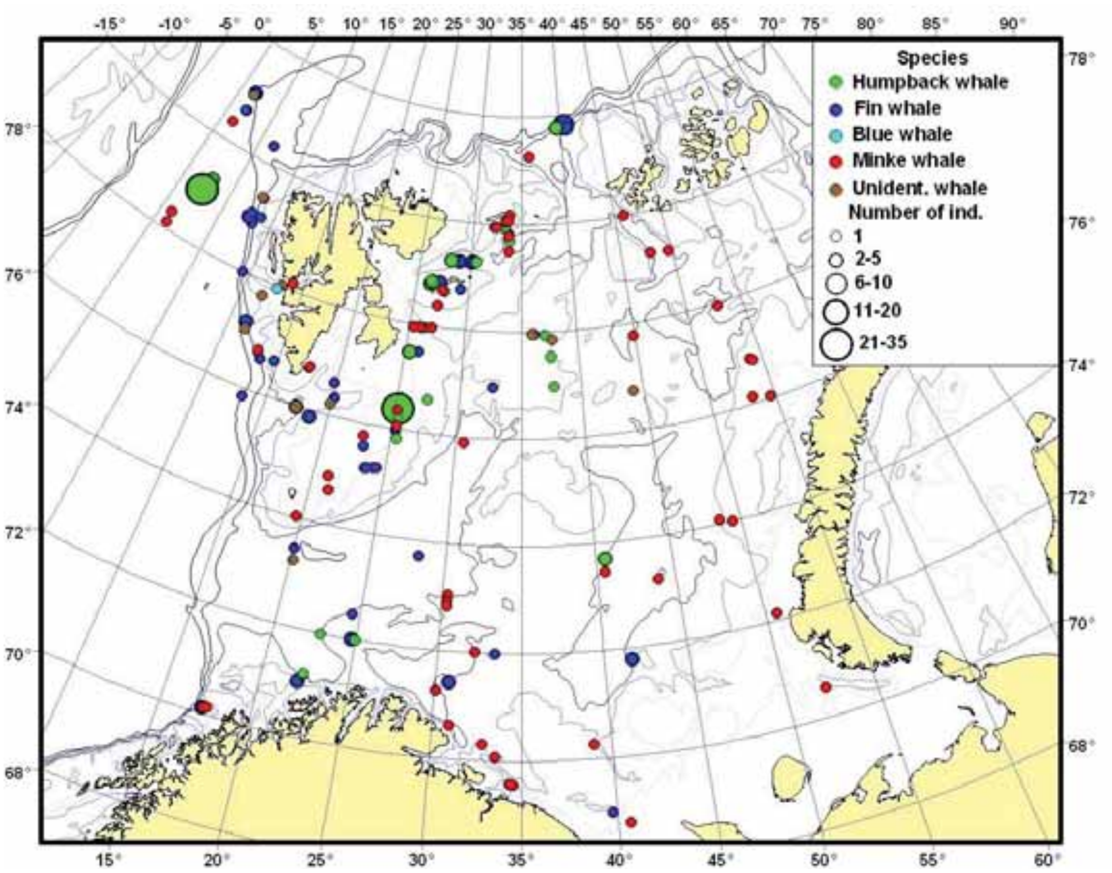


Figure 9.1.2. Distribution of baleen whales observed in August-September 2012.

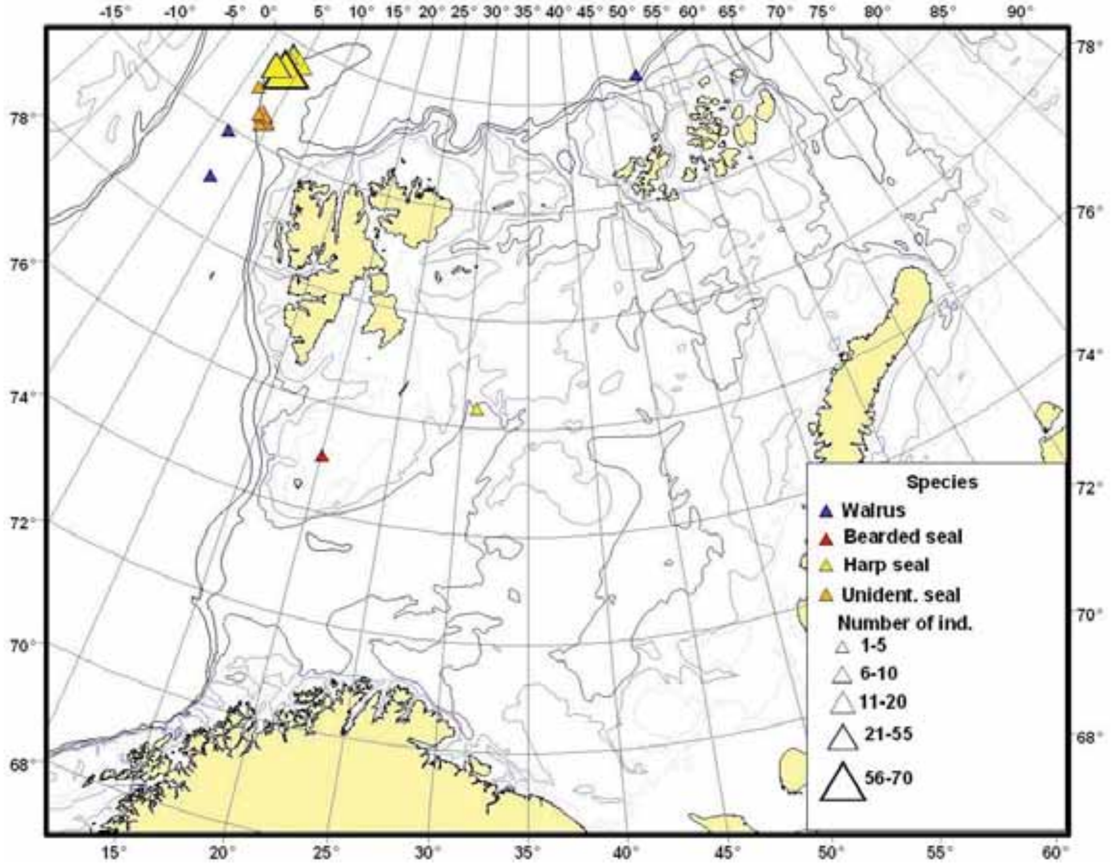


Figure 9.1.3. Distribution pinnipeds observed in August-September 2012.

10 Special investigations

10.1 Acoustic monitoring of zooplankton (abundance and distribution)

by Gavin John Macaulay

10.1.1 Aim of investigations

The overall aim of this special investigation was to develop methods and procedures for the routine estimation of zooplankton abundance and distribution in Norwegian waters using acoustic techniques, with an initial focus on the Barents Sea. The particular objectives for the 2012 ecosystem survey were:

- to collect multi-frequency echosounder data
- to carry out targeted identification trawls on zooplankton marks
- to collect MS70 sonar data in three defined areas

The multi-frequency acoustic data and targeted trawls will be used to estimate zooplankton abundance and distribution for the Barents Sea via a conventional echo-integration analysis. The MS70 sonar data will be used to estimate the sampling efficiency of the echosounder data by comparing numbers and spatial densities of zooplankton aggregations observed by the echosounder and MS70 in three areas (shallow western, deeper region associated with Atlantic inflow, and an eastern area).

10.1.2 Equipment

The equipment used in this investigation was:

- Simrad EK60 multi-frequency echosounders
- Simrad MS70 3D sonar
- Krill trawl
- MOCNESS
- Harstad trawl

10.1.3 Procedure

Standard echo-integration techniques will be used to analyse the acoustic data using LSSS. Trawl catches will be used to broadly partition the zooplankton marks into species groups. The PROMUS software will be used to analyse the MS70 data to yield estimates of zooplankton school size and distribution.

10.1.4 Data & Results

Multi-frequency echosounder data was collected for the entire ecosystem survey area. MS70 data was collected in the three desired areas (Figure 10.1.4.1). Thirteen non-targeted MOCNESS tows, eleven non-targeted krill trawls, and 328 Harstad trawls were carried out, which will be used to assist with acoustic categorisation.

Analysis of the data has not begun. It is expected that estimates of zooplankton abundance and distribution will be available at the end of March 2013.

10.1.5 Plans for future surveys

We wish to repeat the work in 2013 to continue to develop the method and to start a time-series of zooplankton abundance and distribution using acoustic techniques. A significant improvement in future surveys would be to carry out targeted trawls on zooplankton marks. The further development of semi-automated zooplankton classification methods would make the analysis more efficient and reliable.

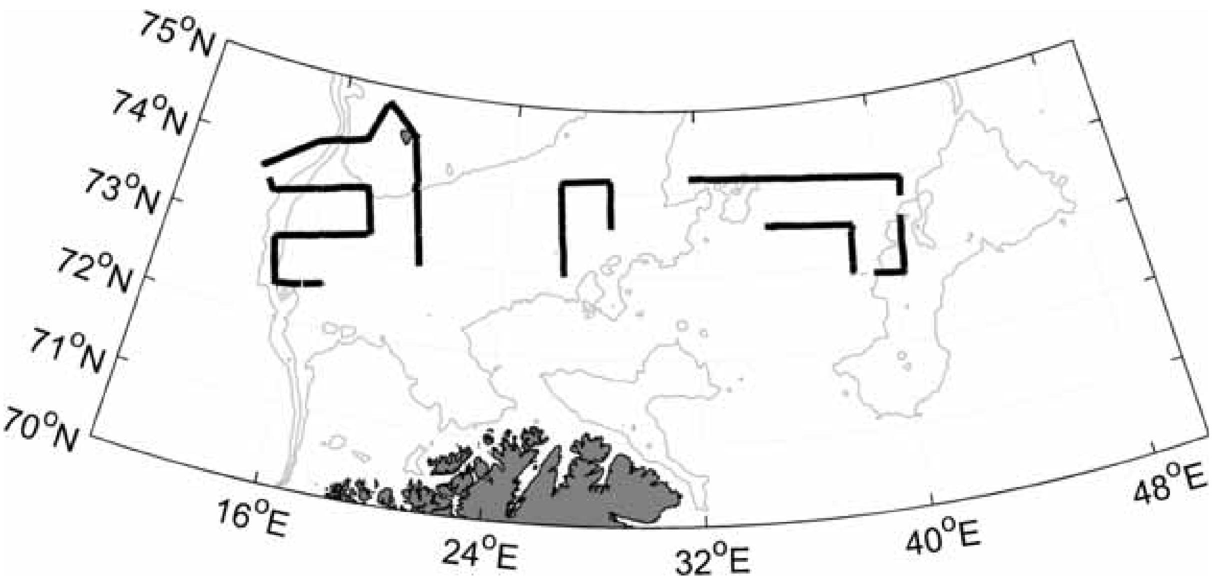


Figure 10.1.4.1. The vessel track lines where MS70 acoustic data were collected.

10.2 Arctic and boreal benthic process and function (ArcProFun) and Deep Sea Vision

by Lis Jørgensen and S. Rosen

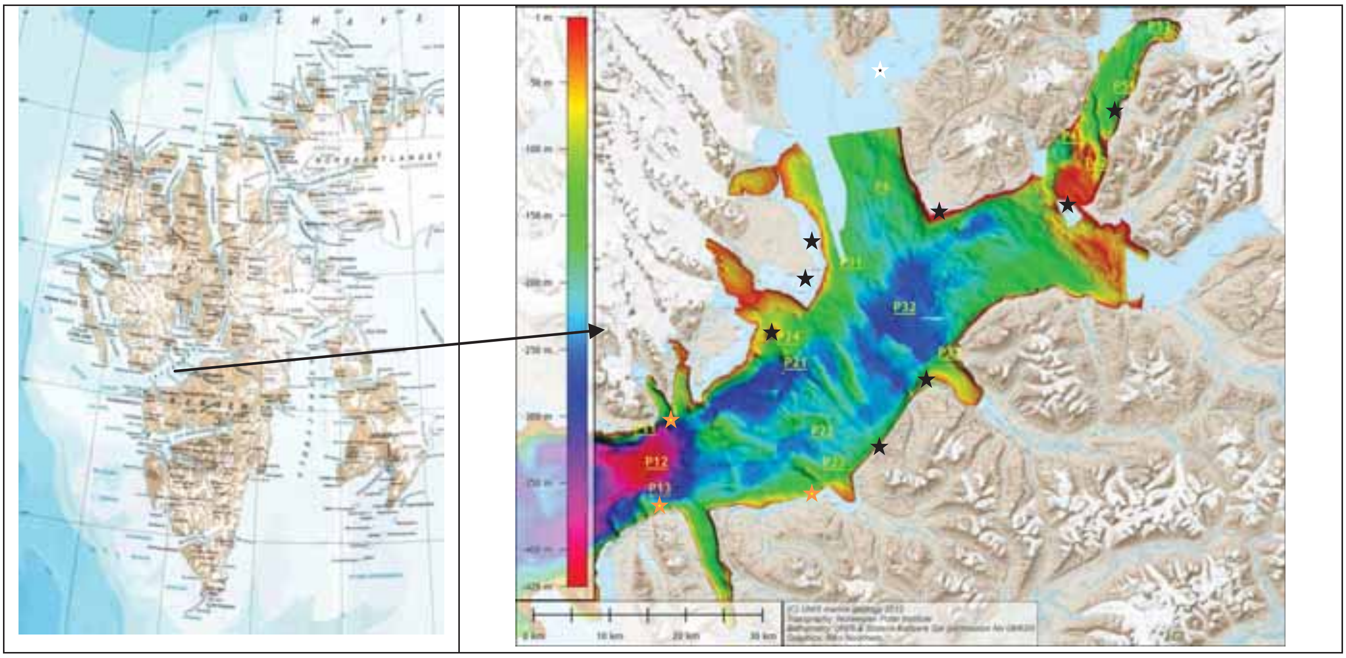


Figure 10.2.1. Svalbard and the western Is- and Billefjord system.

The Isfjord-Billefjord Ecosystem (western Svalbard, fig 10.1) was investigated 16-23 August. One of the main goals for the **Arctic and boreal benthic process and function (ArcProFun)** was to map the pelagic and benthic fauna (fish and invertebrates) composition of the fjords (deep and shallow; inner and outer part) and to characterize the functional roles of the most dominant fauna within identified communities. The question on who eats who will be central.

Another important goal was testing the DeepVision in-trawl camera system to collect a continuous, time- and depth-referenced, record of all organisms captured in the pelagic trawl.

1 The continuation of the ArcProFun (WP 1-6) will be by workshops, data analyses, discussion groups and finally publishing in 2013/2014 if financed by:

WP1: Shallow water systems (lead by Tove Gabrielsen, UNIS)
WP2: Community structure in the Is-Billefjord: how to integrate abundance/biomass/trait data of fish, zooplankton and benthos (Lead by Lis L Jørgensen (IMR)/Olga Ljubina (MMBI))
WP3: Isotop analyses of sediment, water column, zooplankton, benthos and fish: what species isotops are important in relations to environmental factors (depth, inner-outer fjord) and biological factors (same species different locations, same species different life stadium, diverse feeding types) (Lead by Therese Løkken (UNIS)/Paul Renaud (APN/UNIS))
WP4: Fish populations and fish stomach analyses (Lead by Elena Eriksen (IMR)/Tatiana Proklova (PINRO))
WP5: System modeling (lead by Ulf Lindstrøm/Greg Certain, IMR)
WP6: The ability of dominant fauna to adapt to climate change (Raymond Bannester (IMR))
Preliminary results will be presented on the website later this year (before December).

2 The DeepVision in-trawl camera system collects five sets of stereo colour images per second, allowing species to be identified and lengths to be calculated.

The system was deployed on 20 hauls, both standard step-wise hauls for 0-group fish with 10 minutes of sampling each at surface, 20 m depth and 40 m depth and exploratory hauls with full sampling from the surface to seabed.

In addition to fish, the DeepVision system documented depth distribution and densities of crustacea and cnidaria. Distributions of krill, in particular, were highly patchy with magnitude-scale variation in density over < 1 minute.

Further analyses are underway, and will focus on patchiness in distribution of 0-group fishes during shooting and hauling phases of standard step-wise hauls.

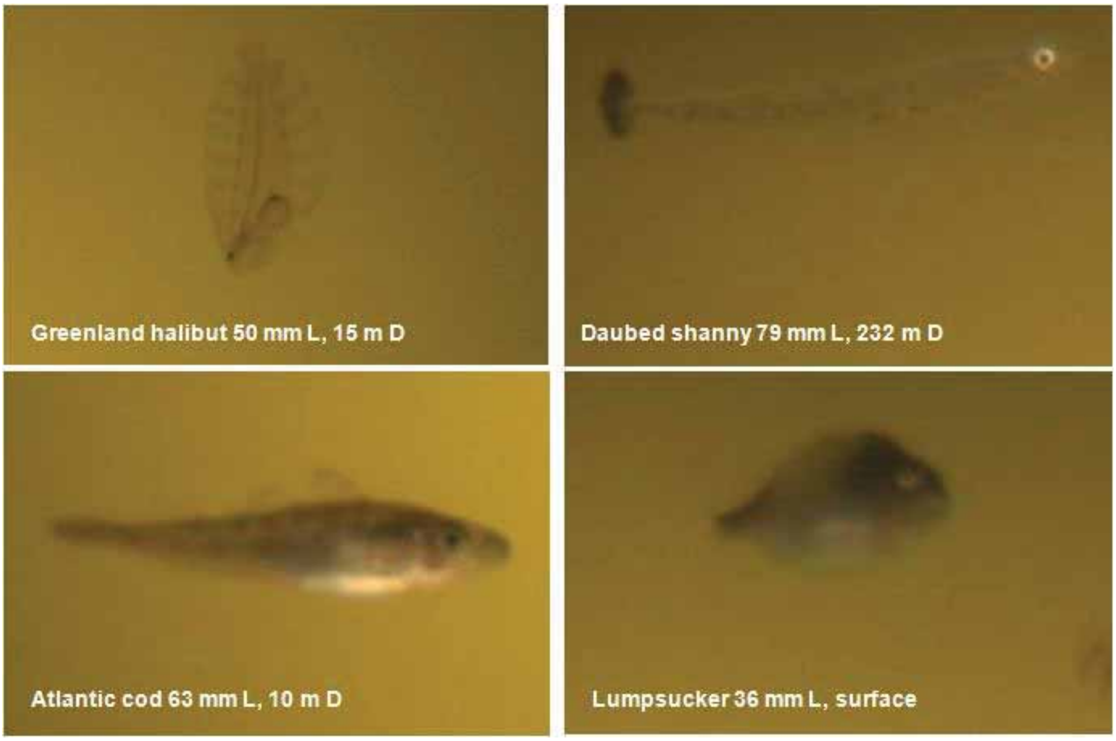


Figure 10.2.2. Examples of 0-group fishes imaged with DeepVision in-trawl camera system.

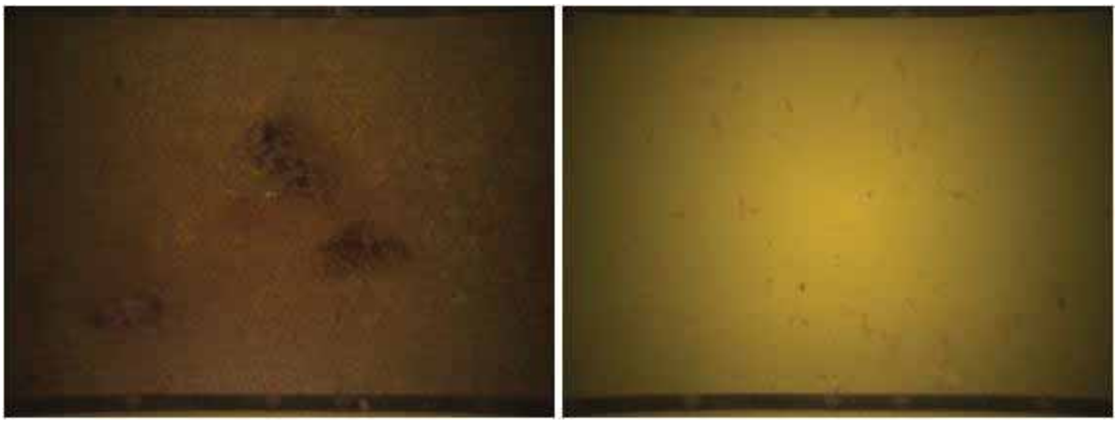


Figure 10.2.3. Magnitude scale variation in krill densities were measured using images from the DeepVision system. These images were taken 41 seconds apart at the surface in Billefjord (station P41).

10.3 Special investigation of 0-group cod (*Gadus morhua* L)

by Torild Johansen

10.3.1 Aim of investigations

The sampling of 0-group cod was part of a larger project where we study population genetic structure of Northeast Arctic cod and it's connectivity to coastal cod along the Norwegian coast. In two years we have collected samples of cod from the Barents Sea (Barents Sea winter survey, ecosystem survey), spawning stock from the Norwegian coast (from Finnmark to Lofoten) and the juvenile cod from the Barents Sea (the ecosystem survey). By collecting cod of all age groups and sizes we will study if there is any sub-structuring within Northeast Arctic cod from the Barents Sea.

Previous investigations of landings of gonads (Sundby & Nakken 2008), modeling studies (Vikebø 2007) and genetic studies (Skarstein and Fevolden 2007, Dahle 1992) have indicated such sub-structuring. In addition the typing of cod otoliths into coastal cod and Northeast arctic cod, show that some coastal cod migrate way into the Barents Sea. We wanted know the possible level of this possible invation.

So the overall aim of the ecosystem survey was to collect 0-group cod covering the Barents Sea and Svalbard to study the genetic structure. This project is closely connected to a similar cod project managed by VNIRO.

10.3.2 Method

Labeled boxes with 2 ml tubes filled with ethanol was stored on board all vessels in 2011 and 2012. 0-group cod was collected from all over the Barents Seas in addition to Svaldbard in two years (2x500 cod). In 2012 the collection of juveniles was coordinated with University of Bergen who collected the whole fish for morphological studies and for more detailed studies of the juveniles' otolliths to identify time for settling of cod.

10.3.3 Procedure

Gill tissue was collected from the fish immediately after the catch came onboard. It was important that the gill tissue was as fresh when collected, to make sure we would get high quality DNA for the genetic analysis.

10.3.4 Data & Results

The samples are in the process of being analysed and so no results are available yet. We can report though, that the quality of the DNA was very good.

10.3.5 Plans for future surveys

In 2013 we will change focus of the sampling of fish. Then we plan to collect samples of other important fish species for similar studies. The focus next year will be on capelin (*Mallotus villosus*) and polar cod (*Boreogadus saida*), redfishes Sebastes spp, Greenland halibut (*Reinhardtius hippoglossoides*).

11 Technical report

From 2003, the survey has been part of a joint Norwegian-Russian ecosystem survey, designed and carried out in cooperation between the Institute of Marine Research (IMR), Norway and the Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO). The survey covers the ice free part of the Barents Sea and the Svalbard shelf. Four (five) vessels normally operate in the region, three Norwegian and one (two) Russian. Most aspects of the ecosystem are covered, from physical and chemical oceanography, pollution, garbage, phytoplankton and zooplankton to fish (both young and adults), sea mammals, benthic invertebrates and birds. A range of methods and gears are applied, from water sampling using CTD's, to plankton nets, pelagic and demersal trawls, grabs and sledges, echo sounders and direct visual observations. The use of these sampling tools and the treatment of the samples are detailed explained in the "Sampling Manual" for the Joint Annual Norwegian-Russian Ecosystem Survey in the Barents Sea" in August-October.

"Technical Report" presentes all types of deviations from the standards presented in the "Sampling Manual" (http://www.imr.no/tokt/okosystemtokt_i_barentshavet/sampling_manual/nb-no). In addition to the standard monitoring of the Barents Sea, several studies and experiments are carried out. These methods of "special investigations" are also described in the "Technical Report".

11.1 Deviations from the standards presented in the "Sampling Manual"

by Wenneck T. and Prozorkevich D.

Equipment:

1: Problems with the one of the trawl drums on G.O. Sars, made krill trawling difficult.

2: Problems with the MOCNESS on Johan Hjort part 2.

3: Calibration of trawl is an issue that should be addressed, both between Norwegian vessels and between Norwegian and Russian vessels.

4: Winch used to handle the MOCNESS on Johan Hjort had some problems. Due to this problem, several mornings where aborted.

5: Due to soft bottom and/or large numbers of sponge, "Tromsø trawl" setup where used. There's no code or routines, to describe this change of trawl settings.

6: Russian vessel has got the new Campelen trawl which have much more catchability for benthic organism then previous equipment.

11.2 Special investigations

Description of aim, methods for different special investigations see followed chpters:

- 10.1. Acoustic monitoring of zooplankton
- 10.2. Arctic and boreal benthic process and function (ArcProFun) and Deep Sea Vision
- 10.3. Special investigation of 0-group cod

12 Acknowledgements

Organising and conducting ecosystem surveys demands a tremendous effort. We are therefore grateful to the research vessel crews and the scientific staffs both in Norway and Russia that have organized and participated in the surveys and those on land who have analysed the samples. Without their dedication and professionalism, it would not have been possible to collect such a huge amount of high quality data. We thank Sam Subbey and Felicia Keulder for proofreading. We also thank The Barents Sea Program at the Institute of Marine Research and PINRO for funding.

Appendix 1. Vessels and participants

Research vessel	Participants
"Vilnyus" (08.08- 29.09)	D. Prozorkevich (cruise leader), A. Amelkin, A. Astakhov, A. Benzik, D. Zakharov, M. Kalashnikova, S. Kharlin, R. Klepikovsky, P. Krivosheya, A. Klyuev, I. Malkov, A. Semenov, A. Trofimov
"G.O. Sars" (18.08 - 12.09)	E. Johannesen (cruise leader), I. M. Beck, T. H. Thangstad, F. Midtøy, J. Røttingen, M. Kvalsund, Ø. Sørensen, I. Henriksen, A. Rey, M. Martinussen, G. Tveit, T. Haugland, M. Dahl, L. Pettersson, O. Dyping, A. Morov, K. Schjølberg
"J. Hjort" (16.08-30.09)	<u>Part 1 (16.08 – 23.08)</u> L. L. Jørgensen (cruise leader), R. Bannister, S. Rosen, A. Bjørge, E. Eriksen, L. Drivenes, M. Mjanger, A. Engås, A. Aasen, G. Sætra, E.Åström , T. Løkken, L. J. Wilson, O. Ljubina, T. Prokhorova, O. M. Rapp. <u>Part 2 (23.08 - 12.09)</u> S. Mehl (cruise leader), A. Voronkov, E. Holm, J. Skadal, A. Kristiansen, S. Karlson, Y. Hunt, S.Wennerqvist, G. Lien, R. Johannesen, J. Alvarez, B. Røttingen, E. Strand, B. E. Grøsvik, J. Erices, O. Ljubina, T. Prokhorova, E. Grønningsæter <u>Part 3 (12.09-30.09)</u> H. Gjøsæter (cruise leader), K. B. Eriksen, H. Sannæs, S. Kolbeinson, A. Storaker, J. Vedholm, S. Subbey, K. A. Fagerheim, N. Øien, J. E. Nygaard, B. Kvinge, J. Alvarez, B. Røttingen, J. Rønning, J. H. Simonsen, G. Nesje, Eirik Grønningsæter, O. Ljubina, T. Prokhorova
"Helmer Hanssen" (06.08-05.09)	<u>Part 1 (06.08 – 20.08)</u> Øystein Skagseth (cruise leader), I. Ahlquist, R. Pedersen,M. Petersen, K. Gjertsen, J. Erices, P. Fossum. <u>Part 2 (21.08 – 05.09)</u> T. de L. Wenneck (cruise leader), A. K. Sveistrup, S. E. Seim, G. Langhelle, H. Mjanger, A. Sæverud, J. Godiksen, M. Nilsen, T. Sivertsen, A.K. Abrahamsen, A. L. Johnsen, E. Hermansen, A. Golokov, S. Enoksen, S. Kortsch, S. Murray.

Appendix 2. Fish sampling

Sampling of fish in ecosystem survey 2012

Species are divided into **boreal**, **arctic** and **arctic-boreal**. Length measurements present samples from bottom and pelagic trawl catches.

Family	Latin name/ English name	Norwegian vessels	Russian vessels	Total	Length, cm mean (min-max)
Agonidae	**Leptagonus decagonus/ Atlantic poacher**				12 (2-22)
	No of stations with samples	144	122	266	
	Nos. length measured	921	1511	2433	
	Nos. aged	-	44	44	
Agonidae	**Ulcina olrikii/ Arctic alligatorfish**				6.5 (3-9)
	No of stations with samples	-	40	40	
	Nos. length measured	-	218	218	
	Nos. aged	-	-	-	
Ammodytidae	**Ammodytes marinus/ Lesser sandeel**				5.8 (2-22)
	No of stations with samples	54	45	99	
	Nos. length measured	224	927	1151	
	Nos. aged	-	-	-	
Anarhichadidae	**Anarhichas sp./ Wolffish**				7.7 (5-10.5)
	No of stations with samples	1	8	9	
	Nos. length measured	1	10	11	
	Nos. aged	-	-	-	
Anarhichadidae	**Anarhichas denticulatus/ Northern wolffish**				67.7 (7-135)
	No of stations with samples	49	13	62	
	Nos. length measured	74	18	84	
	Nos. aged	-	-	-	
Anarhichadidae	**Anarhichas lupus/ Atlantic wolffish**				23.5 (5-118)
	No of stations with samples	68	20	88	
	Nos. length measured	273	48	321	
	Nos. aged	-	1	1	
Anarhichadidae	**Anarhichas minor/ Spotted wolffish**				65.8 (4-121)
	No of stations with samples	51	28	79	
	Nos. length measured	91	51	142	
	Nos. aged	-	1	-	
Argentinidae	**Argentina silus/ Greater argentine**				22.8 (8-51)
	No of stations with samples	14	1	15	
	Nos. length measured	546	1	547	
	Nos. aged	-	-	-	
Clupeidae	**Clupea harengus harengus/ Atlantic herring**				6.7 (3-29.5)
	No of stations with samples	92	27	119	
	Nos. length measured	4123	870	4993	
	Nos. aged	272	51	323	
Clupeidae	**Clupea harengus suworowi/ Kanin herring**				17.3 (4.5-27.5)
	No of stations with samples	-	22	22	
	Nos. length measured	-	2220	2220	
	Nos. aged	-	250	250	
Clupeidae	**Clupea harengus/Herring**				5.3 (4-7)
	No of stations with samples	-	14	14	

	Nos. length measured	-	111	111	
	Nos. aged	-	-	-	
Cottidae	**Artediellus atlanticus/ Atlantic hookear sculpin**				7.6 (1-18)
	No of stations with samples	179	142	321	
	Nos. length measured	1924	3485	5409	
	Nos. aged	-	16	16	
Cottidae	**Cottidae g.sp./ Bullheads and Sculpins**				3.7 (3.5-3.5)
	No of stations with samples	1	22	23	
	Nos. length measured	1	64	65	
	Nos. aged	-	-	-	
Cottidae	**Gymnocanthus tricuspis/ Arctic staghorn sculpin**				13.3 (5-20)
	No of stations with samples	11	20	31	
	Nos. length measured	107	109	316	
	Nos. aged	-	24	24	
Cottidae	**Icelus bicornis/ Twohorn sculpin**				6.6 (3-12)
	No of stations with samples	15	-	15	
	Nos. length measured	62	-	62	
	Nos. aged	-	-	-	
Cottidae	**Icelus spatula/ Spatulate sculpin**				6.4 (3-13)
	No of stations with samples	3	51	54	
	Nos. length measured	5	376	381	
	Nos. aged	-	-	-	
Cottidae	**Myoxocephalus scorpius/ Shorthorn sculpin**				6.2 (2.5-19)
	No of stations with samples	47	11	58	
	Nos. length measured	441	113	554	
	Nos. aged	-	30	30	
Cottidae	**Triglops murrayi/ Moustache sculpin**				8.6 (3-17)
	No of stations with samples	55	28	83	
	Nos. length measured	391	124	515	
	Nos. aged	-	13	13	
Cottidae	**Triglops nybelini/ Bigeye sculpin**				8.7 (3.5-14)
	No of stations with samples	44	63	107	
	Nos. length measured	780	2238	3018	
	Nos. aged	-	56	56	
Cottidae	**Triglops pingelii/ Ribbed sculpin**				11.3 (3-19)
	No of stations with samples	32	15	47	
	Nos. length measured	382	126	508	
	Nos. aged	-	1	1	
Cottidae	**Triglops sp./**				3.7 (2-7)
	No of stations with samples	12	-	12	
	Nos. length measured	46	-	46	
	Nos. aged	-	-	-	
Cyclopteridae	**Cyclopterus lumpus/ Lumpsucker**				23.6 (3-48)
	No of stations with samples	128	63	191	
	Nos. length measured	466	114	580	
	Nos. aged	-	-	-	
Cyclopteridae	**Eumicrotremus derjugini/ Leatherfin lumpsucker**				6 (4-9)
	No of stations with samples	3	4	7	
	Nos. length measured	3	15	18	
	Nos. aged	-	-	-	

Cyclopteridae	**Eumicrotremus spinosus/ Atlantic spiny lumpsucker**				6.7 (3-12)
	No of stations with samples	23	2	25	
	Nos. length measured	49	30	79	
	Nos. aged	-	-	-	
Gadidae	**Arctogadus glacialis/ Arctic cod**				15.2 (9-32)
	No of stations with samples	6	8	14	
	Nos. length measured	27	10	37	
	Nos. aged	-	9	9	
Gadidae	**Boreogadus saida/ Polar cod**				9.6 (2.5-27)
	No of stations with samples	186	163	349	
	Nos. length measured	7305	8181	15486	
	Nos. aged	1466	226	1692	
Gadidae	**Eleginus nawaga/ Atlantic navaga**				15.3 (5.5-27)
	No of stations with samples	-	15	15	
	Nos. length measured	-	2293	2293	
	Nos. aged	-	107	107	
Gadidae	**Enchelyopus cimbrius/ Fourbeard rockling**				18.4 (2-32)
	No of stations with samples	4	4	8	
	Nos. length measured	6	4	10	
	Nos. aged	-	1	1	
Gadidae	**Gadiculus argenteus/ Silvery pout**				12.5 (8-18)
	No of stations with samples	12	1	13	
	Nos. length measured	59	-	59	
	Nos. aged	-	-	-	
Gadidae	**Gaidropsarus argentatus/ Arctic threebearded rockling**				26.6 (12-37)
	No of stations with samples	11	3	14	
	Nos. length measured	29	3	32	
	Nos. aged	-	1	-	
Gadidae	**Gaidropsarus vulgaris/ Three-bearded rockling**				16 (16-16)
	No of stations with samples	1	-	1	
	Nos. length measured	1	-	1	
	Nos. aged	-	-	-	
Gadidae	**Gadus morhua/ Atlantic cod**				9.3 (2.5-130)
	No of stations with samples	403	291	694	
	Nos. length measured	20241	23460	43701	
	Nos. aged	1401	1782	3183	
Gadidae	**Melanogrammus aeglefinus/ Haddock**				28.8 (1-86)
	No of stations with samples	272	145	417	
	Nos. length measured	6093	7130	13223	
	Nos. aged	485	527	1012	
Gadidae	**Merlangius merlangus/ Whiting**				10.7 (7-43)
	No of stations with samples	8	-	8	
	Nos. length measured	18	-	18	
	Nos. aged	-	-	-	
Gadidae	**Micromesistius poutassou/ Blue whiting**				21.6 (15-40)
	No of stations with samples	86	1	87	
	Nos. length measured	4103	1	4104	
	Nos. aged	475	1	476	

Gadidae	**Molva molva/ Ling**				69.8 (62-78)
	No of stations with samples	3	-	3	
	Nos. length measured	5	-	5	
	Nos. aged	-	-	-	
Gadidae	**Pollachius pollachius/ Pollack**				10 (10-10)
	No of stations with samples	1			
	Nos. length measured	1			
	Nos. aged	-			
Gadidae	**Pollachius virens/ Saithe**				16.2 (4-93)
	No of stations with samples	37	33	70	
	Nos. length measured	154	145	299	
	Nos. aged	-	5	5	
Gadidae	**Trisopterus esmarkii/ Norway pout**				17 (4-23)
	No of stations with samples	80	26	106	
	Nos. length measured	2261	427	2688	
	Nos. aged	-	10	10	
Gadidae	**Phycis blennoides/ Greater forkbeard**				33.7 (33-34)
	No of stations with samples	2			
	Nos. length measured	2			
	Nos. aged	-			
Gasterosteidae	**Gasterosteus aculeatus/ Three-spined stickleback**				6.1 (4-8)
	No of stations with samples	7	23	30	
	Nos. length measured	132	332	464	
	Nos. aged	-	-	-	
Liparidae	**Careproctus sp./ Snailfish**				7.5 (1.5-21)
	No of stations with samples	64	-	64	
	Nos. length measured	134	-	134	
	Nos. aged	-	-	-	
Liparidae	**Careproctus micropus/**				7.6 (6-11)
	No of stations with samples	-	11	11	
	Nos. length measured	-	18	18	
	Nos. aged	-	-	-	
Liparidae	**Careproctus ranula/ Scotian snailfish**				8.4 (6-10)
	No of stations with samples	-	1	1	
	Nos. length measured	-	5	5	
	Nos. aged	-	-	-	
Liparidae	**Careproctus reinhardti/ Sea tadpole**				11.4 (5-24)
	No of stations with samples	-	74	74	
	Nos. length measured	-	237	237	
	Nos. aged	-	26	26	
Liparidae	**Liparis fabricii/ Gelatinous snailfish**				7.1 (1.5-29)
	No of stations with samples	70	51	121	
	Nos. length measured	1180	798	1978	
	Nos. aged	-	20	20	
Liparidae	**Liparis gibbus/ Variegated snailfish**				4.4 (1.5-20)
	No of stations with samples	25	18	43	
	Nos. length measured	186	46	232	
	Nos. aged	-	8	8	
Liparidae	**Liparis liparis/ Striped seasnail**				3.7 (3.5-3.5)
	No of stations with samples	1			

	Nos. length measured	1			
	Nos. aged	-			
Liparidae	**Liparis sp./ Sea snail**				3.8 (2-21)
	No of stations with samples	5	2	7	
	Nos. length measured	60	10	70	
	Nos. aged	-	-	-	
Liparidae	**Liparis tunicatus/ Kelp snailfish**				13.7 (12-14)
	No of stations with samples	-	2	2	
	Nos. length measured	-	2	2	
	Nos. aged	-	-	-	
Liparidae	**Paraliparis bathybius/ Black seasnail**				19.6 (3-25)
	No of stations with samples	10			
	Nos. length measured	40			
	Nos. aged	-			
Liparidae	**Rhodichthys regina/ Threadfin seasnail**				14.8 (6-26)
	No of stations with samples	1	2	3	
	Nos. length measured	9	2	11	
	Nos. aged	-	-	-	
Lophiidae	**Lophius piscatorius/ Anglerfish**				93 (93-93)
	No of stations with samples	1	-	1	
	Nos. length measured	1	-	1	
	Nos. aged	-	-	-	
Lotidae	**Brosme brosme/ Cusk**				28.5 (2.5-64)
	No of stations with samples	25	2	27	
	Nos. length measured	76	3	79	
	Nos. aged	-	-	-	
Macrouridae	**Macrourus berglax/ Roughhead grenadier**				35.2 (34-36)
	No of stations with samples	7	1	8	
	Nos. length measured	10	2	12	
	Nos. aged	-	-	-	
Myctophidae	**Benthosema glaciale / Glacier lanternfish**				5.1 (2.5-8)
	No of stations with samples	17	16	33	
	Nos. length measured	134	29	163	
	Nos. aged	-	-	-	
Myctophidae	**Lampanyctus sp./**				17 (17-17)
	No of stations with samples	-	1	1	
	Nos. length measured	-	1	1	
	Nos. aged	-	-	-	
Myctophidae	**Notoscopelus sp./**				5.7 (2.5-7)
	No of stations with samples	9	-	9	
	Nos. length measured	36	-	36	
	Nos. aged	-	-	-	
Osmeridae	**Mallotus villosus/ Capelin**				8 (1-20)
	No of stations with samples	296	244	540	
	Nos. length measured	20053	14170	34223	
	Nos. aged	3310	954	4264	
Osmeridae	**Osmerus eperlanus/ Smelt**				16.8 (11.5-26)
	No of stations with samples	-	12	12	
	Nos. length measured	-	584	584	
	Nos. aged	-	100	100	

Paralepididae	**Arctozenus risso/ White barracudina**				24.2 (6-29)
	No of stations with samples	43	4	47	
	Nos. length measured	87	4	91	
	Nos. aged	-	-	-	
Petromyzontidae	**Petromyzon marinus/ Sea lamprey**				36 (36-36)
	No of stations with samples	1			
	Nos. length measured	1			
	Nos. aged	-			
Petromyzontidae	**Lethenteron camtschaticum/ Arctic lamprey**				27.5 (23-33)
	No of stations with samples	-	3	3	
	Nos. length measured	-	3	3	
	Nos. aged	-	-	-	
Pleuronectidae	**Glyptocephalus cynoglossus/ Witch flounder**				47.2 (44-50)
	No of stations with samples	2	-	2	
	Nos. length measured	2	-	2	
	Nos. aged	-	-	-	
Pleuronectidae	**Hippoglossoides platessoides/ Long rough dab**				18.9 (2-54)
	No of stations with samples	243	214	457	
	Nos. length measured	5686	15810	21496	
	Nos. aged	6	103	109	
Pleuronectidae	**Limanda limanda/ Dab**				12.4 (5-25)
	No of stations with samples	-	12	12	
	Nos. length measured	-	172	172	
	Nos. aged	-	85	85	
Pleuronectidae	**Microstomus kitt/ Lemon sole**				27.9 (14-42)
	No of stations with samples	6	-	6	
	Nos. length measured	43	-	43	
	Nos. aged	-	-	-	
Pleuronectidae	**Phrynorhombus norvegicus/ Norwegian topknot**				8 (8-8)
	No of stations with samples	1	-	1	
	Nos. length measured	1	-	1	
	Nos. aged	-	-	-	
Pleuronectidae	**Pleuronectes glacialis/ Arctic flounder**				14.5 (10-28)
	No of stations with samples	-	11	11	
	Nos. length measured	-	603	603	
	Nos. aged	-	100	100	
Pleuronectidae	**Pleuronectes platessa/ European plaice**				29.2 (14-54)
	No of stations with samples	1	23	24	
	Nos. length measured	2	248	250	
	Nos. aged	-	89	89	
Pleuronectidae	**Reinhardtius hippoglossoides/ Greenland halibut**				27.3 (4.5-87)
	No of stations with samples	168	77	245	
	Nos. length measured	1166	1579	2745	
	Nos. aged	322	707	1029	
Psychrolutidae	**Cottunculus microps/ Polar sculpin**				12.7 (3-28)
	No of stations with samples	22	34	56	
	Nos. length measured	26	254	280	
	Nos. aged	-	7	-	
Psychrolutidae	**Cottunculus sadko/ Sadko sculpin**				13.8 (4-23)
	No of stations with samples	-	22	22	

	Nos. length measured	-	289	289	
	Nos. aged	-	4	4	
Rajidae	**Amblyraja hyperborea/ Arctic skate**				38.3 (14-99)
	No of stations with samples	20	36	56	
	Nos. length measured	152	76	228	
	Nos. aged	-	-	-	
Rajidae	**Amblyraja radiata/ Thorny skate**				32.6 (8-64)
	No of stations with samples	99	77	176	
	Nos. length measured	198	665	863	
	Nos. aged	-	-	-	
Rajidae	**Bathyraja spinicauda/ Spinetail ray**				132.4 (93-158)
	No of stations with samples	5	-	5	
	Nos. length measured	6	-	6	
	Nos. aged	-	-	-	
Rajidae	**Rajella fyllae/ Round ray**				28.8 (10-52)
	No of stations with samples	15	1	16	
	Nos. length measured	19	1	20	
	Nos. aged	-	-	-	
Salmonidae	**Salmo salar/ Atlantic salmon**				31.8 (27-35)
	No of stations with samples	2	1	3	
	Nos. length measured	10	4	14	
	Nos. aged	-	4	4	
Scombridae	**Scomber scombrus/ Mackerel**				27.5 (23-43)
	No of stations with samples	7	-	7	
	Nos. length measured	103	-	103	
	Nos. aged	-	-	-	
Scorpaenidae	**Sebastes norvegicus/ Golden redfish**				20.8 (5-64)
	No of stations with samples	39	30	69	
	Nos. length measured	146	168	314	
	Nos. aged	108	-	108	
Scorpaenidae	**Sebastes mentella/ Deepwater redfish**				15.8 (1-44)
	No of stations with samples	165	84	249	
	Nos. length measured	7942	1472	9414	
	Nos. aged	489	104	593	
Scorpaenidae	**Sebastes sp./ Redfish**				4.3 (1-20)
	No of stations with samples	142	2	144	
	Nos. length measured	4679	2	4681	
	Nos. aged	-	-	-	
Scorpaenidae	**Sebastes viviparus / Norway redfish**				19.3 (4-32)
	No of stations with samples	20	-	20	
	Nos. length measured	490	-	490	
	Nos. aged	-	-	-	
Squalidae	**Somniosus microcephalus/ Greenland shark**				319.5 (278-380)
	No of stations with samples	-	1	1	
	Nos. length measured	-	1	1	
	Nos. aged	-	-	-	
Sternoptychidae	**Maurolicus muelleri/ Pearlside**				3.4 (3-5)
	No of stations with samples	14	-	14	
	Nos. length measured	183	-	183	
	Nos. aged	-	-	-	

Stichaeidae	**Anisarchus medius/ Stout eelblenny**				6 (4-22)
	No of stations with samples	23	10	33	
	Nos. length measured	307	58	365	
	Nos. aged	-	-	-	
Stichaeidae	**Lumpenus fabricii/ Slender eelblenny**				21.4 (12-29)
	No of stations with samples	-	13	13	
	Nos. length measured	-	174	174	
	Nos. aged	-	25	25	
Stichaeidae	**Leptoclinus sp., Lumpenus sp./**				5.6 (4.5-7)
	No of stations with samples	1	-	1	
	Nos. length measured	30	-	30	
	Nos. aged	-	-	-	
Stichaeidae	**Leptoclinus maculates/ Daubed shanny**				6.7 (1-32)
	No of stations with samples	15 5	167	322	
	Nos. length measured	1875	1228	3103	
	Nos. aged	-	-	-	
Stichaeidae	**Lumpenus lampretaeformis/Snake blenny**				15.9 (4-35)
	No of stations with samples	94	53	147	
	Nos. length measured	897	352	1249	
	Nos. aged	-	-	-	
Triglidae	**Eutrigla gurnardus/ Grey gurnard**				36.5 (34-38)
	No of stations with samples	3	-	3	
	Nos. length measured	3	-	3	
	Nos. aged	-	-	-	
Zoarcidae	**Gymnelus retrodorsalis/ Aurora unernak**				12.2 (9-19)
	No of stations with samples	5	13	18	
	Nos. length measured	6	19	25	
	Nos. aged	-	-	-	
Zoarcidae	**Gymnelus sp./**				11 (11-11)
	No of stations with samples	-	1	1	
	Nos. length measured	-	1	1	
	Nos. aged	-	-	-	
Zoarcidae	**Gymnelus viridis/ Fish doctor**				12.5 (11-13)
	No of stations with samples	-	3	3	
	Nos. length measured	-	3	3	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes adolfi/ Adolf's eelpout**				12.3 (5-25)
	No of stations with samples	4	-	4	
	Nos. length measured	31	-	31	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes esmarkii/ Esmark's eelpout**				25.6 (6-60)
	No of stations with samples	25	6	31	
	Nos. length measured	99	22	121	
	Nos. aged	-	9	9	
Zoarcidae	**Lycodes eudipleurostictus/ Double line eelpout**				19.8 (6-34)
	No of stations with samples	19	4	23	
	Nos. length measured	180	168	348	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes gracilis/ Vahl's eelpout**				17.6 (7-31)

	No of stations with samples	68	19	87	
	Nos. length measured	321	36	357	
	Nos. aged	-	19	19	
Zoarcidae	**Lycodes luetkenii/ Lutken's eelpout**				36.2 (35-37)
	No of stations with samples	1	-	1	
	Nos. length measured	2	-	2	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes paamiuti/ Paamiut eelpout**				14.8 (8-21)
	No of stations with samples	6	-	6	
	Nos. length measured	31	-	31	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes pallidus/ Pale eelpout**				13.1 (6-29)
	No of stations with samples	33	68	101	
	Nos. length measured	267	683	950	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes polaris/ Canadian eelpout**				17.7 (9-31)
	No of stations with samples	-	5	5	
	Nos. length measured	-	17	17	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes reticulatus/ Arctic eelpout**				22.8 (7-57)
	No of stations with samples	13	26	39	
	Nos. length measured	29	98	127	
	Nos. aged	-	25	25	
Zoarcidae	**Lycodes rossi/ Threespot eelpout**				13.8 (1-32)
	No of stations with samples	39	55	94	
	Nos. length measured	140	377	517	
	Nos. aged	-	5	5	
Zoarcidae	**Lycodes seminudus/ Halfnaked eelpout**				17.8 (7-41)
	No of stations with samples	14	46	60	
	Nos. length measured	30	303	333	
	Nos. aged	-	10	10	
Zoarcidae	**Lycodes squamiventer/ Scalebelly eelpout**				19 (8-34)
	No of stations with samples	11	8	19	
	Nos. length measured	126	202	328	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodes sp./ Ealpout**				16.9 (15-19)
	No of stations with samples	-	1	1	
	Nos. length measured	-	3	3	
	Nos. aged	-	-	-	
Zoarcidae	**Lycodonus flagellicauda/**				19.1 (10-27)
	No of stations with samples	14	-	14	
	Nos. length measured	98	-	98	
	Nos. aged	-	-	-	
Zoarcidae	**Lycenchelys kolthoffi/ Checkered wolf eel**				17.7 (12-22)
	No of stations with samples	5	6	11	
	Nos. length measured	7	11	18	
	Nos. aged	-	-	-	
Zoarcidae	**Lycenchelys muraena/ Moray wolf eel**				16.2 (14-19)
	No of stations with samples	-	5	5	
	Nos. length measured	-	23	23	

	Nos. aged	-	-	-	
Zoarcidae	**Lycenchelys sarsii/ Sars' wolf eel**				15.5 (10-18)
	No of stations with samples	3			
	Nos. length measured	4			
	Nos. aged	-			

Appendix 3. Invertebrate sampling

Scientific vessels (GOS-G.O.sars, HH-Helmar Hanssen, JH-Johan Hjort and VI-Vilnus), which participated on the 2012 Ecosystem survey in the Barents Sea

Phylum	Class	Order	Family	Species	Author	GOS	HH	JH	VI	Total
Porifera				Porifera g. sp.		51	11	52	6	120
	Calcarea	Calcarea	**Sycettidae**	Sycon sp.		1		5		6
	Demospongiae	Astrophorida	**Ancorinidae**	Stelletta sp.		8	2			10
			Geodiidae	Geodia atlantica	(Stephens, 1915)	1				1
				Geodia barretti	Hentschel, 1929	13	6	1	8	28
				Geodia macandrewii	Bowerbank, 1858	13				13
				Geodia sp.		2	5		1	8
			Pachastrellidae	Thenea muricata	(Bowerbank, 1858)	35	9	7		51
				Thenea sp.		2	12			14
				Thenea valdiviae	Lendenfeld, 1906	1				1
			Stellettidae	Stryphnus ponderosus	Bowerbank, 1866		1			1
			Tetillidae	Tetilla cranium	(O.F. Mueller, 1776)	9	11		8	28
				Tetilla polyura	Schmidt, 1870	25	5	3	1	34
				Tetilla sp.		1	1			2
		Axinellida	**Axinellidae**	Axinella ventilabrum	(Johnston, 1842)	2				2
		Cladorhizidae	**Cladorhizidae**	Cladoriza sp.			6			6
		Dendroceratida	**Darwinellidae**	Aplysilla sp.		3				3
				Aplysilla sulfurea	Schulze, 1878	2				2
		Hadromerida	**Polymastiidae**	Polymastia mammillaris	(Mueller, 1806)				1	1
				Polymastia sp.		5	10		23	38
				Polymastia uberrima	(Schmidt, 1870)	8	1	5		14
				Polymastiidae g. sp.					1	1
				Radiella grimaldi	(Topsent, 1913)	28	6	19	22	75
				Radiella hemisphaericum	(Sars, 1872)	18	4	1		23
				Tentorium semisuberites	(Schmidt, 1870)	6	16	4		26
			Stylocordylidae	Stylocordyla borealis	(Loven, 1866)	4	5	2	1	12
			Suberitidae	Suberites ficus	(Johnston, 1842)	5	11	1	6	23
				Suberites sp.		3	3			6
			Tethyidae	Tethya aurantium	(Pallas, 1766)			1		1
				Tethya citrina	Sarà & Melone, 1965	6				6
				Tethya norvegica	Bowerbank, 1872	16				16
				Tethya sp.		3	3			6
		Halichondrida	**Axinelliidae**	Phakellia sp.		17	8	4	2	31

			Halichondriidae	Halichondria sp.		1	1			2
		Haplosclerida	**Chalinidae**	Reniera sp.		2		1		3
			Haliclonidae	Haliclona sp.		1	16			17
				Haliclona ventilabrum	(Fristedt, 1887)		1	3		4
		Poecilosclerida	**Cladorhizidae**	Asbestopluma sp.			3	1		4
				Chondrocladia gigantea	(Hansen, 1885)		4			4
			Coelosphaeridae	Histodermella sp.			6			6
			Grellidae	Grayella pyrula	(Carter, 1876)	1				1
			Hymedesmiidae	Hymedesmia sp.			1			1
			Microcionidae	Antho dichotoma	(Esper,1794)	1				1
			Mycalidae	Mycale lingua	(Bowerbank, 1866)	6				6
				Mycale sp.		2	3	4		9
			Myxillidae	Forcepia sp.			3			3
				Iophon piceus	(Vosmaer, 1881)		3			3
				Myxilla brunnea	Hansen, 1885	10				10
				Myxilla incrustans	(Johnston, 1842)		6			6
				Myxilla sp.		1	9			10
			Tedaniidae	Tedania suctoria	Schmidt, 1870	10	1			11
Cnidaria	**Anthozoa**			Anthozoa g. sp.			1		1	2
		Actiniaria		Actiniaria g. sp.		22		21	129	172
			Actiniidae	Cribrinopsis similis	Carlgren, 1921		4			4
				Urticina sp.		16				16
			Actinostolidae	Actinostola sp.		11	15			26
				Glandulactis spetsbergensis	(Carlgren, 1913)		5			5
				Stomphia coccinea	(O.F. Mueller, 1776)		2			2
			Edwardsiidae	Edwardsia sp.				1		1
				Edwardsiidae g. sp.				1		1
			Hormathiidae	Hormathia digitata	(O.F. Mueller, 1776)	21	27	42	42	132
				Hormathia sp.		36	1			37
			Liponematidae	Liponema multicornis	(Verrill, 1879)		3			3
		Alcyonacea		Alcyonacea g. sp.					1	1
			Nephteidae	Drifa glomerata	(Verrill, 1869)	11	37	45	20	113
				Duva florida	(Rathke, 1806)	15	8	28		51
				Gersemia fruticosa	(M. Sars, 1860)			2		2
				Gersemia rubiformis	(Ehrenberg, 1834)	19	7	6		32
				Gersemia sp.				28	108	136
		Hexacorallia	**Flabellidae**	Flabellum sp.		4				4
		Pennatulacea	**Funiculinidae**	Funiculina quadrangularis	(Pallas, 1766)				1	1

			Umbellulidae	Umbellula encrinus	(L., 1758)		29		19	48
			Virgulariidae	Virgularia sp.						
		Zoanthacea	**Epizoanthidae**	Epizoanthidae g. sp.					13	13
				Epizoanthus incrustatus	(Dueben & Koren, 1847)			5		5
				Epizoanthus sp.		20	12	2		34
	Hydrozoa			Hydroidea g. sp.		12		2		14
				Hydrozoa g. sp.				18		18
		Athecata	**Candelabridae**	Candelabrum phrygium	(Fabricius, 1780)			2		2
			Corynidae	Sarsia princeps	(Haeckel, 1879)			1		1
			Eudendriidae	Eudendrium sp.		1				1
			Tubulariidae	Tubularia indivisa	L., 1758	3				3
				Tubularia sp.		3	1			4
		Limnomedusae	**Monobrachiidae**	Monobrachium parasitum	Mereschkowsky, 1877		3			3
		Thecaphora	**Campanulariidae**	Campanularia sp.				1		1
				Obelia sp.				1		1
				Rhizocaulus verticillatus	(L., 1758)		1	4		5
			Haleciidae	Halecium labrosum	Alder, 1859			4		4
				Halecium muricatum	(Ellis & Solander, 1786)	9	2	10		21
				Halecium sessile	Norman, 1867		1			1
				Halecium sp.		7	1	5		13
			Lafoeidae	Grammaria abietina	(M. Sars, 1850)			9		9
				Lafoea dumosa	(Fleming, 1828)		3			3
				Lafoea fruticosa	(M. Sars, 1850)		6	3		9
				Lafoea grandis	Hincks, 1874		3	2		5
				Lafoea sp.		2	3	1		6
			Laodiceidae	Ptychogena lactea	A. Agassiz, 1865			4		4
				Ptychogena lactea (medusa)	A. Agassiz, 1865			5		5
			Sertulariidae	Abietinaria abietina	(L., 1758)	3	5	30		38
				Abietinaria sp.		2	1			3
				Diphasia fallax	(Johnston, 1847)		1			1
				Diphasia sp.		2				2
				Hydrallmania falcata	(L., 1758)			1		1
				Sertularella polyzonias	L., 1758			1		1
				Sertularia mirabilis	(Verrill, 1873)			6		6
				Sertularia plumosa	(Clark, 1876)			1		1
				Sertularia sp.		1				1
				Sertulariidae g. sp.		1				1

				Symplectoscyphus tricuspidatus	(Alder, 1856)			8		8
				Thuiaria carica	Levinsen, 1893			1		1
				Thuiaria obsoleta	(Lepechin, 1781)			4		4
				Thuiaria sp.			3	2		5
				Thuiaria thuja	(L., 1758)	2		2		4
	Scyphozoa			Scyphozoa g. sp.				28		28
		Semaeostomeae	**Cyaneidae**	Cyanea capillata	(L., 1758)			42		42
		Stauromedusae	**Eleutherocarpidae**	Haliclystus sp.				1		1
Plathelminthes				Plathelmintes g. sp.				4		4
	Turbellaria			Turbellaria g. sp.					7	7
Nemertini	**Nemertini**			Nemertini g. sp.		13	6	11	9	39
		Heteronemertini	**Lineidae**	Lineus gesserensis	(O.F. Mueller, 1774)			1		1
Cephalorhyncha	**Priapulida**	Priapulomorpha	**Priapulidae**	Priapulopsis bicaudatus	(Koren & Danielssen, 1868)	3		2	11	16
				Priapulus caudatus	Lamarck, 1816	2	2			4
Echiura	**Echiurida**	Echiuroinea	**Bonelliidae**	Hamingia arctica	Danielssen & Koren, 1881	20	4	1	23	48
			Echiuridae	Echiurus echiurus echiurus	(Pallas, 1767)				2	2
Sipuncula	**Sipunculidea**			Sipunculidea g. sp.		1		2	17	20
		Golfingiiformes	**Golfingiidae**	Golfingia margaritacea margaritacea	(M. Sars, 1851)	1	3	3		7
				Golfingia sp.		2				2
				Golfingia vulgaris vulgaris	(Blainville, 1827)		2			2
				Nephasoma diaphanes diaphanes	(Gerould, 1913)		1			1
				Nephasoma lilljeborgi	(Danielssen & Koren, 1880)	1				1
				Nephasoma sp.				1		1
			Phascolionidae	Phascolion sp.				16		16
				Phascolion strombus strombus	(Montagu, 1804)	30	15			45
Annelida	**Hirudinea**			Hirudinea g. sp.				1		1
		Rhynchobdellida	**Piscicolidae**	Notostomum laeve	Levinsen, 1882		1			1
	Polychaeta			Polychaeta g. sp.		21		5	14	40
		Amphinomida	**Euphrosinidae**	Euphrosine armadillo	M. Sars, 1851			2		2
				Euphrosine borealis	Oersted, 1843				1	1
				Euphrosine sp.		8	8	3		19
		Capitellida	**Maldanidae**	Maldane sarsi	Malmgren, 1867		2			2
				Maldane sp.			5			5

				Maldanidae g. sp.		1	2	4		7
				Nicomache personata	Johnson, 1901		1			1
		Chaetopterida	**Chaetopteridae**	Spiochaetopterus typicus	M. Sars, 1856	3	18			21
		Eunicida	**Lumbrineridae**	Lumbrineridae g. sp.			5			5
				Scoletoma fragilis	(Mueller, 1776)	2				2
			Onuphidae	Nothria hyperborea	(Hansen, 1878)		4			4
				Nothria sp.		12		10		22
		Flabelligerida	**Flabelligeridae**	Brada af. inhabilis	(Rathke, 1843)			2		2
				Brada granulata	Malmgren, 1867	15	12		4	31
				Brada granulosa	Hansen, 1880			20		20
				Brada inhabilis	(Rathke, 1843)	34	16	37	38	125
				Brada villosa	(Rathke, 1843)	3	3	5	3	14
				Diplocirrus hirsutus	(Hansen, 1879)		1			1
				Flabelligera affinis	M. Sars, 1829		2			2
				Flabelligera sp.				3		3
				Flabelligeridae g. sp.			1	2		3
		Opheliida	**Opheliidae**	Opheliidae g. sp.				4		4
				Travisia forbesii	Johnston, 1840			2		2
		Phyllodocida	**Aphroditidae**	Laetmonice filicornis	Kinberg, 1855	18				18
			Chrysogorgiidae	Radicipes sp.			1			1
			Glyceridae	Glycera sp.				1		1
			Hesionidae	Nereimyra punctata	(O.F. Mueller, 1788)			1		1
			Nephtyidae	Nephtyidae g. sp.			4	14	7	25
				Nephtys sp.			7	1		8
			Nereididae	Nereididae g. sp.				3		3
			Phyllodocidae	Phyllodocidae g. sp.				5		5
			Polynoidae	Harmothoe sp.		42	41	2	46	131
				Lepidonotus sp.			1			1
				Malmgrenia sp.			1			1
				Polynoidae g. sp.		2	2	49		53
		Sabellida	**Sabellidae**	Sabellidae g. sp.		25	6	7		38
			Serpulidae	Filograna implexa	Berkeley, 1827		4			4
				Placostegus tridentatus	(Fabricius, 1779)	2				2
				Serpulidae g. sp.			4	3		7
			Spirorbidae	Spirorbidae g. sp.					1	1
		Terebellida	**Ampharetidae**	Ampharete sp.			1			1
				Ampharetidae g. sp.			3			3
				Amphicteis gunneri	(M. Sars, 1835)		2			2
			Pectinariidae	Pectinaria hyperborea	(Malmgren, 1865)	15	5	5	9	34

			Terebellidae	Pista maculata	(Dalyell, 1853)		1			1
				Pista sp.			6			6
				Terebellidae g. sp.		22		18		40
				Thelepus cincinnatus	(Fabricius, 1780)		3			3
Arthropoda	**Cirripedia**	Thoracica	**Balanomorpha**	Balanus balanus	(L., 1758)		7	6		13
				Balanus crenatus	Bruguiere, 1789	1	1			2
				Balanus sp.				4	4	8
	Malacostraca	Amphipoda		Amphipoda g. sp.				1	2	3
			Acanthonotozomatidae	Acanthonotozoma cristatum	(Ross, 1835)		1	1		2
			Amathillopsidae	Amathillopsis spinigera	Heller, 1875		9		5	14
			Ampeliscidae	Ampelisca eschrichti	Kroeyer, 1842	6		8		14
				Haploops setosa	Boeck, 1871			1		1
				Haploops tubicola	Liljeborg, 1855			2		2
			Atylidae	Atylidae g. sp.			1			1
				Atylus smittii	(Goes, 1866)	1		2		3
			Calliopiidae	Cleippides quadricuspis	Heller, 1875		12		10	22
				Halirages fulvocinctus	(M. Sars, 1858)		1			1
			Corophiidae	Neochela monstrosa	(Boesk, 1861)	1				1
			Epimeriidae	Epimeria cornigera	(Fabricius, 1779)			1		1
				Epimeria loricata	G.O. Sars, 1879	38	26	19	5	88
				Paramphithoe hystrix	(Ross, 1835)	6	19	7	1	33
			Eusiridae	Eusirus cuspidatus	Kroeyer, 1845		3	1		4
				Eusirus holmi	Hansen, 1887		4		1	5
				Rhachotropis aculeata	(Lepechin, 1780)	3	10	14	1	28
				Rhachotropis helleri	A. Boeck, 1871		2	1		3
			Gammaridae	Gammaridae g. sp.		9				9
				Gammarus wilkitzkii	Birula, 1897		3			3
			Hyperiidae	Hyperia galba	(Montagu, 1813)			1		1
				Hyperia medusarum	(Muller, 1776)		1			1
				Themisto abyssorum	Boeck, 1870		6			6
				Themisto libellula	(Lichtenstein,1882)		30	11		41
			Liljeborgiidae	Lilljeborgia fissicornis	(M. Sars, 1858)		15			15
				Lilljeborgia sp.			1		1	2
			Lysianassidae	Anonyx nugax	(Phipps, 1774)		21	18		39
				Anonyx sarsi	Steele, Brunel, 1986		3			3
				Anonyx sp.		10	4	1	17	32
				Eurythenes gryllus	(Lichtenstein, 1822)		17		1	18
				Hippomedon propinquus	G.O. Sars, 1890			1		1

				Lysianassidae g. sp.		2	1			3
				Onisimus sp.				1		1
				Socarnes bidenticulatus	(Bate, 1858)			2		2
				Tmetonyx cicada	(Fabricius, 1780)	1		4		5
			Oedicerotidae	Acanthostepheia malmgreni	(Goes, 1866)	8	5	10	4	27
				Arrhis phyllonyx	(M. Sars, 1858)		2	7		9
				Paroediceros lynceus	(M. Sars, 1858)			3		3
			Pardaliscidae	Pardalisca cuspidata	Kroeyer, 1842	3	2		1	6
			Stegocephalidae	Phippsiella similis	(G.O. Sars, 1891)		4			4
				Stegocephalopsis ampulla	(Phipps, 1774)	1	2	2		5
				Stegocephalus inflatus	Kroeyer, 1842	10	18	15	30	73
		Cumacea	**Diastylidae**	Diastylis goodsiri	(Bell, 1855)	5				5
				Diastylis sp.				3		3
		Decapoda	**Crangonidae**	Pontophilus norvegicus	M. Sars, 1861	46	11	13		70
				Sabinea sarsi	Smith, 1879	10	20	9		39
				Sabinea septemcarinata	(Sabine, 1821)	18	32	79	138	267
				Sclerocrangon boreas	(Phipps, 1774)		15	6	19	40
				Sclerocrangon ferox	(G.O. Sars, 1821)	5	27	39	76	147
				Sclerocrangon sp.					2	2
			Galatheidae	Munida bamffica	(Pennant, 1777)	25				25
			Geryonidae	Geryon trispinosus	(Herbst, 1803)	2				2
			Hippolitydae	Bythocaris biruli	(Kobjakova, 1964)		23		1	24
				Bythocaris irene	Retovsky, 1946		4			4
				Bythocaris payeri	(Heller, 1875)		14			14
				Bythocaris simplicirostris	G.O. Sars, 1869			1	4	5
				Eualus gaimardi	(Milne-Edwards, 1837)		4	8	8	20
				Eualus gaimardi belcheri	(Bell, 1855)			4		4
				Lebbeus polaris	(Sabine, 1821)	21	29	37	44	131
				Spirontocaris lilljeborgii	(Danielssen, 1859)	4			1	5
				Spirontocaris phippsii	(Kroeyer, 1841)		2	1		3
				Spirontocaris sp.					1	1
				Spirontocaris spinus	(Sowerby, 1802)	7	17	16	4	44
			Hoplophoridae	Hymenodora glacialis	(Buchholz, 1874)		14			14
			Lithodidae	Lithodes maja	(L., 1758)	6	1		3	10
				Paralithodes camtschaticus	(Tilesius, 1815)				8	8
			Majidae	Chionoecetes opilio	(Fabricius, 1788)	4		7	105	116
				Hyas araneus	(L., 1758)	6	13	12	95	126
				Hyas coarctatus	Leash, 1815	35	4			39
				Hyas sp.				1		1

			Paguridae	Pagurus bernhardus	(L., 1758)	19	13	2	6	40
				Pagurus pubescens	(Kroeyer, 1838)	22	5	14	84	125
			Pandalidae	Atlantopandalus propinqvus	(G.O. Sars, 1870)	16	8	3		27
				Pandalina profunda	Holthuis, 1946		1			1
				Pandalus montagui	Leach, 1814	5	1			6
				Pandalus sp.					2	2
			Pasiphaeidae	Pasiphaea multidentata	Esmark, 1886	9	6		11	26
				Pasiphaea sivado	(Risso, 1816)	4	2			6
				Pasiphaea tarda	Krøyer, 1845		6	1		7
			Sergestidae	Eusergestes arcticus	(Kroeyer, 1855)		2			2
		Euphausiacea	**Euphausiidae**	Euphausiidae g. sp.				1		1
				Meganyctiphanes norvegica	(M. Sars, 1857)		20	32		52
				Thysanoessa inermis	(Kroeyer, 1846)			3		3
				Thysanoessa sp.				1		1
		Isopoda	**Aegidae**	Aega psora	L., 1758	4				4
				Aega sp.		3	4			7
			Gnathiidae	Gnathia sp.					1	1
			Idotheidae	Saduria sabini	(Kroeyer, 1849)	19	3	4	43	69
			Ilyarachnidae	Ilyarachna sp.			3			3
			Munididae	Munida tenuimana	Sars, 1872	4				4
			Munnopsidae	Munnopsis sp.				2		2
			Paranthuridae	Calathura brachiata	(Stimpson, 1854)	2		3		5
		Mysidacea	**Mysidae**	Mysidacea g. sp.			8			8
	Pycnogonida	Pantopoda		Pycnogonida g. sp.					67	67
			Callipallenidae	Pseudopallene brevicolis	G.O. Sars, 1891	1	6	2		9
				Pseudopallene circularis	(Goodsir, 1842)			1		1
				Pseudopallene malleolata	(G.O. Sars, 1879)	3	6			9
				Pseudopallene sp.		1				1
			Colossendeidae	Colossendeis angusta	G.O. Sars, 1877	2	10			12
				Colossendeis proboscidea	(Sabine, 1824)	1	10	1	14	26
				Colossendeis sp.					47	47
			Nymphonidae	Boreonymphon abyssorum	(Norman, 1873)	10	19	27		56
				Boreonymphon ossiansarsi	Knaben, 1972	15	6			21
				Nymphon elegans	Hansen, 1887		13	4		17
				Nymphon gracilipes	Heller, 1875	11		1		12
				Nymphon grossipes	(Fabricius, 1780)		2	1		3
				Nymphon hirtipes	Bell, 1853	19	16	42		77
				Nymphon hirtum	(Fabricius, 1780)	11	17	1		29
				Nymphon leptocheles	G.O. Sars, 1888		3			3

				Nymphon longitarse	Kroeyer, 1845		1			1
				Nymphon macronyx	G.O. Sars, 1877		5	1		6
				Nymphon megalops	Sars, 1877		1			1
				Nymphon mixtum	Kroeyer, 1844-45		2			2
				Nymphon serratum	G.O. Sars, 1879		1	1		2
				Nymphon sluiteri	Hoek, 1881			2		2
				Nymphon spinosum	(Goodsir, 1842)			1		1
				Nymphon stroemi stroemi	Kroeyer, 1845	2		26		28
Mollusca	**Bivalvia**			Bivalvia g. sp.					1	1
		Cardiiformes	**Arcticidae**	Arctica islandica	(L., 1767)				1	1
			Cardiidae	Clinocardium ciliatum	(Fabricius, 1780)	11	9	12	43	75
				Serripes groenlandicus	(Bruguiere, 1789)				17	17
			Myidae	Mya truncata	L., 1767	1	1	3	5	10
			Tellinidae	Macoma calcarea	(Gmelin, 1791)		1	1	5	7
		Cuspidariiformes	**Cuspidariidae**	Cuspidaria arctica	(M. Sars, 1859)	8	1		8	17
				Cuspidaria obesa	(Loven, 1846)			1		1
		Luciniformes	**Astartidae**	Astarte acuticostata	(Friele, 1877)			2		2
				Astarte arctica	(Gray, 1824)	1				1
				Astarte borealis	Schumacher, 1817		1		13	14
				Astarte crenata	(Gray, 1842)	41	10	24	45	120
			Hiatellidae	Hiatella arctica	(L., 1767)	7	5	16	6	34
		Mytiliformes	**Arcidae**	Bathyarca glacialis	(Gray, 1842)	35	18	11	15	79
				Bathyarca sp.				1		1
			Mytilidae	Modiolus modiolus	(L., 1758)	2			7	9
				Musculus discors	(L., 1767)		1			1
				Musculus laevigatus	(Gray, 1824)			3		3
				Mytilus edulis	L., 1758				11	11
		Nuculiformes	**Nuculanidae**	Nuculana pernula	(Mueller, 1779)		1	2	4	7
			Nuculidae	Leionucula tenuis	(Montagu, 1808)			1		1
				Nucula sp.					1	1
			Yoldiidae	Yoldia hyperborea	(Torell, 1859)		6	3		9
				Yoldiella intermedia	(M. Sars, 1865)		1			1
				Yoldiella nana	(M. Sars, 1865)			1		1
				Yoldiella sp.					1	1
		Pectiniformes	**Anomiidae**	Anomia squamula	(L., 1767)			2		2
			Pectinidae	Chlamys islandica	(O.F. Mueller, 1776)	13	21	30	81	145
				Chlamys sulcata	(O.F. Mueller, 1776)				3	3
				Delectopecten vitreus	(Gmelin, 1791)	1				1

				Pseudamussium septemradiatum	(Mueller, 1776)	14				14
			Propeamussiidae	Arctinula greenlandica	(Sowerby, 1842)	22	4	7	22	55
				Cyclopecten imbrifer	(Lovén, 1846)	2	1			3
	Caudofoveata			Caudofoveata g. sp.				3	2	5
	Cephalopoda			Cephalopoda g. sp.					1	1
		Octopoda	**Bathypolypodinae**	Bathypolypus arcticus	(Prosch, 1849)	8	17	4	47	76
				Benthoctopus sp.			5	1	3	9
			Cirroteuthidae	Cirroteuthis muelleri	Eschricht, 1836		4			4
		Sepiida	**Sepiolidae**	Rossia palpebrosa	Owen, 1834	14	8	2	100	124
				Rossia sp.		14		1		15
		Teuthida	**Gonatidae**	Gonatus fabricii	(Lichtenstein, 1818)	3	27	7	6	43
	Gastropoda			Gastropoda g. sp.		3		1		4
		Bucciniformes	**Beringiidae**	Beringius ossiani	(Friele, 1879)	4	3	1	21	29
				Beringius turtoni	(Bean, 1834)	1			2	3
			Buccinidae	Buccinidae g. sp.				10		10
				Buccinum angulosum	Gray, 1839				16	16
				Buccinum belcheri	Reeve, 1855				1	1
				Buccinum ciliatum ciliatum	(Fabricius, 1780)		1			1
				Buccinum ciliatum sericatum	Hancock, 1846	2		1	2	5
				Buccinum cyaneum	Bruguiere, 1789-1792	1			9	10
				Buccinum elatior	(Middendorff, 1849)		4	4	72	80
				Buccinum finmarchianum	Verkruezen, 1875	5	2	6	7	20
				Buccinum fragile	Verkruezen in G.O. Sars, 1878	5	6	7	39	57
				Buccinum glaciale	L., 1761				13	13
				Buccinum hydrophanum	Hancock, 1846	9	16	15	67	107
				Buccinum maltzani	Pfeiffer, 1886			3	1	4
				Buccinum micropoma	Jensen in Thorson, 1944			3	5	8
				Buccinum nivale	Friele, 1882	4		1	1	6
				Buccinum polare	Gray, 1839		1		10	11
				Buccinum sp.		2		3	1	6
				Buccinum undatum	L., 1758	2			2	4
				Colus altus	(S. Wood, 1848)	3	1	1	20	25
				Colus holboelli	(Moeller,1842)	9	2	1	1	13
				Colus islandicus	(Mohr, 1786)	31	4	4	70	109

				Colus kroyeri	(Moeller,1842)			1		1
				Colus latericeus	(Moeller,1842)			1		1
				Colus pubescens	(Verrill, 1882)	5	1	6	3	15
				Colus sabini	(Gray, 1824)	20	19	18	104	161
				Colus sp.		1	1	6		8
				Colus turgidulus	(Jeffreys, 1877)	2		5	8	15
				Eggs Buccinidae g. sp.					10	10
				Neptunea communis	(Middendorff, 1901)				14	14
				Neptunea denselirata	Brogger, 1901	2	2		33	37
				Neptunea despecta	(L., 1758)	14	1		29	44
				Neptunea sp.				1	2	3
				Neptunea ventricosa	(Gmelin, 1789)				34	34
				Pyrulofusus deformis	(Reeve, 1847)				3	3
				Turrisipho dalli	(Friele in Tryon, 1881)	3				3
				Turrisipho lachesis	(Moerch, 1869)	8	12	4	41	65
				Turrisipho moebii	(Dunker & Matzger, 1874)	1			1	2
				Turrisipho sp.		1				1
				Turrisipho voeringi	Bouchet et Waren, 1985		2			2
				Volutopsis norvegicus	(Gmelin, 1790)	5		5	40	50
			Muricidae	Boreotrophon truncatus	(Stroem, 1767)		2			2
		Caenogastropoda	**Newtoniellidae**	Laeocochlis sinistratus	(Nyst, 1835)	1				1
		Cephalaspidea	**Philinidae**	Philine finmarchica	G.O. Sars, 1878		19	22	14	55
				Philinidae g. sp.		14		2		16
			Scaphandridae	Scaphander punctostriatus	(Mighels & Adams, 1842)				20	20
				Scaphander sp.		10				10
		Cerithiiformes	**Naticidae**	Bulbus smithi	Brown, 1839	20	1	1	10	32
				Cryptonatica affinis	(Gmelin, 1791)	8	4	1	39	52
				Lunatia pallida	(Broderip & Sowerby, 1829)	11	6	5	28	50
				Naticidae g. sp.				1		1
			Trichotropidae	Torellia delicata	(Philippi, 1844)		2			2
			Velutinidae	Limneria undata	(Brown, 1838)	3	8	3	5	19
				Onchidiopsis glacialis	(M. Sars, 1851)			2	9	11
				Velutina sp.				1		1
		Coniformes	**Admetidae**	Admete viridula	(Fabricius, 1780)		1		2	3
			Turridae	Oenopota sp.		1				1
		Epitoniiformes	**Epitoniidae**	Boreoscala groenlandica	(Moeller, 1842)				3	3

				Epitonium sp.		1				1
		Nudibranchia		Hexabranchus sanquineus	(Ruppel & Leuckart, 1830)			1		1
				Nudibranchia g. sp.		4	8	7	30	49
			Aldisidae	Aldisa zetlandica	(Alder et Hancock, 1854)			3		3
			Cadlinidae	Cadlina laevis	(L., 1767)		1			1
			Dendronotidae	Dendronotus frondosus	(Ascanius, 1774)	1				1
				Dendronotus robustus	Verrill, 1870		3			3
				Dendronotus sp.			1	10		11
			Onchidoridiae	Onchidoridae g. sp.		26				26
		Patelliformes	**Lepetidae**	Lepeta caeca	(O.F. Mueller, 1776)	2	1	1		4
			Tecturidae	Capulacmaea radiata	(M. Sars, 1851)			1	3	4
		Pleurotomariiformes	**Fissurellidae**	Puncturella noachina	(L., 1771)	1	1			2
		Pneumodermatiformes	**Clionidae**	Clione limacina	(Phipps, 1774)		1	15		16
		Trochiformes	**Trochidae**	Margarites costalis	(Gould, 1841)		3	2	10	15
				Margarites groenlandicus groenlandicus	(Gmelin, 1790)	1	2	2	2	7
				Margarites sp.				1		1
	Polyplacophora	Chitonida	**Ischnochitonidae**	Stenosemus albus	(L., 1767)		1			1
			Tonicellidae	Tonicella marmorea	(Fabricius, 1780)			1		1
		Lepidopleurida	**Hanleyidae**	Hanleya hanleyi	J.E. Gray, 1857	5	1			6
			Leptochitonidae	Leptochiton arcticus	(G.O. Sars, 1878)	1				1
	Solenogastres			Solenogastres g. sp.			1			1
		Cavibelonia	**Proneomeniidae**	Proneomenia sluiteri	Huebrecht, 1880	5				5
				Proneomenia sp.		2				2
Echinodermata	**Asteroidea**	Forcipulatidae	**Asteriidae**	Asterias rubens	L., 1758	2		3		5
				Asteriidae g. sp.		2			1	3
				Icasterias panopla	(Stuxberg, 1879)	13	21	24	94	152
				Leptasterias muelleri	(M. Sars, 1846)		1			1
				Leptasterias sp.		6	2	4	45	57
				Stichastrella rosea	(O.F. Mueller, 1776)	5				5
				Urasterias linckii	(Mueller & Troschel, 1842)	11	8	23	119	161
			Pedicellasteridae	Pedicellaster typicus	M. Sars, 1861			2		2
		Notomyotida	**Benthopectinidae**	Pontaster tenuispinus	(Dueben & Koren, 1846)	50	29	47	103	229
		Paxillosida	**Astropectinidae**	Bathybiaster vexillifer	(W. Thomson, 1873)		15		15	30

				Leptychaster arcticus	(M. Sars, 1851)	24	3			27
				Psilaster andromeda	(Mueller & Troschel, 1842)				1	1
			Ctenodiscidae	Ctenodiscus crispatus	(Retzius, 1805)	49	39	64	140	292
		Spinulosida	**Echinasteridae**	Henricia sp.		52	31	16	87	186
		Valvatida	**Goniasteridae**	Ceramaster granularis granularis	(Retzius, 1783)	24	1	1	2	28
				Hippasteria phrygiana phrygiana	(Parelius, 1768)	17	2		16	35
				Pseudarchaster parelii	(Dueben & Koren, 1846)	3	1			4
			Poraniidae	Poraniomorpha bidens	Mortensen, 1932		2		6	8
				Poraniomorpha hispida	(Sars, 1872)	25			3	28
				Poraniomorpha sp.					1	1
				Poraniomorpha tumida	(Stuxberg, 1878)	6	6	9	51	72
				Tylaster willei	Danielssen & Koren, 1881				3	3
		Velatida	**Pterasteridae**	Diplopteraster multipes	(M. Sars, 1877)	1				1
				Hymenaster pellucidus	W. Thomson, 1873	11	18	4	23	56
				Pteraster militaris	(O.F. Mueller, 1776)	17	17	15	53	102
				Pteraster obscurus	(Perrier, 1891)	3	9	4	12	28
				Pteraster pulvillus	M. Sars, 1861	21	19	5		45
				Pteraster sp.					1	1
			Solasteridae	Crossaster papposus	(L., 1768)	18	22	18	80	138
				Lophaster furcifer	(Dueben & Koren, 1846)	4	4	13	32	53
				Solaster endeca	(L., 1771)	4		4		8
				Solaster glacialis	(Danielssen & Koren, 1881)		3			3
				Solaster sp.		1		1	77	79
				Solaster syrtensis	Verrill, 1894	2	4	3		9
	Crinoidea	Bourgueticrinida	**Bathycrinidae**	Bathycrinus carpenteri	(Danielssen & Koren, 1877)		1			1
		Comatulida	**Antedonidae**	Heliometra glacialis	(Owen, 1833)		15	27	52	94
				Poliometra prolixa	(Sladen, 1881)		14			14
	Echinoidea	Echinoida	**Echinidae**	Echinus esculentus	L., 1758	6				6
				Echinus sp.		14				14
			Strongylocentrotidae	Strongylocentrotus droebachiensis	O.F. Mueller, 1776		42	1	2	45
				Strongylocentrotus pallidus	(G.O. Sars, 1871)	15	4	41	99	159
				Strongylocentrotus sp.		16		8		24
		Spatangoida	**Spatangidae**	Brisaster fragilis	(Dueben & Koren, 1846)	21			1	22

				Spatangus purpureus	(O.F. Mueller, 1776)	4				4
	Holothuroidea			Holothuroidea g. sp.				1	2	3
		Apodida	**Myriotrochidae**	Myriotrochus rinkii	Steenstrup, 1851	14	1	20	13	48
				Myriotrochus sp.			1	1		2
		Aspidochirotida	**Stichopodidae**	Stichopus tremulus	(Gunnerus, 1767)	18				18
		Dendrochirotida	**Cucumariidae**	Cucumaria frondosa	(Gunnerus, 1867)	3		3	12	18
				Pentamera calcigera	(Stimpson, 1851)				3	3
			Phyllophoridae	Thyonidium drummondi	(Thompson, 1840)	3		1		4
				Thyonidium sp.					18	18
			Psolidae	Psolus phantapus	Strussenfelt, 1765	1	5	1	41	48
				Psolus squamatus	(O.F. Muller, 1776)	7	2	3		12
		Molpadiida	**Caudinidae**	Eupyrgus scaber	Luetken, 1857			2		2
			Molpadiidae	Molpadia arctica	von Marenzeller, 1878				7	7
				Molpadia borealis	(M. Sars, 1859)	38	17	18	90	163
	Ophiuroidea			Ophiurida g. sp.		6				6
		Euryalida	**Gorgonocephalidae**	Gorgonocephalus arcticus	(Leach, 1819)		22	24	50	96
				Gorgonocephalus eucnemis	(Mueller & Troschel, 1842)	2	11	25	38	76
				Gorgonocephalus lamarcki	(Mueller & Troschel, 1842)	1				1
				Gorgonocephalus sp.				3		3
		Ophiurida	**Ophiacanthidae**	Ophiacantha abyssicola	G.O. Sars, 1871	3				3
				Ophiacantha bidentata	(Retzius, 1805)	10	39	70	116	235
			Ophiactidae	Ophiopholis aculeata	(L., 1767)	49	44	51	66	210
			Ophiomyxidae	Ophioscolex glacialis	Mueller & Troschel, 1842	10	27	39	59	135
			Ophiuridae	Ophiocten sericeum	(Forbes, 1852)		15	7	11	33
				Ophiopleura borealis	Danielssen & Koren, 1877	1	14	20	50	85
				Ophiura robusta	(Ayers, 1851)			6		6
				Ophiura sarsi	Luetken, 1855	38	44	42	75	199
				Ophiura sp.		1				1
				Stegophiura nodosa	(Luetken, 1854)				3	3
Brachiopoda	**Craniata**	Craniida	**Craniidae**	Novocrania anomala	(Mueller, 1776)		1			1
	Rhynchonellata	Rhynchonellida	**Hemithyrididae**	Hemithyris psittacea	(Gmelin, 1790)	1	6	6	20	33
		Terebratulida	**Cancellothyrididae**	Terebratulina retusa	(L., 1758)	18	10		5	33

			Macandreviidae	Macandrevia cranium	(Mueller, 1776)	12				12
Bryozoa	**Gymnolaemata**			Bryozoa g. sp.		11		8		19
		Cheilostomida	**Bicellariidae**	Dendrobeania sp.		6				6
			Celleporidae	Cellepora sp.		6	3	7		16
			Flustridae	Flustra foliacea	(L., 1758)		1			1
				Flustra sp.		6	1	37	1	45
			Myriaporidae	Myriapora coarctata	(M. Sars, 1863)		1			1
				Myriapora sp.		5	8			13
			Reteporidae	Retepora beaniana	King, 1846	14		3		17
				Retepora sp.			1	2		3
				Sertella septentrionalis	Jullen, 1933		14		1	15
			Schizoporellidae	Myriozoella sp.				5		5
			Scrupariidae	Eucratea loricata	(L., 1758)	3		14		17
			Scrupocellariidae	Scrupocellaria sp.				1		1
				Tricellaria sp.				1		1
			Smittinidae	Parasmittina jeffreysii	(Norman, 1903)	11	1	1		13
				Porella sp.			1	9		10
				Smittina sp.				1		1
		Ctenostomata	**Alcyonidiidae**	Alcyonidium proboscideum	(Kluge, 1962)		1			1
				Alcyonidium disciforme	Smitt, 1872			1	7	8
				Alcyonidium gelatinosum	(L., 1767)		6	42	3	51
				Alcyonidium sp.		1	1	2		4
		Cyclostomata	**Corymboporidae**	Defrancia lucernaria	(M. Sars, 1851)	2	2			4
			Diastoporidae	Diplosolen intricarius	(Smitt, 1872)	4	3	4		11
			Horneridae	Hornera sp.		17	1			18
				Stegohornera lichenoides	(L., 1758)	1	11	8		20
			Idmidroneidae	Idmidronea atlantica	(Forbes, 1847)		2			2
		Cyclostomatida	**Crisiidae**	Crisiella producta	(Smitt, 1865)		1			1
Chaetognatha	**Sagittoidea**			Chaetognatha g. sp.			2			2
Chordata	**Ascidiacea**			Ascidiacea g. sp.		47	4	4	36	91
		Aplousobranchia	**Didemnidae**	Didemnidae g. sp.				2		2
				Didemnum albidum	(Verrill, 1871)		13	3		16
			Polycitoridae	Eudistoma vitreum	(Sars, 1851)		7			7
			Polyclinidae	Aplidium glabrum	(Verrill, 1871)			1		1
		Phlebobranchia	**Ascidiidae**	Ascidia prunum	(Mueller, 1776)	5	5	8		18
				Ascidia sp.			1			1
			Cionidae	Ciona intestinalis	(L., 1767)	5	3		19	27
		Stolidobranchia	**Molgulidae**	Eugyra pedunculata	Traustedt, 1886			1		1
				Molgula sp.		1	9			10

				Molgulidae g. sp.		1				1
			Pyuridae	Boltenia echinata	(L., 1767)		3	4	3	10
				Halocynthia pyriformis	(Rathke, 1806)		1	1		2
				Microcosmus glacialis	(M. Sars, 1859)		5	3		8
				Pyura sp.		1	1			2
				Pyuridae g. sp.		1				1
			Styelidae	Botryllus schlosseri	(Pallas, 1776)			18		18
				Dendrodoa aggregata	(Rathke, 1806)		1			1
				Dendrodoa grossularia	(Van Baneden, 1846)		2			2
				Styela coriacea	(Alder & Hancock, 1848)		1	2		3
				Styela rustica	(L., 1767)		4	2	4	10
Total						**2 609**	**2 245**	**2 504**	**4 650**	**12 008**

JOINT REPORT

Institute of Marine Research
Nordnesgaten 50,
5817 Bergen
Norway

Polar Research Institute of Marine Fisheries and Oceanography (PINRO)
6 Knipovich Street,
183763 Murmansk
Russia