

5.6.1. Demersal fish species

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The aim of the demersal fish investigations is to obtain data for abundance, distribution and growth of cod and haddock, and also to obtain data for feeding habits of cod. The results from the bottom trawling are also useful for monitoring other species, both commercial and non-commercial, as well as in an ecological context. Catch per nautical mile from the “Super” stations generate the basis for estimates of bottom trawl indices (swept-area estimates) for each year class (or length group) of the different demersal fish species. So far no attempts have been made to calculate acoustic abundance indices for demersal fish, although the main groups of demersal fish are separated out during the judging of the acoustic recordings.

Stock sizes estimation

The computations of number and biomass per length groups were calculated from bottom trawl catches based on “swept-area” method (Jacobsen, 1997).

Length based indices for each trawl station and length, fish density was estimated by:

$$P_{s,l} = \frac{f_{s,l}}{a_{s,l}},$$

where:

$P_{s,l}$ is the number of fish/n.m.² observed at station s (length l)

$f_{s,l}$ is the estimated frequency of length l

$a_{s,l}$ is swept area given by

$$a_{s,l} = \frac{d_s * EW_l}{1852}$$

d_s is towed distance (n.m.)

EW_l is the length dependent effective swept width.

For Greenland halibut, redfish, long rough dab and the catfishes, there is no available estimate of the length dependent effective swept width, so it was set to 25 m, independent of fish length and trawl depth.

Based on (Dickson 1993a; Dickson 1993b), length dependent effective fishing width for cod and haddock was included in the calculations where EW was:

$$EW_i = \alpha l^\beta \quad \text{for} \quad l_{\min} < l < l_{\max}$$

$$EW_i = \varnothing W_{l_{\min}} = \alpha l_{\min}^\beta \quad \text{for} \quad l \leq l_{\min}$$

$$EW_i = \varnothing W_{l_{\max}} = \alpha l_{\max}^\beta \quad \text{for} \quad l \geq l_{\max}$$

The parameters used for cod and haddock are given in the text table:

Species	α	β	l_{\min}	l_{\max}
Cod	5.91	0.43	15 cm	62 cm
Haddock	2.08	0.75	15 cm	48 cm

Point observations for fish density based on length (l) was summed up in 5cm length groups denoted by $p_{s,l}$. Stratified abundance indices for each length group and strata range were generated using

$$L_{p,l} = \frac{A_p}{S_p} * \sum P_{s,l}$$

where: $L_{p,l}$ is the index for stratum p , length group l

A_p area (n.m.²) of stratum p

S_p is the number of stations in stratum p

The strata system was constructed based on standard “low areal” WMO squares, 0.5 x 2 degrees (Figure 5.6.1.). Covering the whole Barents Sea and include all survey area. This geographic system is also depth stratified by depth: <100, 100-200, 200-300, 300-400 and >400 m (Figure 5.6.2.). The GEBCO[®] depths data has been used.

In the absence of data within WMO squares, data are interpolated within the same depth ranges from neighboring squares. Extrapolation of the data in the boundary squares requires no more than 1 square of WMO. For each WMO area, the total number of fish in each length group was estimated by summing over all depth data. Finally, the total index for each length class is the sum of the values for all WMO areas. A separate length/weight key was

calculated for each year and the entire area as a whole. The “weight” of length-age key from each sampling for total key depends from numbers of fish in trawl catches.

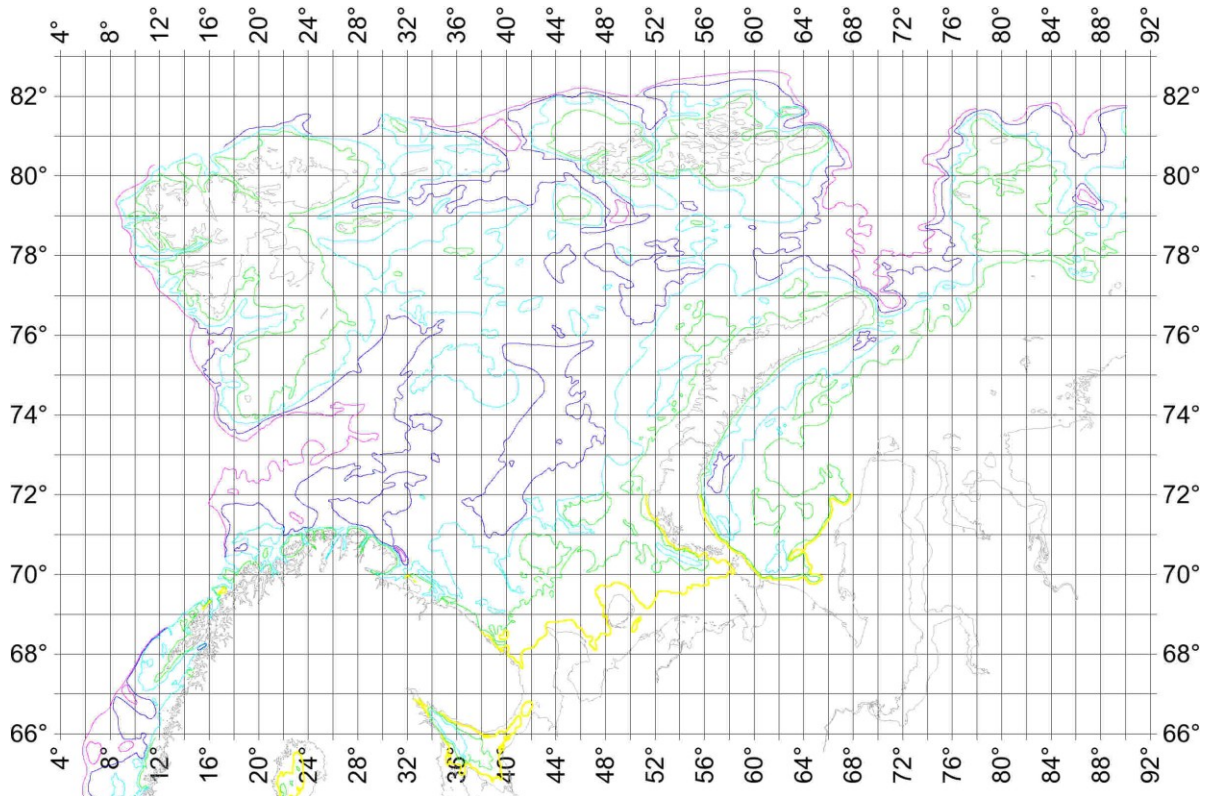


Figure 5.6.1. The WMO squares (0.5x2 degrees) are depth stratified (<100, 100-200, 200-300, 300-400 and >400 m). using GEBCO[®] depths data.

Survey delivers spatial densities per station to the “FishExChange” database and the relative abundance indices to the “Sjømil” database and all collected data are stored at Norwegian marine data centre. Surveys data and results are reported to the ICES (AFWG) The Arctic Fisheries Working Group, The Research Council of Norway, Barentswatch portal and used for internal map production.

Stock abundance indices estimated by the method explained above are calculated for the some demersal species. These are reported to The Arctic Fisheries Working Group (ICES AFWG).