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DESCRIPTION OF THE NORWEGIAN/RUSSIAN STOMACH DATA SET

by

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INTRODUCTION

In the beginning of the 1980's the work on a multispecies model for the Barents Sea was initiated at IMR, Bergen. An essential requirement for the model is quantitative data on the cod stock's food selection, and a stomach sampling program on cod started winter 1984. A stomach content data base has been built up, and data on other species than cod have been included in the base.

The resources needed for developing multispecies models often exceeds what can be expected to be spent by one country. Especially, the data requirements are high. The stomach data must be extensive, both in time and space, and the predators' main area of distribution should be covered at several times of the year. To meet this requirement, an exchange program between IMR and PINRO, Murmansk, Russia, was initiated in 1987.

METHODS

The methods used for sampling, stomach analysis, data recording and computer input are mainly the same as for the ICES "Stomach Sampling Project 1981" in the North Sea (Anon. 1974, 1980, 1981; Westgård 1982; Mehl 1986, Christiansen 1987; Tretyak *et al.* 1990). Samples have been collected onboard Norwegian and Russian research vessels during routine surveys in the Barents Sea and the Svalbard area. The gears used are both pelagic and bottom trawl, but the bulk of the samples are taken by the latter. The trawl stations are either randomly spread within strata in the investigated area (several strata systems, see Figure 1-3), the stations are fixed or the trawl hauls are made on basis of acoustic information. Trawling continues over 24 hours per day.

The stomach sampling strategy has been adjusted to the two countries' survey programs. On Norwegian surveys, the aim has been to collect up to 5 stomachs of cod for each 5-cm lengthgroup on stations with other biological sampling (otoliths etc.). At least one station within each stratum is sampled (the station might be either fixed, random or based on acoustic information), but normally 2-3 stations are sampled within each stratum. Based on the work by Bogstad *et al.* (1991), now (from winter 1992) only 2 stomachs are samled within each 5-cm length group, but more stations are sampled within each stratum (3-4). Portion of samples collected by PINRO has been obtained in special cruises for observations over daily dynamics of fish feeding. In these cases the samples have been taken in the same area in definite intervals of time during a day or more (Tarverdieva and Yaragina 1989; Dolgov 1989; Dolgov and Yaragina 1990). These data are not included in the present data set.

Fish which show evidence of regurgitation, are if possible replaced with non-regurgitating feeding fish. On board Norwegian vessels, each stomach is frozen separately as soon as possible after sampling. Data on each individual predators length, weight, sex, maturity stage and the number caught of the same length in the trawl haul are recorded together with the station data. Age data are included later after the otoliths are read and age determined. Onboard Russian vessels, the stomachs are preserved individually in 4% formalin.

In the laboratory, the frozen stomachs are opened as soon as practically possible. Fish prey and shrimps are identified to species level when possible, other prey is identified to species level when practical. Each recognizable prey species, genus, family or higher order are split into size-classes and damp dried on bibolus paper. Digestion degree, numbers and total wet weight, measured to the nearest milligram, are recorded for each size-class and prey category seperately.

Table 1 presents the total number of stomachs included in the data base by species and year. All together data from 64509 fish are now in the base. The cod stomachs are sampled from 1950 to 1991, but the bulk of them are from 1984 and onwards. Only the latter data are included in the present data set. As earlier mentioned, data from Russian "many-day-stations" are not included.

Table 1. Number of stomachs included in the Norwegian-Russian stomach data base at 15 May 1992 by species and year.

Year	Cod	Hadd.	Capel.	Herr.	Redf.	Blue W.	Pol c.	Plaice
1950	141							
1951	25							
1952	616							
1954	134							
1955	188							
1956	1005				74			
1957	522							
1958	453							
1959	1028							
1960	186							
1973	174							
1975	199							
1980	608	241	125					
1981	408							
1982	833		225					
1983			441					
1984	3731	593	636	998				
1985	4153	1240	98	430		21		
1986	6044	1228	365	77		103	208	
1987	5945	1025	50			228	488	
1988	5597	2477			110		752	15
1989	7122	2311	728				625	32
1990	6359	853						
1991	2241							

THE DATA SET

Year, nation, ship, station number and fish number constitute a unique sample number. In principle, predator code should also be included here, but we deal with only one predator (cod).

The temperature was calculated in the same way as in the MULTSPEC model. Temperature data from standard hydrographic sections are used. At different depths and over different parts of the sections Fourier analysis is used on the temperature data. The temperature is then integrated in time for a representative location in each area to give one temperature for each year, area and month. The procedure is documented in Alvarez and Tjelmeland (1989). Due to problems with the temperature data base, this has been done only for the period 1980-1987. The temperatures in 1988, 1989, 1990 and 1991 have been set equal to the temperature in 1987, adjusted by the differences in the yearly mean in the Kola section between these years. These differences are 0.3, 0.9, 1.1 and 1.0° C respectively (PINRO, Murmansk, pers. comm.).

The CPUE for the Norwegian data is calculated as the number of fish caught per hour of the actual 1-cm length group. The CPUE for the Russian data is unknown.

The local time is set to UTC + 1 hour. 24 hours are subtracted if the local time then becomes > 2400, but the date is not changed accordingly (e.g. September 17 2318 UTC becomes Sep 17 0018 local time and not Sep 18 0018 local time which would be correct).

The number of stomachs with skeletal remains and skeletal remains as digestion stage is not registered.

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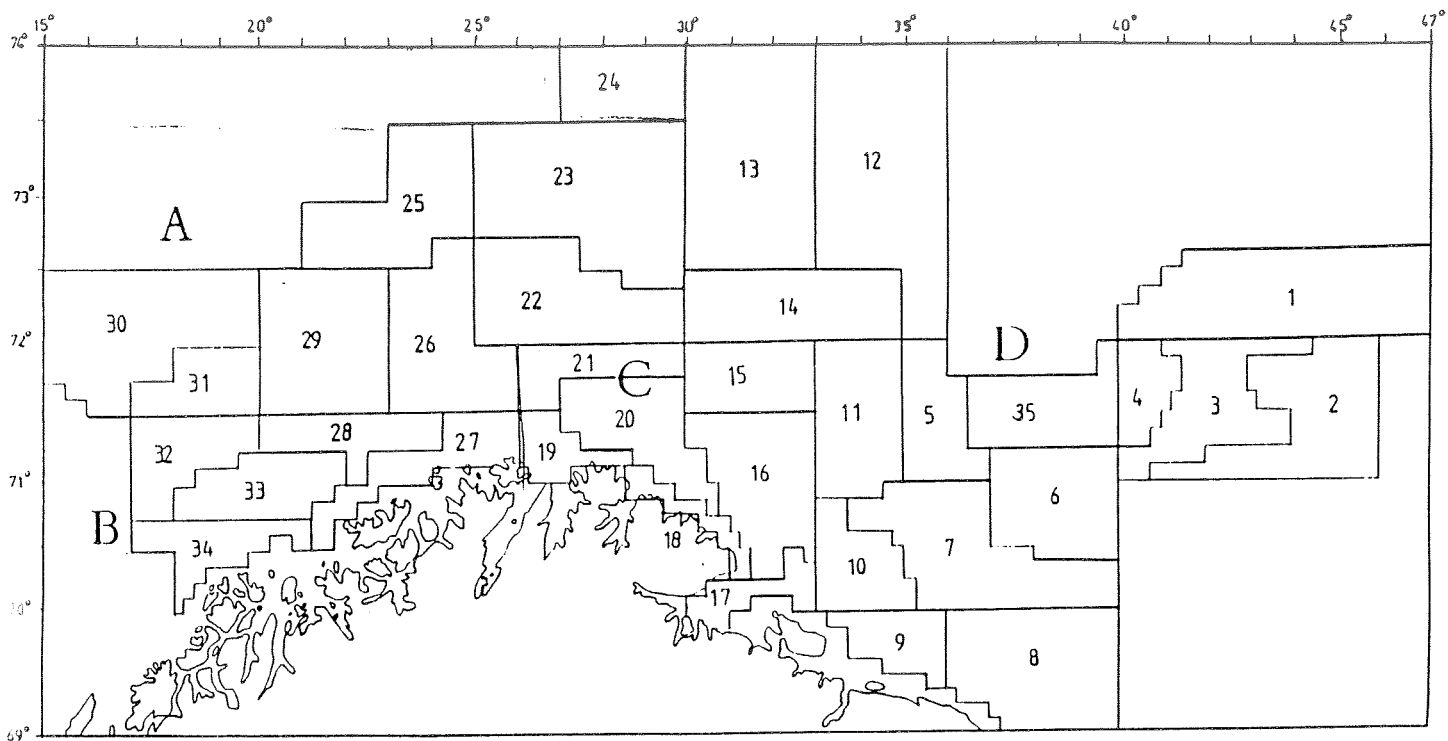


Figure 1. Strata codes for Norwegian bottom trawl surveys in the Barents Sea in winter.

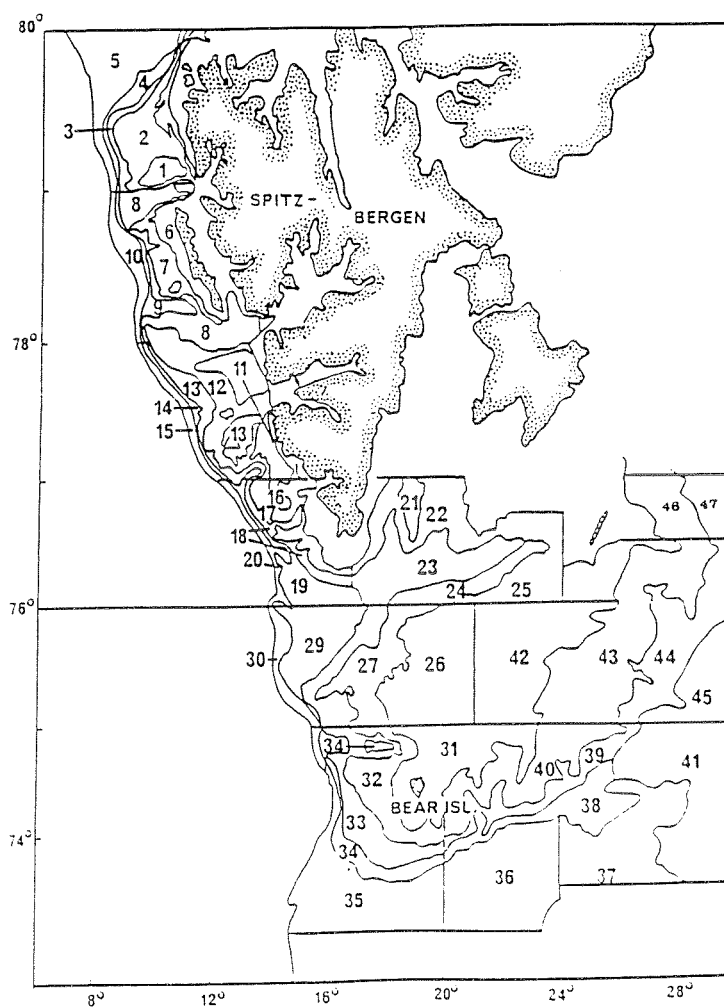


Figure 2. Strata codes for Norwegian bottom trawl surveys in the Svalbard area in autumn.

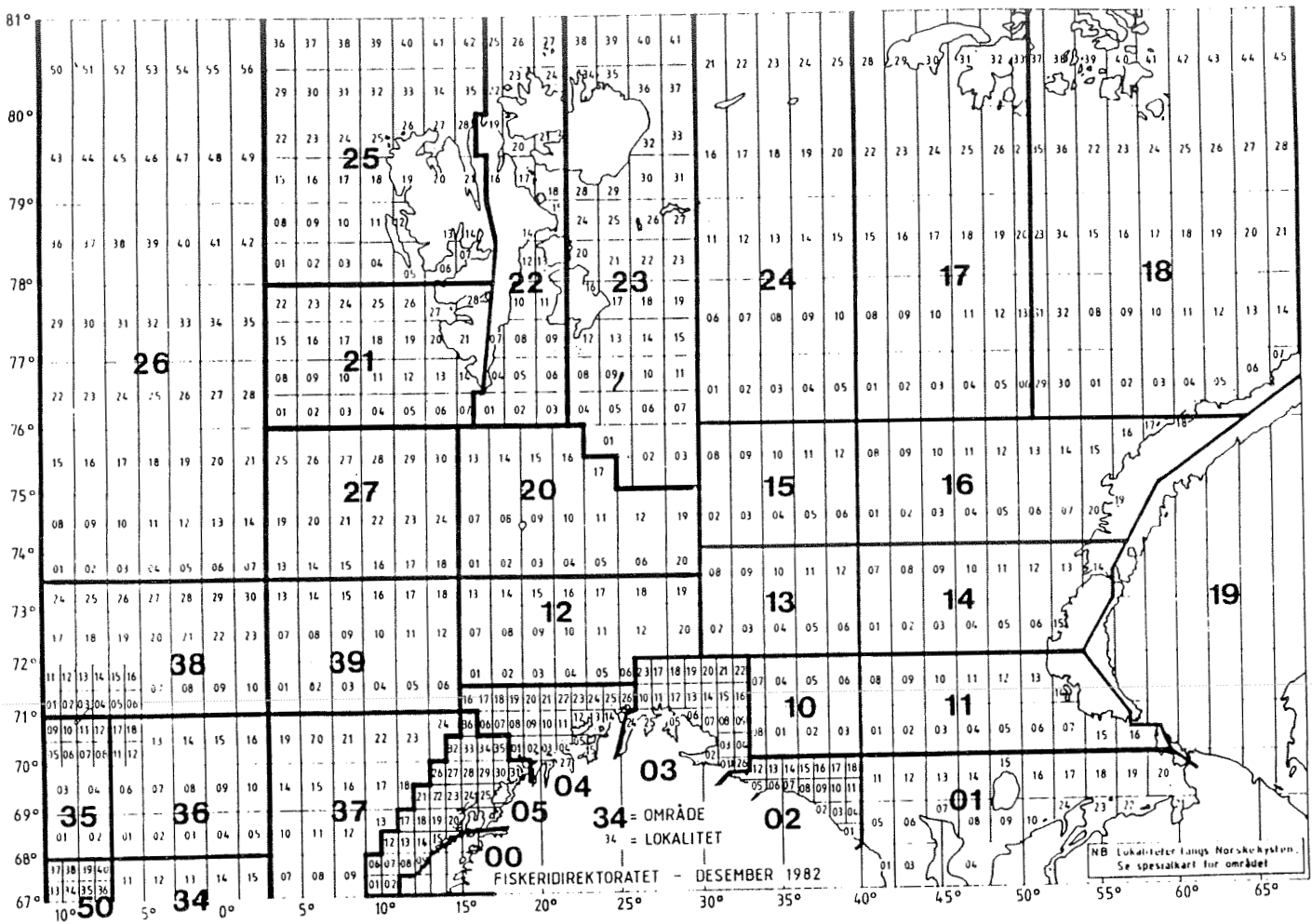


Figure 3. Norwegian statistical areas for catch, the strata system used during Norwegian bottom trawl surveys in autumn.

