

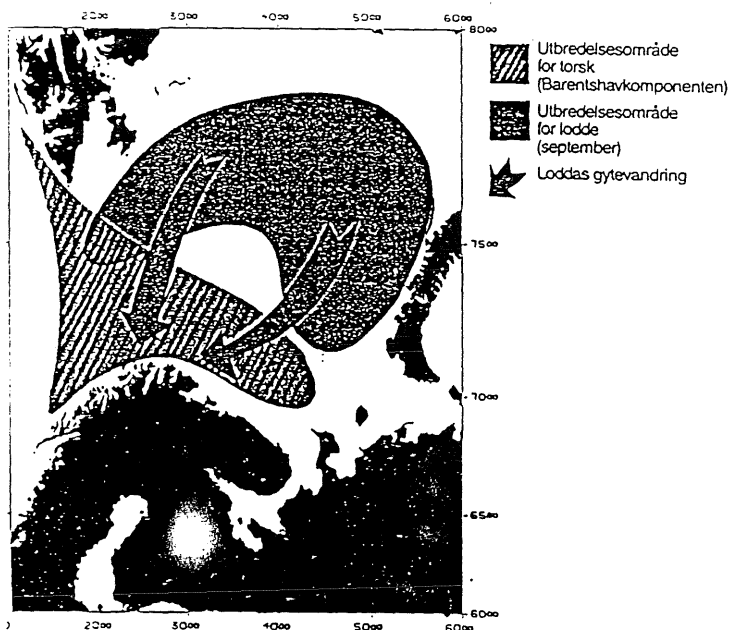
THE PREDATION OF COD ON CAPELIN 1983-1988

by

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The North-East arctic cod stock started to grow in 1983 because of rich year-classes in 1983 and subsequent years. The poster describes the effect of the growing cod stock on capelin through predation. The consumption is calculated using stomach data and the most recent values of stomach evacuation rates from experiments in Balsfjord, Northern Norway. These experiments are carried out by the University of Tromsø.

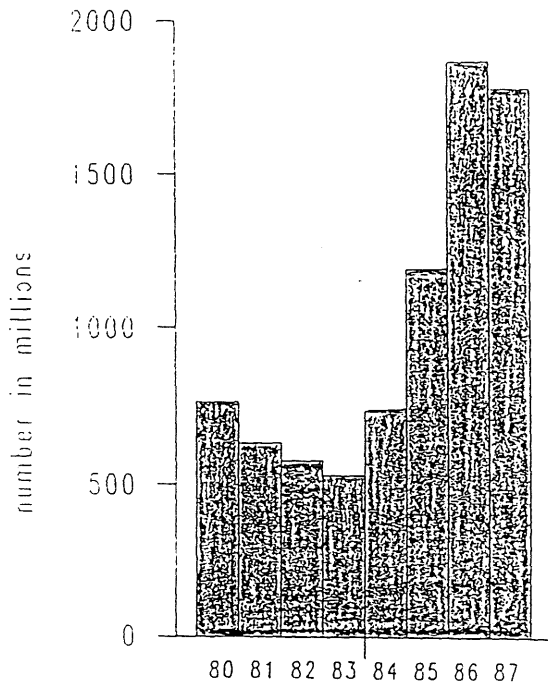


The map to the left shows the geographical distribution of cod during the period January-March and the geographical distribution of capelin in September. The smallest cod is found in the eastern part of the area. The capelin spawning migration in the period January-March is shown with arrows. While the geographical overlap between these species is small during the autumn, the spawning migration of capelin leads to overlap of cod and mature capelin in the spring.

The extent of overlap, and the individual size of cod that overlaps the mature capelin, is largely determined by the geographical location of the capelin spawning migration. In the 1970's there was largely an eastern migration, while in the 80-ies the migration was more westerly, leading to spawning towards the western border of the Barents Sea.

Also, there may be a considerable degree of overlap between cod and immature capelin during the period April-July. However, this varies from year to year, probably linked to environmental conditions.

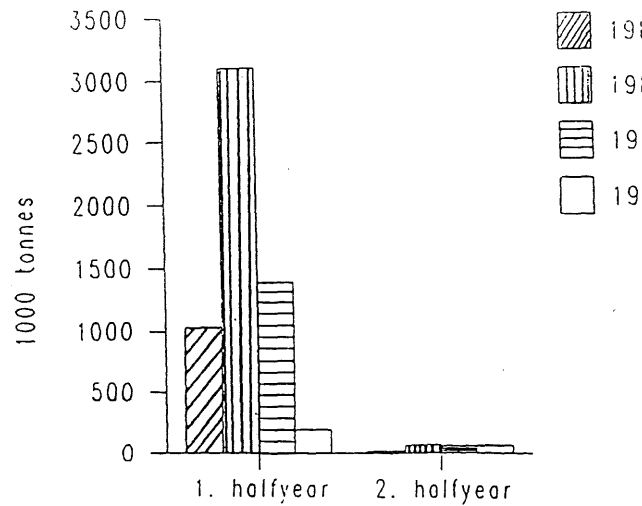
NORTHEAST ARCTIC COD
development age 3+ in 1980-87



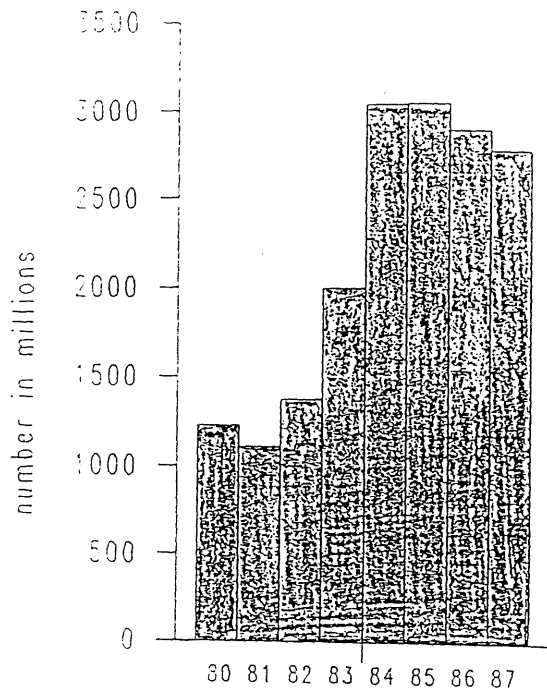
The figure to the left shows the development in numbers of adult (3+) Northeast Arctic cod in 1980 - 1987, based on 1987-VPA data. In 1984 the adult part of the cod stock started to increase because of improved recruitment in the beginning of the 80's. At the same time a stomach sampling program started in the Barents Sea. On this basis stomach content weights and diet composition data from this programme, plus preliminary data on gastric evacuation rates from an experiment now in progress in Northern Norway, and the number and distribution of cod in each age group, the cod stock's annual food consumption is estimated.

From age 3 cod are capable of eating considerable amounts of adult capelin. The figure to the right shows the adult cod stock's consumption of adult capelin in 1984 - 1987, by halfyear. Normally 90% of this consumption takes place in the first part of the year during the capelin's spawning migration. The estimated consumption of capelin was 3 times higher in 1985 than 1984, while the number of adult cod only increased by 50%. The reason for this was probably a better overlap between the two stocks during the period of investigation in 1985. In 1986 consumption decreased by more than 50% even though the adult cod stock continued to increase, and by the end of 1986 the capelin stock was seriously depleted.

BIOMASS ADULT CAPELIN
consumed by adult cod in 1984-1987



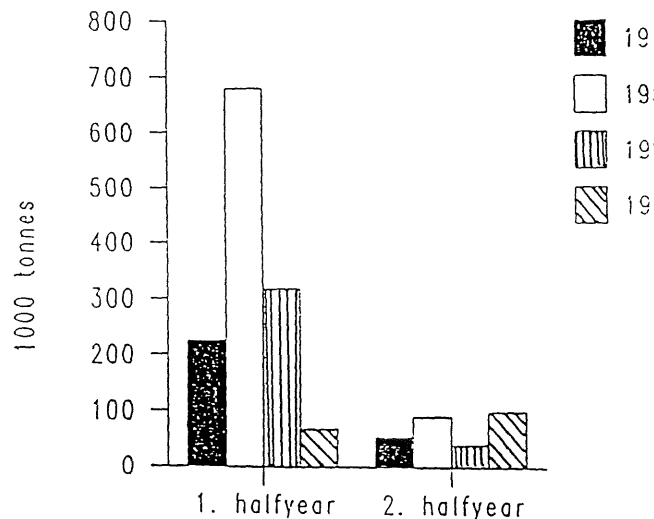
NORTHEAST ARCTIC COD
stock development in 1980-87



The figure to the left shows the development in numbers of the total Northeast Arctic cod stock in 1980 - 1987, based on 1987-VPA data. The numbers in age groups 1 and 2 are backcalculations of the recruitment prognosis, using natural mortality (M) = 0.2. The stock increased in numbers from 1981 to 1984 and then levelled out.

Cod start to eat considerable amounts of juvenile capelin already from age 1, and the figure to the right shows the total cod stock's consumption of juvenile capelin in 1984 - 1987, by halfyear. In the first part of the year the 2-group of capelin contributes most to this consumption, which was highest in 1985. In the second part of the year the 1-group of capelin dominates, and contributes just as much as all the other age groups together to the consumption of adult capelin (see also figure above). The consumption of 1-group capelin was actually highest in 1987, when the 1986 year-class was about all that was left of the capelin stock.

BIOMASS JUVENILE CAPELIN
consumed by cod in 1984-1987



The calculation of the cod stock's consumption of capelin in the period 1983-1988 shows that a rapid increase of predation must be one of the most important causes of the decline of the capelin stock.

However, there are several sources of error in these calculations. The most vital parameter is the stomach evacuation rate. Here, work is in progress to improve our knowledge (J. Santos, pers. comm.).

Good coverage of stomach samples is also essential. Joint work between the marine institutes of Bergen, Norway, and Murmansk, USSR, aims at improving the data base in this respect.