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Feeding and food consumption of the most abundant fishes of the Barents Sea in the 1990s

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Data from the Russian–Norwegian database were used to study food composition of the most abundant Barents Sea fishes (cod, haddock, Greenland halibut, long rough dab, and thorny skate) in the 1990s. Total food consumption by these species is estimated and the impact of these predators on the stock status of commercial species is considered.

Keywords: Barents Sea, cod, feeding, food consumption, Greenland halibut, haddock, long rough dab, thorny skate.

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Introduction

In the 1980s, a stomach sampling programme run by the Institute of Marine Research (Bergen, Norway) and PINRO (Murmansk, Russia) began in the Barents Sea. Feeding was analysed primarily for two species, cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). Since the mid-1990s, stomach samples have been collected for several other species, including Greenland halibut (*Reinhardtius hippoglossoides*), long rough dab (*Hippoglossoides platessoides*), thorny skate (*Raja radiata*), and one or two other species.

Materials and methods

The data were taken from the Russian–Norwegian database on fish (107 178 cod stomachs, 1990–2000; 3533 haddock stomachs, 1990–1991) (Mehl and Yaragina, 1992), as well as from PINRO sources (9666 haddock stomachs, 1993–1999; 8110 Greenland halibut stomachs, 1990–2000; 5659 long rough dab stomachs, 1990–2000; 1692 thorny skate stomachs, 1994–2000). Stomachs of fish from all observed length classes were analysed.

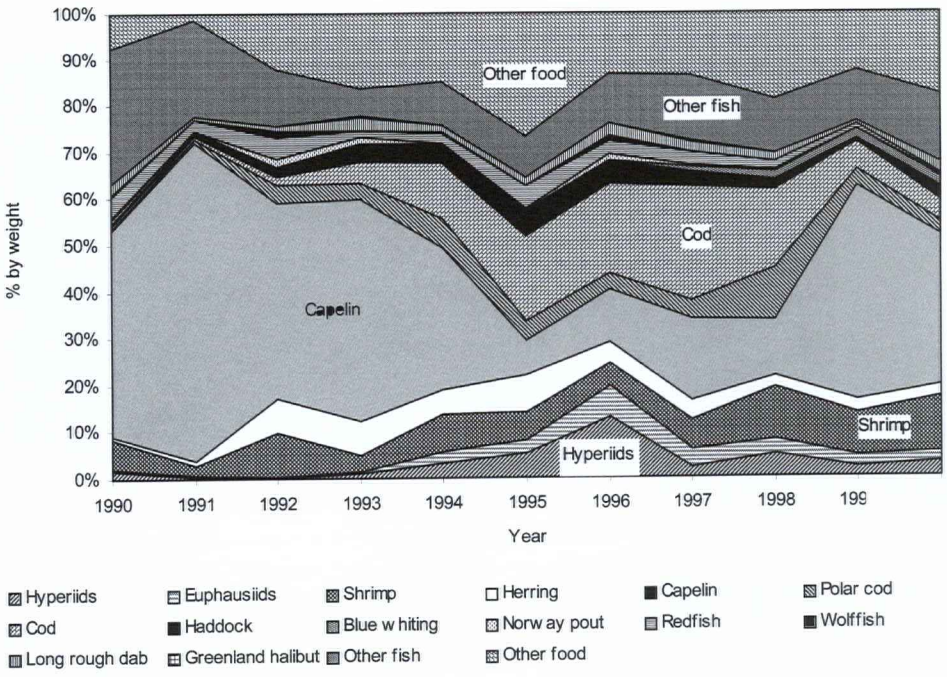
Consumption by all species was estimated for the entire sea on a quarterly basis using data on food composition, daily food consumption, mean weight of stomach contents, and mean weight of separate food items (from feeding data), as well as data on mean weight and mean abundance of each age/length group of predator (from the research surveys).

Results and discussion

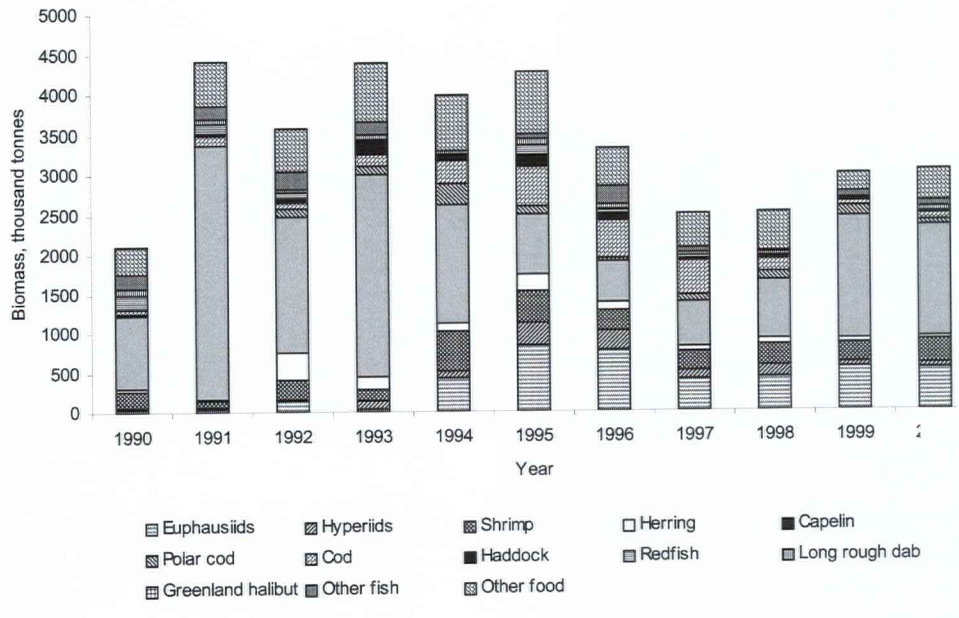
In the 1990s notable changes were observed, both in the food supply of the Barents Sea fishes and in fish feeding. The capelin (*Mallotus villosus*) stock, after a restoration in 1990–1993, declined again in 1994–1995 down to 500 000 t (ICES, 2001a). At the same time a number of strong year classes of herring (*Clupea harengus*) (1992–1995) and cod (1990–1993) appeared in the Barents Sea (ICES, 2001a, b), which led to changes in the food composition of a number of fishes.

The mean annual portion of juvenile cod in the diet of adult cod increased sharply after 1993 and in the period up to 1999 ranged from 4–7% to 20–24%. Prior to 1993 they did not exceed 3% of the diet (Figure 1A). Since 1991, haddock have fed upon young cod, but the mean annual value only contributed 0.2–1% of the total biomass (Figure 2A). In the 1980s, however, haddock virtually did not feed on this species. At the same time herring began to play a more important role in the diet of cod and haddock, making up 7–8% and 3–7% by mass, respectively, as compared to 0.1–3% in 1984–1991.

Foraging conditions for some species may have deteriorated over the 1990s and could have led to the increased consumption of low-value or non-traditional food items. In the 1990s, long rough dab, thorny skate, and Greenland halibut consumed more fisheries waste on the fishing grounds, with an annual mean of up to 50–70% by stomach content weight, whereas in the 1980s the role of fisheries waste was much lower (Berestovsky, 1989, 1996).



A



B

Figure 1. Percentage (A) and total food consumption (B) by weight for Atlantic cod in the Barents Sea.

Comparison of the total biomass of food consumed by different predators in 1990–2000 shows that the largest amount of food is consumed by cod and harp seal (up to 34%) and by minke whale (18%). The analysis of consumption of commercial species by fishes and marine mammals (Nilssen *et al.*, 2000; Folkow *et al.*, 2000) indicates that the consumption of most prey by cod is comparable to

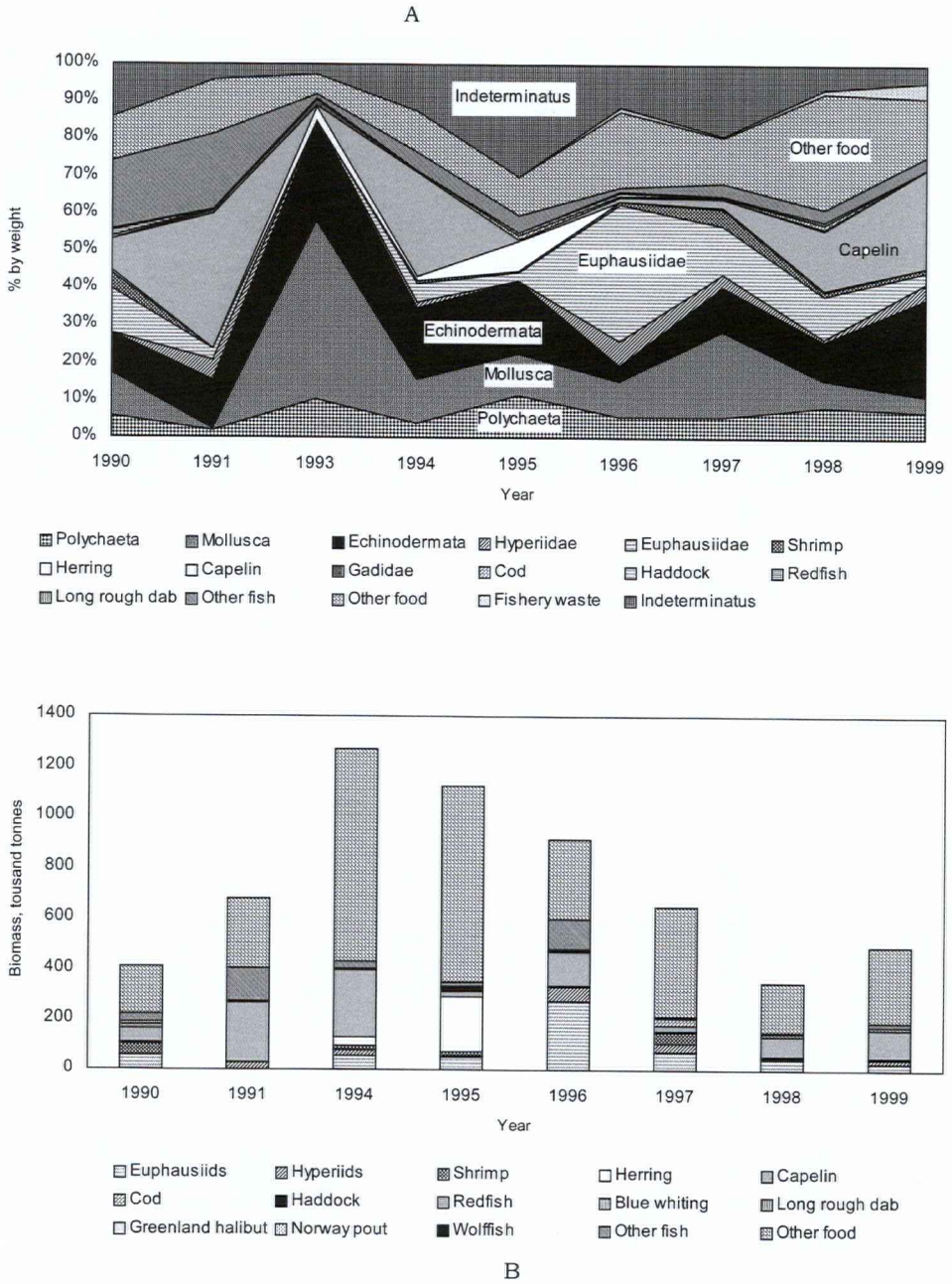


Figure 2. Percentage (A) and total food consumption (B) by weight for haddock in the Barents Sea.

that by all other predators. The exceptions are herring, young cod, and haddock, which are to a greater degree consumed by minke whale.

Conclusion

Based on the amount of biomass of commercial species consumed, cod has the greatest impact on the Barents Sea ecosystem. This applies to both the variety of species eaten and the high abundance of cod. The other most important predators that can affect the dynamics of commercial marine species are Greenland halibut, long rough dab, and thorny skate. Haddock predation is less important because of the rather reduced role of commercial species in its diet.

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