MARINE RESEARCH NEWS

NO. 1 - 2004

What do cod have for dinner?

BY EDDA JOHANNESEN, BJARTE BOGSTAD AND HARALD GJØSÆTER

Most of the cod we buy in the shops in Norway have spent much of their lives in the Barents Sea, where they are an important part of the ecosystem. The different organisms in any ecosystem affect each other mostly by eating each other. So the answer to the question "Who eats whom, and how much?" can provide us with important information about how an ecosystem operates.

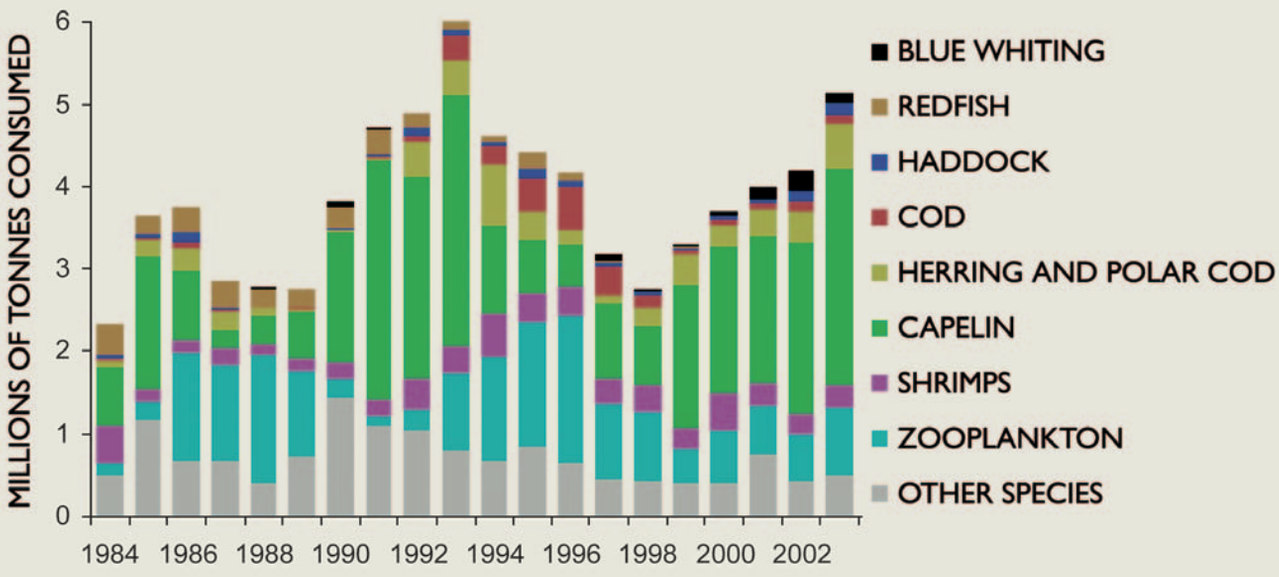
WHO EATS WHOM?

Warm and cold water masses meet in the Barents Sea. This swirls up nutrient salts and leads to a high rate of biological production in the summer months. The free water masses are where we find plankton, tiny organisms that drift freely on the ocean currents. The plant plankton, or phytoplankton, utilise nutrients in the seawater and capture energy from the sun by photosynthesis. Animal plankton or zooplankton, most of which are tiny crustaceans, browse on the phytoplankton. The zooplankton in their turn are food for a number of fish species, as well as for seabirds, seals and whales.

Pelagic fish, which is to say fish that live in the free water masses, are specialised eaters of zooplankton. In the Barents Sea, herring, capelin and polar cod are the most important species of pelagic fish. Non-pelagic species such as cod have a diet that varies from one species to another. These fish eat everything from zooplankton to bottom-living (or benthic) animals and fish. Some species of fish are omnivores, i.e. they will eat anything, while others have more or less specialised in certain types of food.

MUCH TO LEARN FROM THE COD'S STOMACH

In the course of the past 20 years, nearly 180,000 cod stomachs have been collected in the Barents Sea in order to see what they held! More than 150 different species of fish and other organisms have been found in these stomachs, so we can safely say that the cod is quite omnivorous. The stomach collection programme is a cooperative project run by the Institute of Marine Research and its Russian equivalent PINRO, and it has given us useful new information about the Barents Sea ecosystem.



Estimated consumption of the cod's prey species.

What do cod have for dinner?

If we wish to estimate how much a cod eats in the course of a day, or a year, it is not enough just to register its stomach contents when it is caught. For this reason, experiments have been carried out to find out how rapidly cod digest various types of food, and how the digestive process is affected by temperature and the size of the cod. The total consumption of the cod also depends on the size of the stock and the distribution of sizes of individual fish in the stock.

MAJOR CONSUMER OF CAPELIN

If we look at all the years from 1984 until 2003 as one, capelin have been the cod's most important prey species, making up about 37 % of everything that it eats. In some years, the cod stock has eaten more than three million tonnes of capelin, which is as much as we fished in the record capelin catch year of 1977! The cod can actually be an important factor in causing capelin stocks to collapse, as has happened three times in the Barents Sea during the past 20 years. In some years, its consumption of capelin has fallen drastically, as in 1987–88 and 1995–96. In these years, the capelin stock was at a very low level, and the cod seems to have compensated for the lack of capelin by eating more large zooplankton.

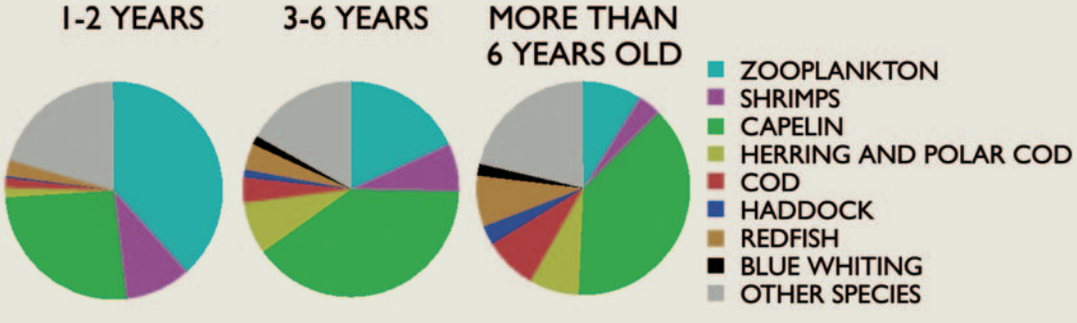
REDFISH OUT, BLUE WHITING IN

During the early 90s, there was also a large element of cod itself on the cod's menu, and this coincided with a period when there was little capelin, while large quantities of cod fry were available. Two other changes in the ecosystem that have been reflected in the cod's pattern of consumption are worth noting: the redfish, which was an important prey of cod in the 80s, is now almost never found in their stomachs, while the blue whiting has become more and more frequent since the end of the 90s. This is related to the fact that since the early 90s the redfish has been virtually absent from the Barents Sea, due to severe fishing and recruitment failure, while the strong year-classes of blue whiting since the end of the 90s have spread well into the Barents Sea.

CAPELIN ARE GOOD FOR COD

In years when cod eat a lot of capelin, they grow faster, become sexually mature at an earlier age and store large amounts of fat in their livers. This is because the capelin is an oily fish, rich in nutrients. This affects spawning in Lofoten, since in years when the cod has stored a lot of fat in its liver it also produces more eggs at spawning.

What the cod eats thus depends on how large it is and what food is available. But if you have a cod from the Barents Sea on your dinner plate, it is quite likely that its last dinner consisted of capelin!



How the composition of its prey species varies with the age of the cod.

INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET

Nordnesgaten 50
P.O. Box 1870 Nordnes
N-5817 Bergen – Norway
Tel.: +47 55 23 85 00
Faks/Fax: +47 55 23 85 31

www.imr.no

HAVFORSKNINGSINSTITUTTET, TROMSØ
Sykehusveien 23
P.O. Box 6404
N-9294 Tromsø – Norway
Tel.: +47 55 23 85 00
Faks/Fax: +47 77 60 97 01

HAVFORSKNINGSINSTITUTTET, FLØDEVIGEN
N-4817 His – Norway
Tel.: +47 37 05 90 00
Faks/Fax: +47 37 05 90 01

HAVFORSKNINGSINSTITUTTET, AUSTEVOLL
N-5392 Storebø – Norway
Tel.: +47 55 23 85 00
Faks/Fax: +47 56 18 22 22

HAVFORSKNINGSINSTITUTTET, MATRE
N-5984 Matredal – Norway
Tel.: +47 55 23 85 00
Faks/Fax: +47 56 36 75 85

REDERIAVDELINGEN
RESEARCH VESSELS DEPARTMENT
Tel.: +47 55 23 68 49
Faks/Fax: +47 55 23 85 32

INFORMASJONEN
INFORMATION
Tel.: +47 55 23 85 21
Faks/Fax: +47 55 23 85 55
E-mail: informasjonen@imr.no

CONTACT PERSON:
Head of Research Group
Harald Gjøsæter,
Tel.: +47 55 23 84 17
E-post: harald.gjosaeter@imr.no

RESEARCH GROUP:
Barents Sea Ecosystem and Fish Stocks

www.reinelinjer.no
rl0439