

“Not to be cited without prior reference to the author”

The post-war evolution of the Norwegian longline fishery for ling and tusk

Kristin Helle and Michael Pennington

Ling and tusk have been fished by Norway for centuries, and the yearly total landings have been recorded since 1896. The major catches are taken by longlines; both species are targeted, but are also caught as bycatch. The landings statistics for ling and tusk reflect the state of the stock, but also to a very large extent the amount landed depends on the size of the fleet and variable fishery regulations. The early data before World War II are doubtful; however after the war the landings statistics are more reliable. Fishing was minimal during the war; consequently, the post-war stocks of ling and tusk were abundant, and as a result the landings of ling and tusk were considerably larger after 1945 than the average annual pre-war landings. Immediately after the war, the fleet consisted of small, wooden boats with limited range and little storage capacity. During the 1960s the fleet gradually shifted to larger steel boats that had greater range and capacity. In 1977 automatic baiting machines were introduced and by the end of the 1980s, about 95 percent of the boats had converted to autolines. From the introduction of the autoline until 2000 the number of longliners increased, and the fishing pressure became so great that regulations were implemented that in effect reduced the longline fleet from 72 boats in 2000 to 35 boats in 2010.

Keywords: Norwegian longline fleet, ling, tusk, autolines.

Contact author: Kristin Helle, Institute of Marine Research, P.O. Box 1870, Nordnes 5817 Bergen, Norway. Tel +47 55238601; fax +47 55235393; e-mail: kristin.helle@imr.no

Development of the fleet

A longline fishery has been conducted along the coast of Norway for centuries, and one of the early descriptions of this fishery dates from 1625 (Rabben, 1983). The first information about the longline fishery in Norway is found in letters to the king from farmers at Giske in mid-Norway. They were complaining about the longlining fishermen and claimed that this fishery only led to fighting, cursing and swearing and everything that was disrespectful to God. After 25 years of extensive correspondence with the king, longlining was banned in 1650.

The ban was probably forgotten by 1861, the year when Swedish longliners, because of a severe storm, sheltered in Ålesund. While in port they talked with local fishermen who told them a very old legend which claimed that Storegga (Figure 1) in the old days was a magnificent fishing area. The Swedes checked out these grounds and discovered that the legend was true: they caught an exceptional amount of large ling and tusk. After this the news spread quickly and a new era in Norwegian longlining began.

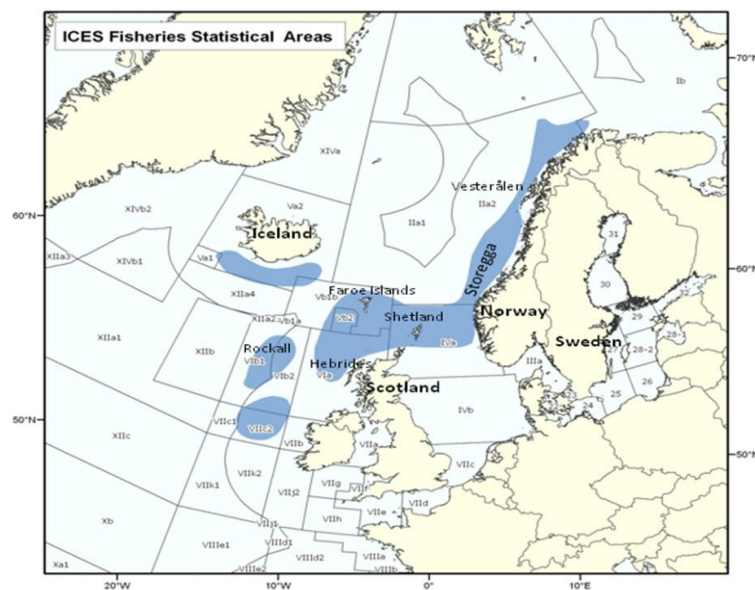


Figure 1. ICES Fisheries Statistical Areas and the regions (in blue) where Norwegian longline vessels generally fish for ling and tusk.

Since then the fleet has gone through large changes and especially so over the last 60 years during which the longline fleet greatly improved the efficiency of the vessels and gear (Bjordal and Løkkeborg 1996). The early post-war longline fleet was comprised of wooden

boats 50-70 feet long, which had limited range and little storage capacity. During the 1960s the fleet gradually shifted to larger steel boats which increased the range of the fishery. These boats only fished during the day, and they all used hand-baited lines (Arnt Leinebø, pers. comm.). The vessel efficiency increased greatly in 1977 due to the introduction of autolines, which are longlines that are automatically baited, and by the end of the 1980s the fleet consisted of about 53 vessels larger than 21 m, and about 95% of the vessels were equipped with autolines (Magnusson *et al.* 1997). From 1977, the year autolines were introduced, until 2000, the number of boats in the fleet increased continuously (Figure 3). Because of this larger and increasingly powerful fleet, the fishery authorities and even the fishers themselves were concerned that the fishing pressure would become too great. Therefore, regulations were introduced in 2000 which resulted in the reduction of the number of boats in the fleet from 70 in 2000 to 35 in 2010 (Figure 2).

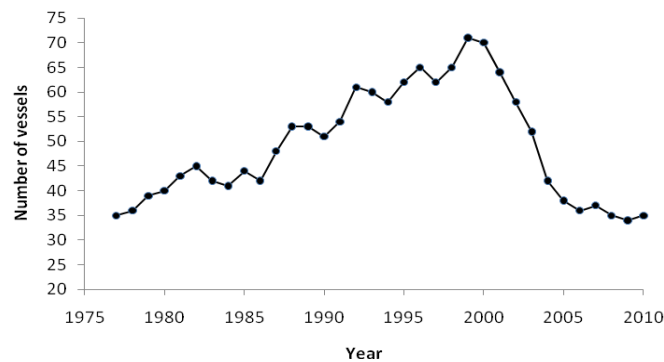


Figure 2. The number of longliner boats larger than 21 m during the period 1977 through 2010.

The Norwegian Directorate of Fisheries started recording landings and information about vessels electronically in 1977 and very much of the information about the fleet is contained in this database. For example, based on these data, the estimated average size of the longliners has gradually increased from 34 m in 1977 to 41.5 m in 2010.

In the 1990s a Nordic and a Norwegian project studied the ling, blue ling, and tusk in the Northeast Atlantic. The study focused on the age distributions, general biology and fishery (Bergstad and Hareide, 1996; Magnusson *et al.*, 1997). A cpue series (average catch per hook) based on data from a few longliners and estimates from the Directorate of Fisheries for the period 1972 to 1994 was constructed for ling and tusk. Based on a large sample of logbooks from the entire fleet from 2000-2010 this series was extended. During the entire period, the average number of hooks set per day by each boat increased from about 10 000 in 1972 to

almost 40 000 in 2010 (Figure 3). The time spent at sea has, however, decreased over this period (Figure 3).

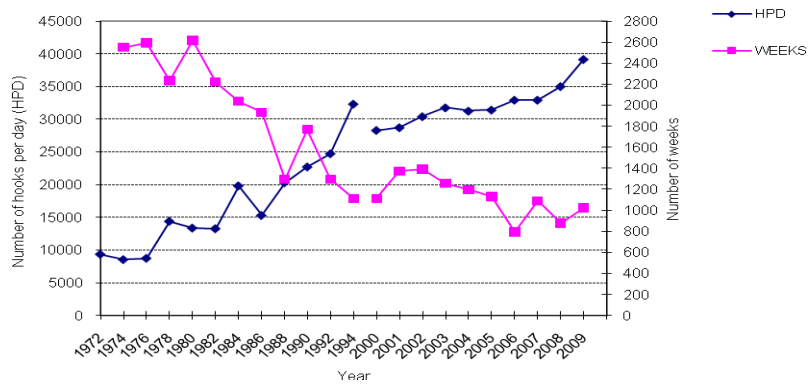


Figure 3. The combined time series for 1972-1994 (Bergstad and Hareide, 1996) and the series based on data from 2000-2009. The numbers of hooks used per day and the total number of weeks the long liners participated in the fishery for ling and tusk.

The fishery for ling and tusk

The total landings of ling (*Molva molva*) and tusk (*Brosme brosme*) have been recorded since 1896 (Figure 4).

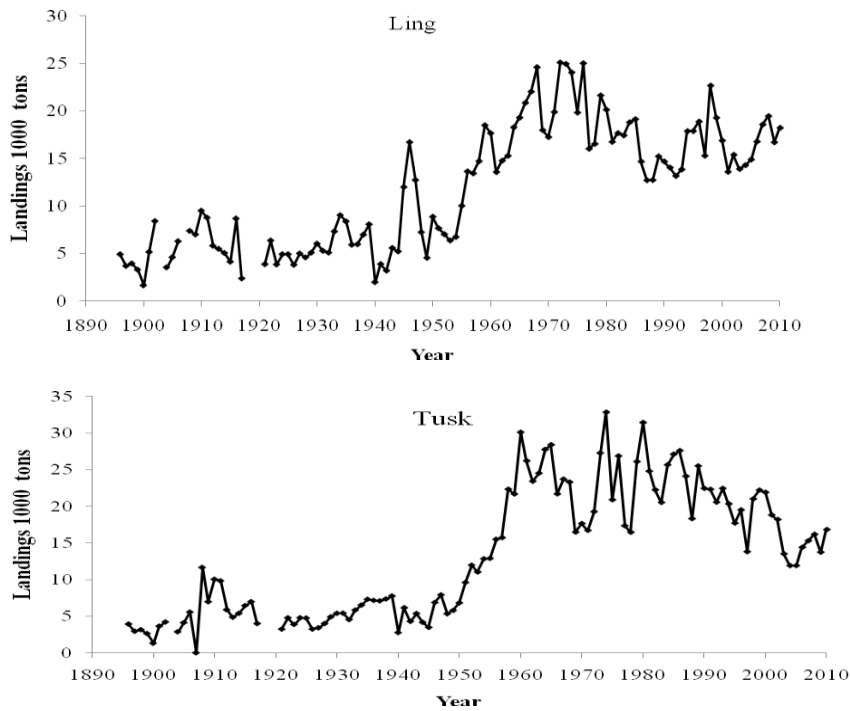


Figure 4. Reported Norwegian landings of ling and tusk during the period 1896 -2010.

Most of the ling and tusk catches are taken by longliners, either as the target species or as bycatch (ICES 2010). The Norwegian fishery is concentrated in the areas depicted in Figure 1. For both species the largest proportion of the landings are from area IIa (Storegga), followed by area IVa (Shetland, Northern North Sea). For ling subarea VIIb (Rockall) is also an important fishing ground. The Norwegian landings are mainly from longliners and account for about 50 percent of the landings of ling in the northeast Atlantic and about 60-70 percent of the total landings of tusk (Figure 5).

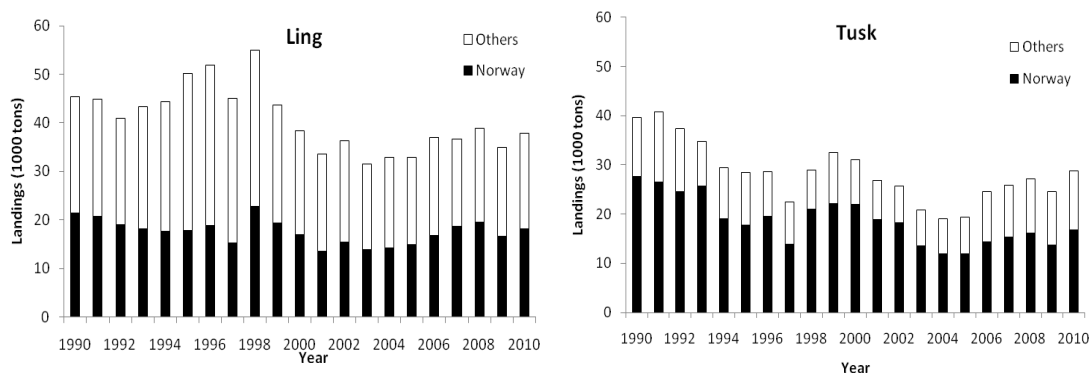


Figure 5. The total landings of ling and tusk in all ICES subareas. The Norwegian landings are in black while all other landings are in white.

The size of vessels that have landed ling and tusk has changed dramatically over the years. In 1977 the longliners larger than 21 m only landed about 20 percent of the total landings of ling and tusk. This rapidly changed and by the mid 1990ies the large longliners landed more than 90 % of the total landings (Figure 6). This trend has continued and now the main fishery is conducted with fewer and larger vessels.

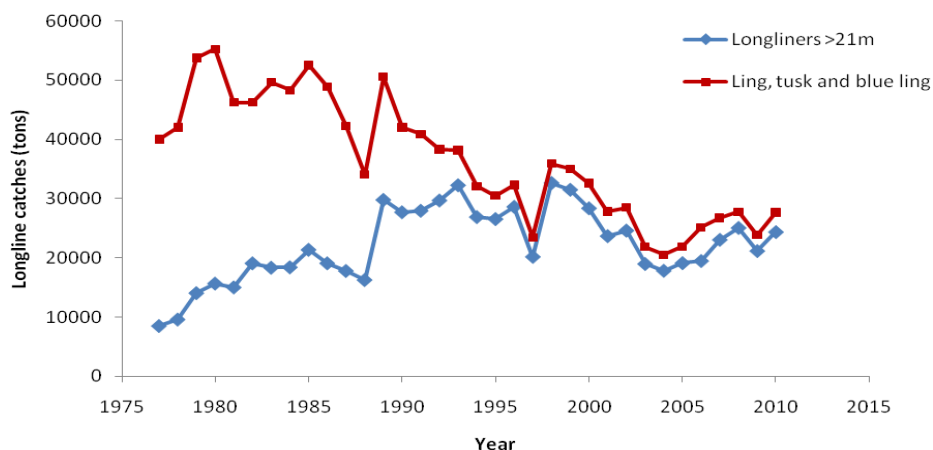


Figure 6. The total longline landings (red squares) and the total longline landings delivered by vessels larger than 21 m (blue diamonds).

The present state of the two stocks

Scientific surveys do not cover the main habitats occupied by ling (Helle and Pennington 2004). Consequently, to track the health of the stock it is necessary to develop indicators based on commercial data. For the Norwegian longline ling fishery, there are two sources of data for assessing the condition of the stock; the official landing statistics, and the logbook records collected by the Norwegian Directorate of Fisheries.

The annual ling landings may reflect trends in the condition of the ling stock, but this signal is confounded to a very large degree by changes in the fleet size; the size of various quotas for other species, especially the quotas for Arcto Norwegian cod and haddock; and pertinent fishery regulations. Therefore, the total landings may not be a good indicator of the condition of the ling stock. In particular the landings of ling and tusk are highly correlated with the number of vessels participating in the fishery. For example the total landings dropped dramatically from 2000 to 2004 (Figure 7a), which was mostly caused by a rapid decrease in fleet size, while the average landings per vessel varied without any apparent trend until 2004. After 2004 the average catches per vessels have increased sharply (Figure 7).

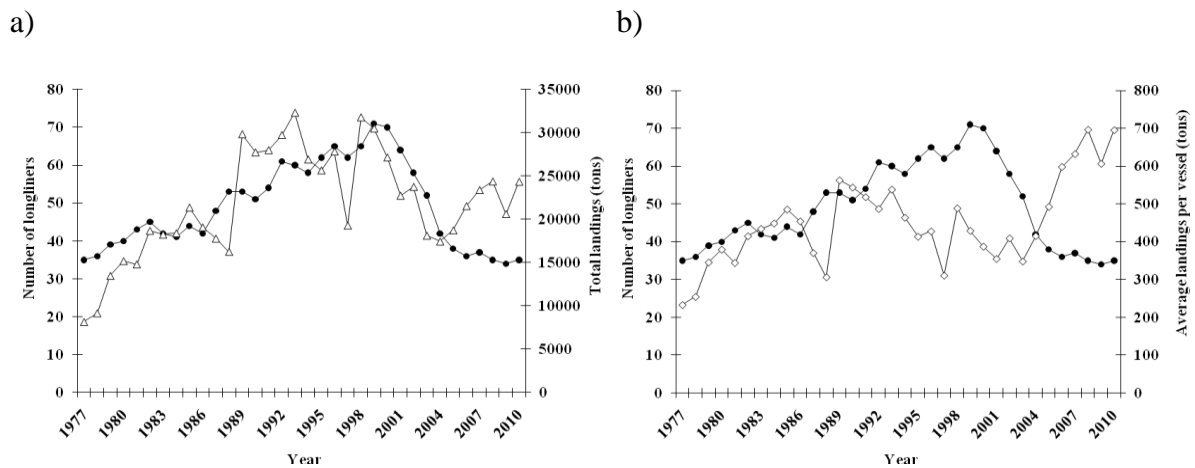


Figure 7. (a) The number of longliners (solid circles) and the total landings (open triangles) of ling and tusk. (b) The annual number of boats in the Norwegian longline fleet (solid circles) and the annual average landings per vessel (open diamonds) of ling and tusk combined.

As mentioned, the landings by the longline fleet are influenced by several factors. For example, there is an inverse relation between the amount of ling, tusk and blue ling landed and the landings of cod by the longline fleet (Figure 8).

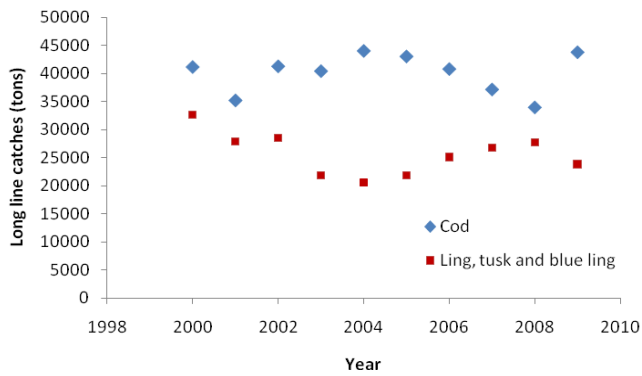


Figure 8. Total catch by t longliners of cod (diamonds) and the combined total catch of ling, tusk and blue ling (squares).

The development of a standardized cpue series has just begun and will be presented at the working group meeting WGDEEP in 2012. A simple and straight forward method calculating kg per 1000 hooks shows that both species, but particularly ling has had a positive development after the introduction of the unit quota and the following reduction in the numbers of vessels starting in 2000. Figure 9 show the cpue in area IIa, the area where the largest proportion of the catches are taken.

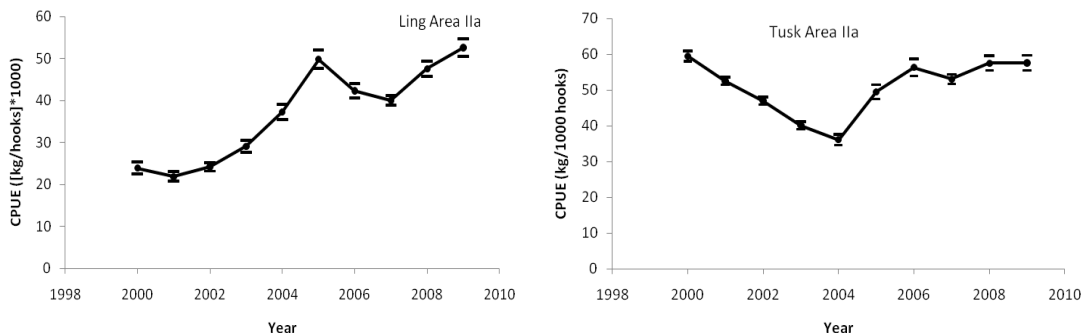


Figure 9. cpue ([kg/hook] x1000) for ling and tusk in ICES subarea IIa, for period 2000 through 2009. The bars denote the 95% confidence intervals.

Quotas and regulations

Other than the ban of the longline fishery that was introduced in 1650 the fishery for ling and tusk in Norwegian waters has never been regulated using quotas. The fishery in EU waters is regulated via quotas and Norway is given its own quotas in EU waters, and also in Icelandic and Faroese waters.

The regulation that recently has had the largest effect on the fleet was the introduction of the unit quota in 2000. The goal for introducing the unit quota was to reduce the number of vessels in order to improve the profit for those which remained in the fleet and to secure a balance between the catch capacity and the resources. To prevent the fleet from expanding in the future, regulations were introduced in 2011, which in effect makes it very difficult for new vessels to enter the fishery for ling and tusk. There have also been other changes earlier, mainly for regulating the fishery for cod which has either directly or indirectly affected the fishery for ling and tusk.

The future of the longline fishery

The longline fleet is now more or less completely restructured and after years of buying and selling of quotas the fleet now is ready to make new investments. How much this will increase the efficiency of the fleet is unknown. A study is currently underway to evaluate what effect the large restructuring of the fleet in 2000 had on the fishery and the development of the stocks.

There is a growing public awareness of how the resources are used and how sustainable are the fisheries of the different stocks. WWF, together with a number of other environmental groups, has developed a methodology to assess the sustainability of various seafood species. These guides together with other information, such as the Norwegian Red List, are important when large food chains are deciding on which species they are going to sell. The general knowledge about ling and tusk is minimal compared with other species, and this has been used to classify ling as a species that may be in danger. Therefore, it is necessary and important to improve the basic knowledge of these species and to develop better methods for assessing their condition, which will be very important in the future for the marketing ling and tusk

Longlining is considered environmentally friendly, especially with regards to coral reefs. The quality of the fish is generally better than that of fish caught by other fishing gears (Akse *et al.*, 2004). Longlining is also size selective and data from the Norwegian Reference Fleet (Borge *et al.* 2010) show that the percentage of undersized ling caught is very low (Helle and Pennington, 2010).

References

- Akse, L., Joensen, S. and Tobiassen, T. 2004. Fangstskader på råstoff i kystfisket. Torsk fisket med garn, line, snurrevad og juksa mars - mai 2004 Fiskeriforskning. RAPPORT 15/2004 (in Norwegian).
- Bergstad, O. A., and N.-R. Hareide. 1996. Ling, blue ling and tusk of the North-East Atlantic. *Fisken og havet*, 15. 126pp.
- Bjordal, Å., and S. Løkkeborg. 1996. Longlining. Fishing News Books. Blackwell Science Ltd. 156 pp.
- Borge, A., Godøy, H., and Nedreaas, K. 2010. The Norwegian reference fleet- a trustful cooperation between fishermen and scientists. Institute of Marine Research, Bergen, Norway. *Focus on Marine Research*, 1-2010. 12 pp.
- Gordon, J. D. M., N. R. Merrett, and R. L. Haedrich. 1995. Environmental and biological aspects of slope-dwelling fishes of the North Atlantic. *In : Deep-water fisheries of the North Atlantic Oceanic Slope*, pp 1-26. Edited by A. G. Hopper. Kluwer Academic Publishers, Amsterdam.
- Helle, K., and M. Pennington. 2004. Survey design considerations for estimating the length composition of the commercial catch of some deep-water species in the Northeast Atlantic. *Fisheries Research*, 70: 55-60.
- Helle, K. and Pennington M. 2010. Estimates of effort, CPUE, and mean length for the Norwegian commercial catch of ling, blue ling and tusk: 2010 update. Working Document to the ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP). 33 pp.
- ICES. 2010. Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP). International Council for Exploration of the Sea Document CM 2010/ ACOM: 17. 616 pp.
- Magnusson, J. V., O. A. Bergstad, H.-R. Hareide, J. Magnusson, and J. Reinert. 1997. Ling, blue ling and tusk of the Northeast Atlantic. *Nordic Council of Ministers, TemaNord* 1997:535. 64 pp.
- Pethon, P. 2005. *Aschehougs store fiskebok* (in Norwegian). H. Aschehoug & Co., Oslo. 448 pp.
- Rabben, B. 1983. *Folket ved havet: fiskarsøge for Sunnmøre og Romsdal*. Sunnmøre Fiskarlag, Romsdal fiskarlag.

Information about ling and tusk

Ling



Ling is found in areas with a hard bottom or a sandy bottom with large rocks that are in relative deep and warm waters on the continental shelf, the continental slope, in fjords from the Bay of Biscay to Iceland, the North Sea, Skagerrak, Kattegat and in the southwestern Barents Sea.

Ling also inhabits the Northwestern Atlantic from areas south of Greenland to Newfoundland. Ling occurs most frequently at depths between 300-400 m but can also be found at depths between 60 and 1000m. The juvenile fish are distributed in relatively shallow areas near the coast and on banks, including the northern parts of the North Sea. Ling becomes sexually mature between 5 and 7 years of age. Most likely the timing of its migration to deeper water and spawning grounds in the North Sea, near the Faroese Islands, the banks west of Great Britain and southwest of Iceland is size and age dependent.

Facts about ling

Latin name: *Molva molva*

Family: Lotidae (Gadoids)

Maximum size: 40 kg and 2 m

Maximum age/ longevity: 30 years

Distribution areas: on the continental shelf, the continental slope and in the fjords from Bay of Biscay to Iceland, the North Sea, Skagerrak, Kattegat and in the southwestern Barents Sea.

Main spawning area: the North Sea, Storegga, near the Faroese Islands, on the banks west of Great Britain and southwest of Iceland.

Diet: Fish



Lange
Utbredelse

Tusk



Photo: Don Flescher (WHOI, USA)

Tusk is a bottom living species that prefers stony bottoms on the continental shelf and slope at depths between 100 and 1000 m. The adults live in relatively deep water, while the juveniles are found in fairly shallow water. The diet includes fish and larger crustaceans. The distribution area reaches from Ireland to Iceland and Greenland, it is also found in the Skagerrak, Kattegat and in the western Barents Sea. It is also found in the Northwestern Atlantic ocean, for example on Georges Bank off the coasts of the USA and Canada, west of Greenland and along the Mid Atlantic Ridge to about 52°N. Tusk becomes sexually mature at 8 to 10 years of age (the age of maturity varies among areas). The identified spawning areas are off the coast of south and mid-Norway, south, and southwest of the Faroese Islands and Iceland. There are likely other spawning grounds.

Facts about tusk

Latin name: *Brosme brosme*

Family: Lotidae (Gadoids)

Maximum size: 9 kg and 1 m

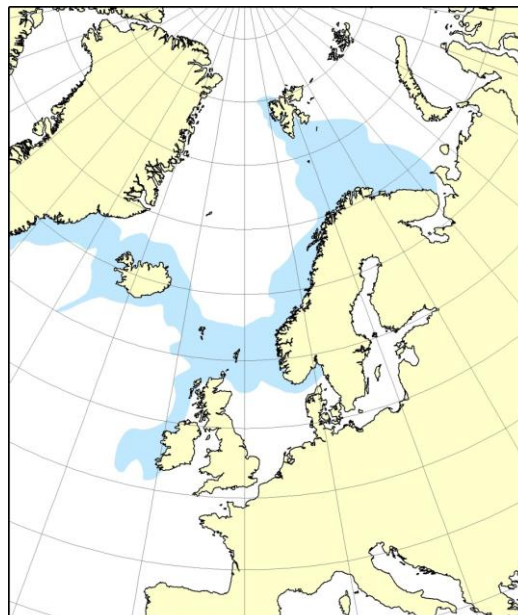
Maximum age/ longevity: probably more than 20 years of age

Distribution area: from Ireland to Iceland and Greenland, it is also found in Skagerrak, Kattegat and the western Barents Sea, on the continental shelf and slope, and in fjords.

Main spawning areas: the coast of south and mid-Norway, south and southwest of the Faroese Islands and Iceland.

Time of spawning: April-June

Diet: Fish but also crustaceans



Brosme
Utbredelse

More information is found in: Gordon *et al.* 1995; Bergstad and Hareide 1996; Magnusson *et al.* 1997 and Pethon 2005.