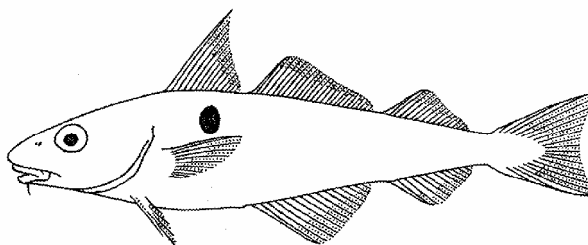


**Haddock*****Melanogrammus aeglefinus***  
**Family Gadidae**Max size: 100 cm  
Max age: 20 years

## Introduction

**Taxonomy:** Haddock *Melanogrammus aeglefinus* (Linnaeus, 1758) (Order: Gadiformes, Family: Gadidae) belongs to the family of the cod-like fishes. The genus *Melanogrammus* is represented by only one species. The species can be easily recognized by its dark blotch on the lateral line near the first dorsal fin, often said to be the finger print of St. Peter, the biblical fisherman [1].

common names			
<i>Danish</i>	Kuller	<i>Icelandic</i>	Ýsa
<i>Dutch</i>	Schelvis	<i>Latvian</i>	Pikša
<i>English</i>	Haddock	<i>Norwegian</i>	Hyse
<i>Estonian</i>	Kilttursk	<i>Polish</i>	Plamiak
<i>Faeroese</i>	Hýsa	<i>Portuguese</i>	Arinca
<i>Finnish</i>	Kolja	<i>Russian</i>	Пикша
<i>French</i>	Eglefin	<i>Spanish</i>	Eglefino
<i>German</i>	Schellfisch	<i>Swedish</i>	Kolja

**General:** Haddock is widespread throughout the deeper waters of the temperate northern Atlantic, shoaling loosely at depths of less than 300 m. It is a valuable species that is exploited commercially in mixed trawl and seine fisheries, along with cod and whiting, and is a bycatch in *Nephrops* fisheries.

**Minimum Landing Size:** 30 cm in the North Sea; 27 cm in the Skagerrak and Kattegat.

## Distribution

**Biogeographical distribution:** Haddock is a boreal species occurring in the eastern Atlantic from the Celtic Sea to Spitsbergen (Svalbard), the Barents Sea, and around Iceland. The species is also found in shelf waters of the Northwest Atlantic, from the Georges Bank to Newfoundland [2].

Haddock has a demersal life style and shoals in colder waters at depths from 40-300 m, with a preference for depths between 75 and 125 m [3].

**Spatial distribution in North Sea:** The bulk of both immature (<30 cm) and mature haddock (>30 cm) is found in the northerly areas [3], with the southern distribution border extending from north-east England, along the Dogger Bank, to the Skagerrak and Kattegat, closely following the 50 m depth contour. The distributions of these two groups fully overlaps (Fig. 1), although juveniles tend to be more abundant in the Skagerrak than adults.



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In the Norwegian Deeps, haddock is generally not found in waters more than 300 m deep [4]. However, in case of extremely strong year classes (such as in 1962 and 1967) the distribution area may be expanded, swarming over the entire North Sea, and haddock has been landed from the Southern Bight in the years after these year classes were born.

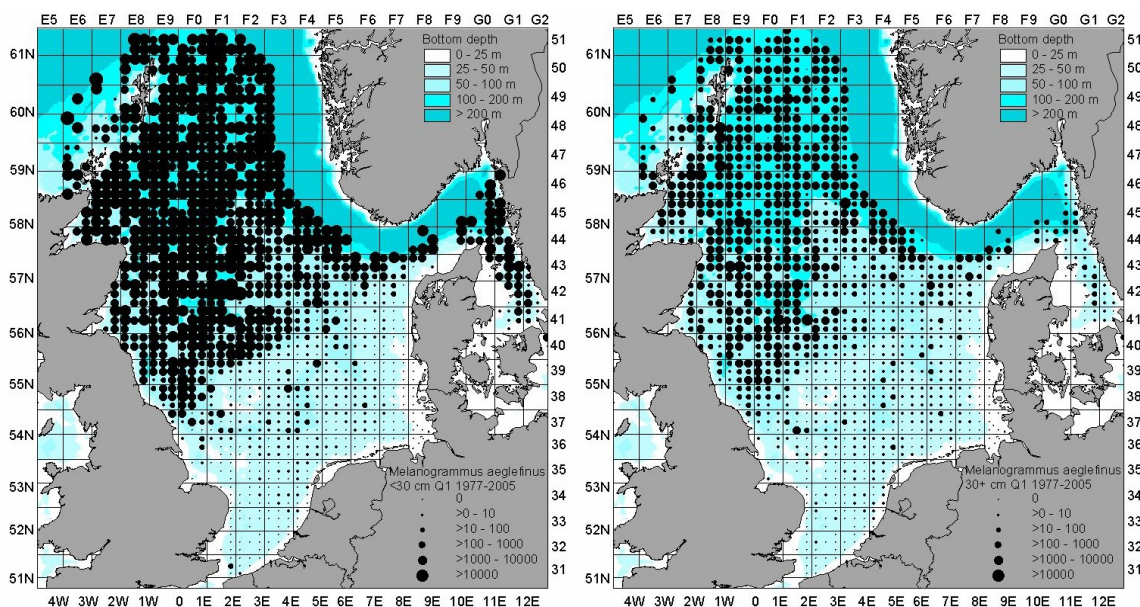


Figure 1. Average annual catch rate (number per hour fishing) for juvenile (<30cm, left) and adult (≥30cm, right) haddock in the quarter 1 IBTS survey, 1977–2005.

**Habitat characteristics:** The bulk of the haddock population occurs within an envelope of the following environmental characteristics: depths between 75 and 125 m, bottom temperatures greater than 6 °C, and salinities greater than 34.5 ppt [3]. Within this envelope, there is no evidence for a preference for specific sediments.

## Life history

**Age, growth rates, length-weight relationship:** Males and females have similar growth rates up to about age 4, but females grow ultimately to a little larger size than males (Fig. 2) and males reach maturity earlier. Nearly all haddock have reached maturity by age 3 (Fig. 2).

The mean annual relationship between total length (L) and gutted weight (GW) for haddock in the North East Atlantic is [5]:  $GW = 0.0157 * L^{2.8268}$ .



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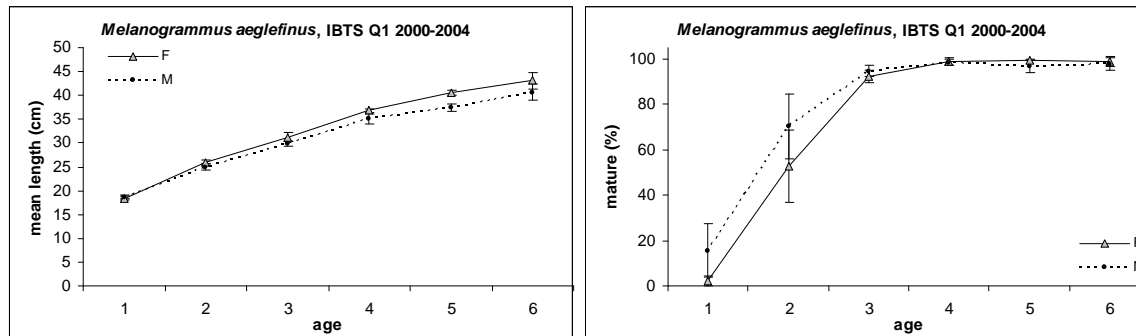
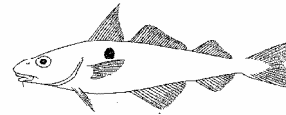


Figure 2. Mean length (left) and percentage mature (right) per age group in the North Sea and Skagerrak/Kattegat in February 2000-2004, based on IBTS-data.

**Reproduction:** Spawning takes place from March to May, at depths of 100–150 m. A four-year-old female carries on average 500 eggs per gram body weight, equivalent to 300,000 eggs for a 40 cm (630 g) female [6]. The pelagic eggs are 1.2–1.7 mm in diameter and take one to three weeks to hatch [7]. After metamorphosis, the 0-group remain pelagic until they reach a size of approximately 7 cm, after which they settle to a demersal life style.

**Migrations:** Migration patterns are in general poorly documented. Judging from the IBTS data, haddock does not appear to display seasonal long-distance migrations. However, the haddock of the Norwegian Deep shows a seasonal migration between relatively shallow areas in summer and deeper parts in winter. Mature specimens are even migrating out of the area in winter [4].

**Food habits:** The larval stages feed mainly on immature stages of copepods [7], while the pelagic post-larvae (0-group) (3–10 cm) predate on euphausiids, appendicularians, decapod larvae, copepods and small fish [8]. Once 0-group have settled to the demersal, post-larval stage, they still feed to some extent on pelagic organisms such as euphausiids, but benthic invertebrates become increasingly more important as they grow (Fig. 3). Larger haddock also eat fish such as sandeel, Norway pout, long rough dab, gobies, sprat, and herring [9, 10]. The majority of stomachs at any given sampling station at any given time contain similar prey, suggesting that they feed in shoals rather than individually [10]. However, temporal and spatial variation is large.

**Predation:** Especially the juveniles are an important prey for larger gadoids and other demersal fishes. Seals are also taking the larger ones.

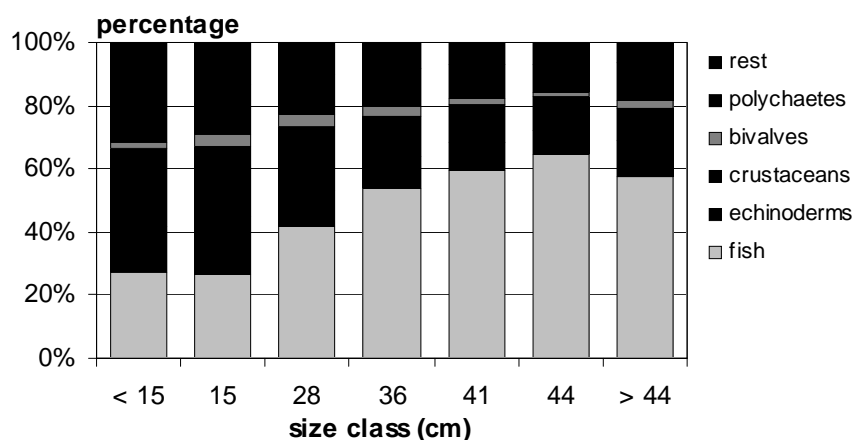


Figure 3: Average stomach contents as percentage weight by size class in 1981 [9]



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## Population structure

**Length composition:** The length-frequency distribution of the IBTS catches shows two peaks, corresponding to 1- and 2-year olds around 15 and 26 cm (Fig. 4). The 1-group is slightly larger in Skagerrak/Kattegat (Fig. 4), while larger haddock is almost absent.

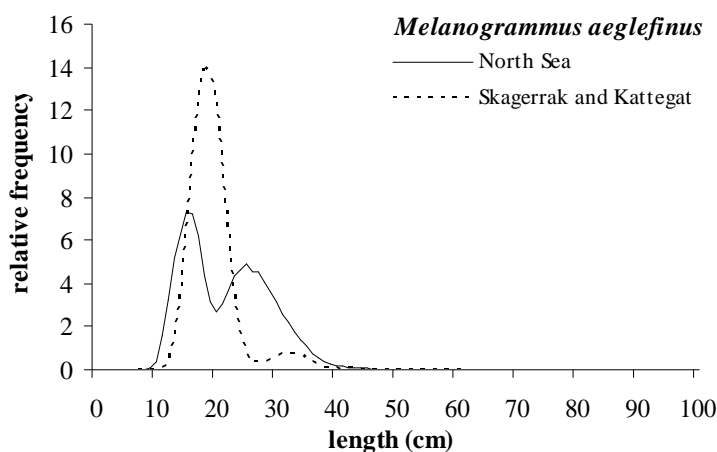


Figure 4. Relative length-frequency of haddock in the North Sea and Skagerrak/Kattegat, based on quarter 1 IBTS data, 1977–2005.

**Sex ratio:** In the Barents Sea, males outnumbered females in the immature fish while females are predominant among the mature ones. This may be related to the males reaching maturity earlier and suffering higher mortality [11].

**Changes in abundance:** Periodically, the haddock stock produces exceptionally strong year classes, for example those born in 1962 and 1967, and to a lesser extent 1974, and 1999. Strong year classes generally result in a more southerly distribution (Fig. 5). These peaks in recruitment strongly affect the spawning stock biomass, but owing to the high fishing mortality, these revivals are of short duration. In general, haddock produced above average recruitment during the 1960s, 1970s and early 1980s, just like cod and whiting, and this has been termed the gadoid outburst. After the strong 1999 year class, recruitment has been extremely poor.



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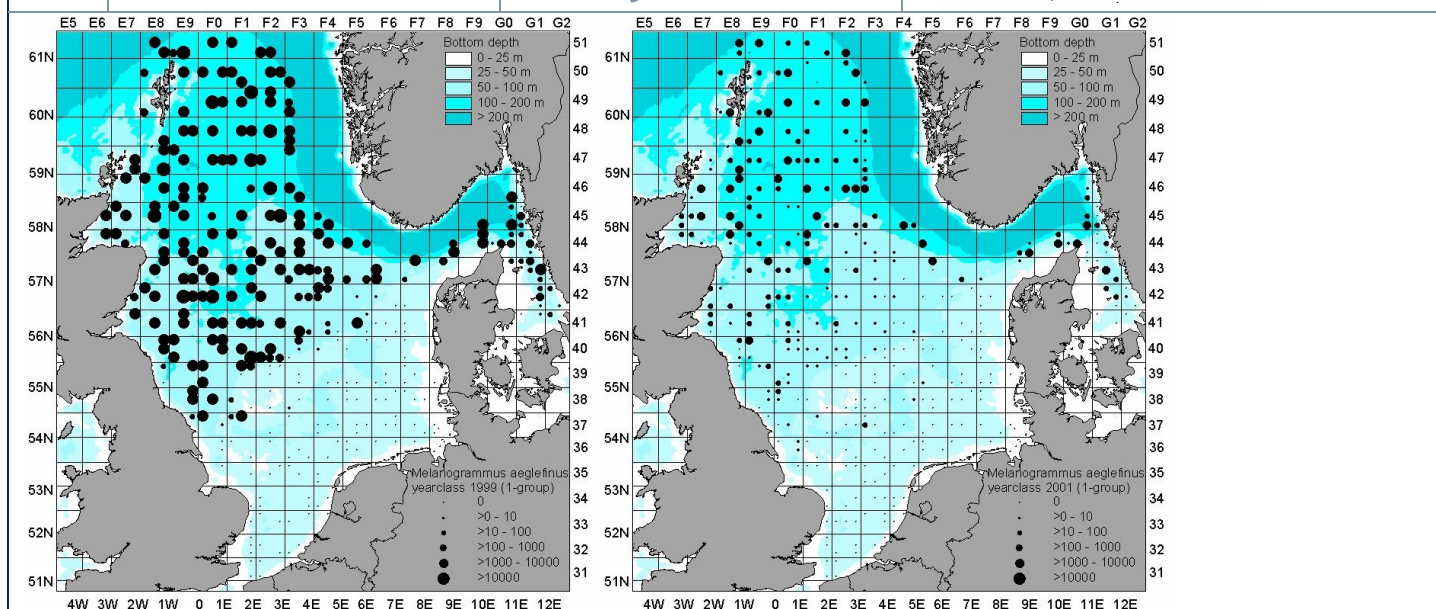


Figure 5. Distribution and abundance of the strong year class of 1999 (left) versus a weak year class of 2001 (right) (source: IBTS).

**Stock structure:** The haddock in the North Sea and Skagerrak/Kattegat area is assessed as one unit stock and there are no indications of sub-populations [3]. However, it is uncertain whether exchange exists between the North Sea and the West of Scotland stocks, which is presently assessed separately. The line drawn between the two stocks is somewhat arbitrary and variations in relative year-class strength are quite similar, suggesting that they may belong to one and the same reproductive unit. Furthermore, tagging experiments have confirmed that there is at least some exchange.

## Exploitation

**Main métiers targeting the stock:** Haddock is a valuable species that is mainly exploited in mixed fisheries, along with cod and whiting, by Scottish light trawlers, seiners and pair trawlers. It is also taken as a bycatch in localized *Nephrops* fisheries in muddy/sandy areas. Discard rates of undersized haddock in these fisheries have been high (up to 50% in weight). Vessels from England, Denmark and Norway also target haddock, but to a lesser extent. Furthermore, haddock is taken as a bycatch in industrial fisheries.

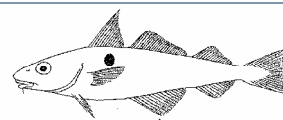
**Landings:** Since the early 1970s, the haddock stock in the North Sea and Skagerrak/Kattegat has decreased steadily (Fig. 6) [12]. However, the trend has been erratic owing to the periodic occurrence of exceptionally strong year classes, on which the stock and the fisheries are heavily dependent.

**Status of the stocks:** ICES classifies the stock as having full reproductive capacity and being harvested sustainably [12]. Spawning stock biomass is well above the limit biomass ( $B_{lim}$ ) of 100 000 t and is predicted to remain at that level. Also fishing mortality appears to have dropped well below the limit reference point ( $F_{lim}$ ) of 57%. After a sequence of 4 poor recruitments (well below average), the 2005 year class is above the long-term geometric mean [12].



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**Protection and management:** To promote sustainable fisheries and greater potential yield of the haddock stock, the EU and Norway have implemented a precautionary approach. Therefore, harvest of haddock should be constrained within safe biological limits as defined by the limit reference points and an associated margin to allow for uncertainty in the assessments [12]. As part of the cod recovery plan, the minimum mesh size was increased from 100 to 120 mm in 2002/2003, which should also reduce the discard problem and enhance sustainable exploitation. The Norway pout box (see under Norway pout) has been established to reduce bycatch of juveniles in the industrial fisheries.

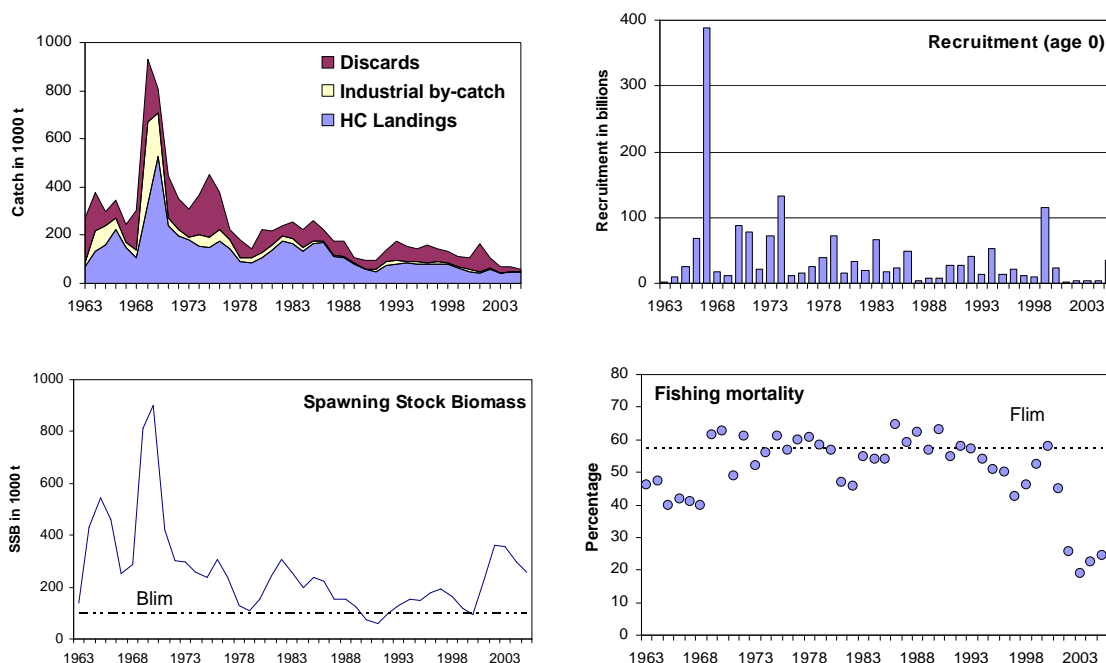


Figure 6. Time series of catch ('000 t), spawning stock biomass ('000 t), recruitment at age 0 (billions of 0-group fish) and fishing mortality (percentage of ages 2–4) of haddock in the North Sea and Skagerrak/Kattegat [12].

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