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Book 9
Widely Distributed and Migratory Stocks

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BOOK 9

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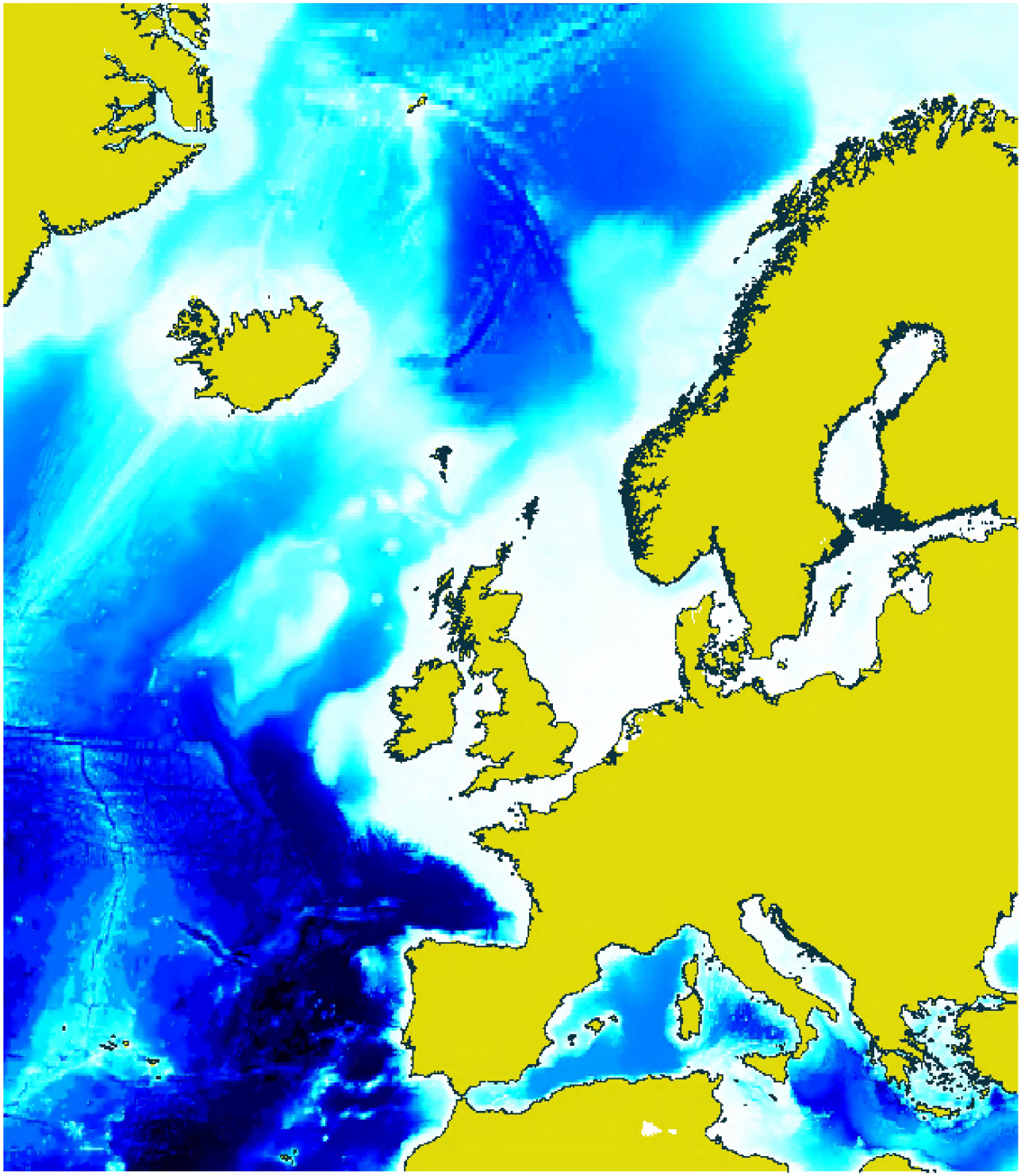
9 WIDELY DISTRIBUTED, MIGRATORY AND DEEPWATER POPULATIONS



A number of exploited marine populations are not confined to the individual areas considered in other sections of this report: fish species with stock units that are distributed over much wider areas (hake, elasmobranch and deepwater species) and migratory species (mackerel, horse mackerel, Norwegian spring spawning herring and blue whiting). This chapter deals with all of these species. By their nature the migratory and wide ranging species interact with a number of the ecoregions. Within these areas, the deep water species occupy a unique and different habitat from the shelf and pelagic species.

Productivity is very low in the deep water. Without light the deep water has no primary productivity via the photosynthesis of plants and algae except in the surface waters. Furthermore, the nutrient concentrations in the surface water arelow, and overall there is very little food compared to the shallow seas. This, together with low temperatures in the deep water results in very low productivity of the organisms living here. Many animals migrate at night up into the

surface waters to feed. Otherwise the deep-sea food web is fueled by a rain of dead plants and animals from surface waters.

The diversity of deep-sea life history strategies is considerable, but many species of fish targeted by fisheries and their communities are particularly vulnerable to disturbance because they grow slowly, mature late in life, and form aggregations easily accessible to fisheries. Recovery rates are much slower than in shallower waters. Examples are the archetypal long-lived fish species orange roughy and grenadiers, but also vulnerable benthic species such as cold-water corals that form important habitats for many fishes.

The knowledge of central biological characteristics such as stock identity, migration, recruitment, growth, feeding, maturation, and fecundity of most deep-sea species still lags considerably behind that of commercially exploited shelf-based species. Such information is required to expand our understanding of the population dynamics of deep-sea fishes, which in turn is needed to underpin stock assessments.

In some parts of the northeast Atlantic where the continental shelf is narrow, such as off Portugal (including Madeira and the Azores), there are traditional fisheries, for example for black scabbardfish (Aphanopus carbo) and red (=blackspot) seabream (Pagellus bogaraveo), which have been exploiting deepwater species for many years. Other traditional species are ling, blue ling, and tusk, which have supported large fisheries in wide areas for several decades. The existence of other potentially exploitable stocks in the ICES area has been known since the 1960s and 1970s. However, before the 1980s, with the exception of a fishery for species such as roundnose grenadier (Coryphaenoides rupestris) there was little interest from the fishing industry in exploiting stocks in international waters.

Since the 1980s, dwindling resources on the continental shelves of the North Atlantic have encouraged the development of fisheries in deeper waters. There has been a tendency for fisheries for species such as anglerfish and Greenland halibut to extend into deeper waters, and new fisheries have developed to target the new deepwater species that have been found there. Deepwater species such as the argentine or greater silver smelt (Argentina silus) and roundnose grenadier (Coryphaenoides rupestris), which were previously bycatch species have been targeted within the ICES area for the last two decades. Orange roughy (Hoplostethus atlanticus) has been a target species since the early 1990s.

9.1 Ecosystem overview

9.1.1 Ecosystem components

Bottom topography, substrates, and circulation

Most of the surface of the advisory region K is abyssal plain with average depth >ca 4 000 m. To the east the continental slope of Europe is mainly rocky and hard from south to the Latitude of Ireland, further north important sediment cover occurs to the west of the British Isles. West of the Rockall Trough there is a large bank area which the two major shallowest parts are known as Rockall Bank to the west of Scotland and Hatton bank. The North of the advisory region coincides with the Wyville Thomson and Iceland-Faroe Ridges. In the west, the major topography feature is the mid-Atlantic Ridge (MAR) starting from Iceland where it is known as Reykjanes Ridge, down to the Azores. At the ridge new oceanic floor is formed and western and eastern parts of the North Atlantic basin spread at a speed of 2-6 cm/year. Numerous seamounts of variable height occur all along the ridge and isolated seamounts are known over the whole basin. The ridge and the associated complexes of seamounts form an extremely rugged topography, the European slope is comparatively gentle. The western part of the advisory region extends beyond the MAR over north east Atlantic deep basin. Along the reef, the Charlie Gibbs Fracture Zone (CGFZ) is a major transversal feature at about 52°N. At the CGFZ the axis of the southern part of ridge shifts of about 6° east from that of the northern part. This feature has major interaction with the hydrology, and flow of deep-water between the western and eastern deep-sea basins of the North Atlantic occur through these deep channels and affects to whole circulation (see http://www.mar-eco.no).

The general circulation in the epipelagic zone (0-200m) is well understood as a warm current flowing from the Southwest Atlantic towards the European coast with several branching. Cold current flow south form the Labrador sea and Irminger sea (Figure 9.1.1.1).

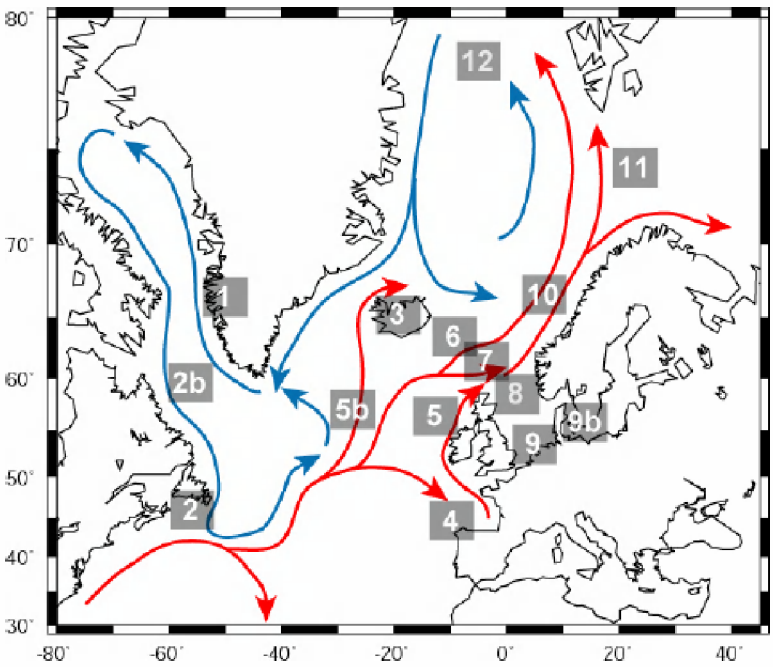


Figure 9.1.1.1 Schematic of the general circulation of the North Atlantic in relation to the numbered areas presented in the Annual ICES Ocean Climate Status Summary 2004/2005 (ICES, 2005a). The blue arrows indicate the cooler waters of the sub-polar gyre. The red arrows show the movement of the warmer waters in the sub-tropical gyre.

Physical and Chemical Oceanography (temperature, salinity, nutrients)

Below ca 700 m the seasonality in temperature is almost negligible, and spatial variations within the advisory region are small. Average temperatures are 7 to 8°C by 1000 m and lower than 4°C below 2000 m (Figure 9.1.1.2).

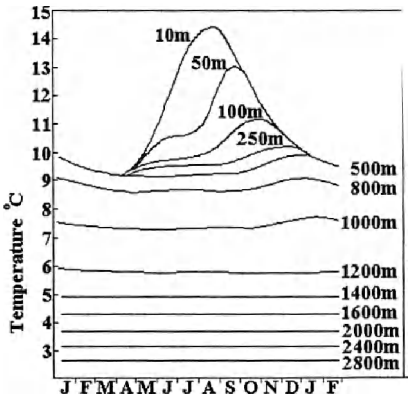


Figure 9.1.1.2 Seasonal variations of the sea temperature by depth in the Rockall Trough, west of Scotland (Gordon et al., 1995).

Nutrients are permanently present in the deep water as a result of mineralisation processes. However, due to darkness, there is no photosynthesis in the deepsea. Primary production only occurs at hydrothermal vents and cold seeps from chemo-autotrophic bacteria and archaeas either as free cells or symbiotics of larger organisms. This primary production is fuelled by the oxidation of reductive fluids flowing out of the seabed. Although this The deep primary production supports exceptionally dense, diverse and original deep water communities including reigns of animals unknown in any other ecosystem such as the vestimentifer wormsbut it is not believed to produce a significant part of the total primary production at the advisory region's scaleof the whole water column.

Organic matter is brought to the deep environment by three processes (Figure 9.1.1.3.):

- "planktonic snow"; the sinking of pPhytoplankton and other particles for the residuals of the primary production infrom the epipelagic zone sinking into deeper waters is known as planktonic snow. This process together with f
- Sinking of alls of carcasses of large animals and p
- Flow of particulate organic matter flowing down slopes from shelves and continental bring organic matter to the deep environment (Figure 9.1.3.).

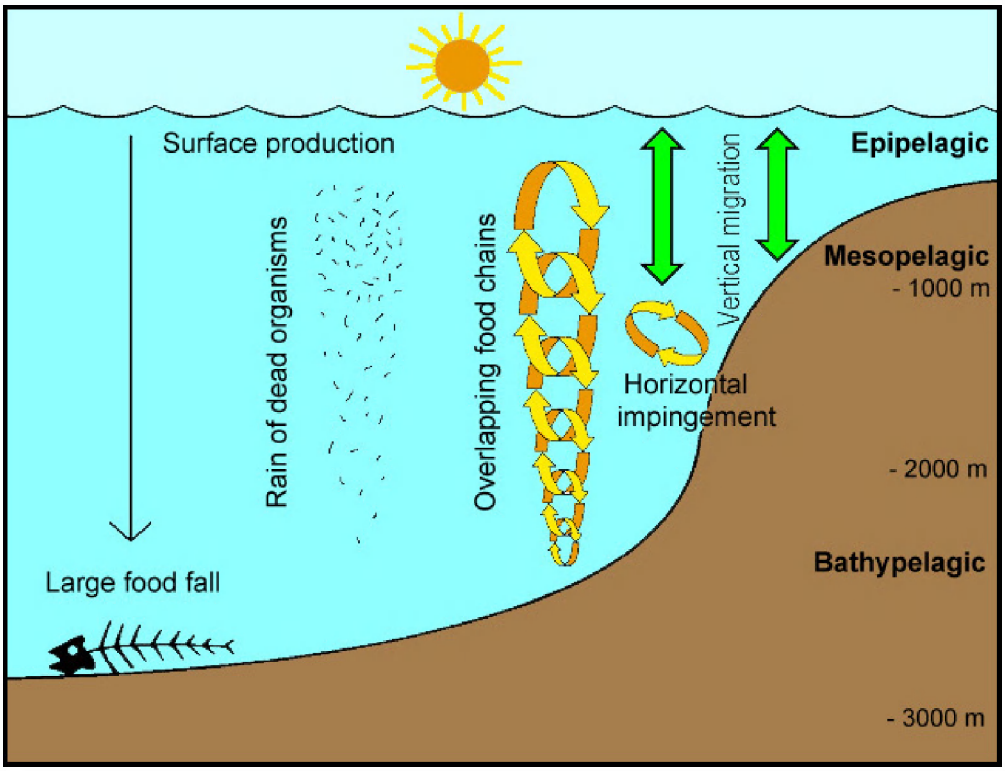


Figure 9.1.1.3 Trophic transport in the deepwater ocean (courtesy from Dr. J. Gordon, Scottish Association for Marine Science, see also Gordon, 1979).

Except in hydrothermal and cold seeps areas, primary production in the ocean is limited to the so-called euphotic zone near the surface, where there is enough ambient light to allow photosynthesis. This zone goes down between 150 m and 200 m at the most. The organic matter available for deep-sea heterotrophic organisms result from the flow of matter from the surface towards the seafloor, however, only 1%-3% of this primary organic production reaches the depths of the abyssal plain in some form or other (Gage and Tyler, 1991). The use and gradual depletion of this organic matter is reflected in the logarithmic decline in the concentration of plankton as depth increases (Angel and Baker in Merret and Haedrich, 1997). However, this pattern does not explain the distribution of fish biomass along the slope, which does not in fact decline regularly as depth increases. For example, to the west of Scotland, biomass reaches its maximum level at around 1,200 m (Gordon and Bergstad, 1992; Gordon and Duncan, 1985), while primary production at the surface directly above the continental slope is insufficient to maintain the biomass level (Koslow, 1997). This means that other processes bring a flow of energy to the fish living along the slope, so that the slope is believed to benefit from oceanic input (Figure 9.1.1.3). Such processes are also involved in the distribution and density of deepsea corals (Genin et al., 1986). Slope fishes feed on meso- and bathy-pelagic fauna daily brought to the slope by tidal currents (Gordon, 1979; Koslow, 1997).

Broad-scale climate & Oceanographic features & drivers like NAO, major currents

The NAO is known to control or modify three of the main parameters which drive the circulation in the ocean area covered by this climate summary (i.e. wind speed, air/sea heat exchange and evaporation/-precipitation). The NAO is presented here is terms of the Hurrell index, which is more closely correlated with conditions over the eastern North Atlantic. Following a long period of increase from an extreme and persistent negative phase in the 1960s to a most extreme and persistent positive phase during the late 1980s and early 1990s, the Hurrell NAO index underwent a large and rapid decrease during the winter preceding 1996. Since 1996 the Hurrell NAO index has been fairly weak but mainly positive, except for the winter preceding 2001 (Figure 9.1.1.4). (ICES, 2005a).

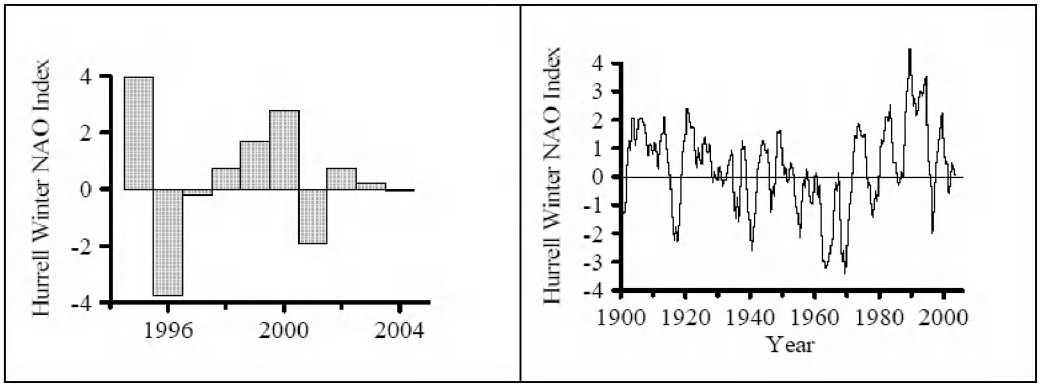


Figure 9.1.1.4 The winter NAO Hurell index (see text) in terms of the present decade (left) and the last 100 years (right–a two-year running mean has been applied), (from ICES, 2005a). The effect of the NAO on deep layers is poorly known.

Benthos, larger invertebrates, biogenic habitat taxa

There is little commercial exploitation of large invertebrates in the ICES part of the advisory region. Deep-water trawling is known to catch some cephalopods, the landings might most often be reported as miscellaneous cephalopods and are limited. The crab *Chaceon affinis* occurs at slope depths over the advisory region, it is a by-catch of deep-water trawling and netting and a target of pot and net fisheries.

Biogenic habitat occur along the slope, the main biogenic organism is the sclera*ctinian Lophelia pertusa* a colonial coral, which locally forms large bioherms, along the slope and on seamounts . No exhaustive description of the distribution of *Lophelia pertusa* exist, it is still unclear if modern multibeam echosounding can provide full mapping of *Lophelia pertusa* reefs. However, synthesis of available data shows that such reefs may be found in all parts of the advisory region (Figure 9.1.1.5) (Freiwald, 1998; Rogers, 1999). Like the general distribution, the information on the size of reefs remains partial, to the south and west of Ireland several reefs of 150 to 200 m height and about 1 km wide are known.

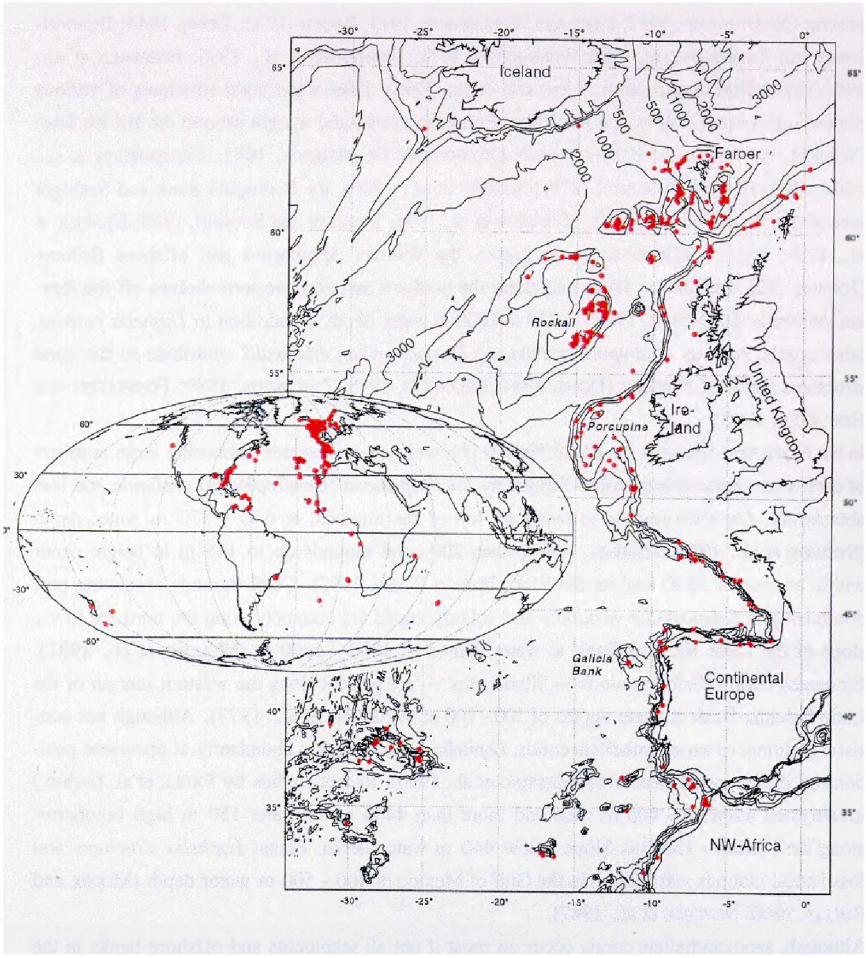


Figure 9.1.1.5 Distribution of deepwater coral reefs in the North East Atlantic and in the world ocean and (from Freiwald, 1998).

A dense and diverse megafauna is associated to *Lophelia* reefs. This includes fixed (anthipatarians, gorgonians, sponges…) and mobile invertebrates (echinoderms, crustaceans). The species richness of macrofauna associated to coral reefs is up to three time higher than on surrounding sedimentary seabed (Mortensen et al., 1995). Several species of deepwater fish occur on corals, some are more abundant is corals but the possible functional links between fish and coral are still to be confirmed but are likely for some species (Husebo et al., 2002).

Fish Community

In the advisory region the tTwo major small epi-pelagic species are blue whiting and greater argentine. Both occur mainly over the slope and at the shelf edge, mainly . Bblue whiting is a major prey fish for some deepwater deepwater species (e.g. Black scabbard fish) and shelf species (e.g. hake) predators.

The meso-pelagic zone (200-1000 m) comprise a high diversity of small species presenting striking morphological characters and adaptations such as large mouth and teeth, light organs, specialized eyes. The most abundant families are Myctophidae and Gonostomatidae (with Cyclothone, the most common vertebrate genus on earth), these may form up to 50 % of the catch when sampling this fauna. The most diverse (number of genus and species) families are Myctophidae and Stomiidae (F. Uiblein, IMR, pers. comm.). Many if not all meso-pelagic fish migrate daily to feed on pelagic prey in upper water layers during the night and return to the deeper darker waters during daytime when they would be more vulnerable to epi-pelagic predators, i. In this way they participate to the process of overlapping food chain (Figure 9.1.1.3).

Similar fauna is found in the bathy-pelagic zone (1000-3000m) but the abundance is lower, is it understood as less abundant. Bathylagidae forms the most common family, o. Other common families are Platytroctidae and Searsidae (F. Uiblein, IMR, pers. Comm.).

The demersal deepsea fish community accounts several larger species. Species composition primarily depends on depth and most deepwater species have large areas of distribution, in particular some species from slope environment are

found in both hemispheres and Atlantic, Pacific, Indian oceans (eg orange roughy, Alphonsinos., several deepsea squalids sharks and smaller non commercial species such as *Halagyreus johnsonii*). Several large demersal species typically living between ca 400 to 2000 m, are found is environment as different as the continental slope, the MAR and isolated seamounts.

In the advisory region, tThe dominant commercial species at 200-2000m are species such as ling, blue ling, tusk, roundnose genadier, orange roughy, black scabbard fish (dealt upon by WGDEEP) and deep-water sharks and chimaeriforms (WGFE). Amongst The two main commercial deepwater sharks, *Centroscymnus coelolepis* and *Centrophorus squamosus,* the two main commercial species (1 to 1.5 m long) are seriously depleted. The status of a number of smaller or less common species (*Centroscymnus crepidater*, *Deania calcea*, *Dalatias licha*, *Scymnodon ringens*, *Etmopterus* spp. *Galeus* spp. *Apristurus* spp.) is less clear. Chimaeriforms occur at least down to 3000 m but are more abundant on the upper slope, 400-800m (Lorance et al., 2000). All deep-water shark species are assumed highly vulnerable and of these that are commercial seem currently overexploited. The status of chimaeriform populations is unknown. Most of these species are discarded but there is some directed fishing for *Chimaera monstrosa* on the upper slope.

The knowledge of central biological characteristics such as stock identity, migration, recruitment, growth, feeding, maturation, and fecundity of most deep-sea species still lags considerably behind that of commercially exploited shelf-based species. Such information is required to expand our understanding of the population dynamics of deep-sea fishes, which in turn is needed to underpin stock assessments.

Most deepwater demersal fish are typically long-lived and poorlywith low productive so that they can only sustain low exploitation rates. For example the maximum exploitation rate of orange roughy is estimated between 1 and 2% of the unexploited biomass (Koslow et al., 2000). The sensitivity of species to over -exploitation depends upon their production, their catchability and their commercial interest. As a result orange roughy, which is poorly productive and has a high catchability as it forms dense aggregation (Koslow et al. 2000 ; McClatchie et al., 2000, Lorance et al., 2002) was depleted in the early 90s in some ICES areas, in particular off west Scotland and Ireland (Lorance and Dupouy, 2001; ICES, 2004). The distribution and abundance of the remaining biomass in unknown. The blue ling, exploited on the upper slope, was depleted longer ago.

Many demersal slope species are not commercial because they do not reach sufficient size while the alepocephalid are large but are poorly palatable because of the high proportion of water in their flesh. By 1000-1500 m *Alepocephalus bairdii* is the dominant species in biomass to the west of the British Isles (Gordon, 1986 ; Gordon and bergstad, 1992) so that it makes the bulk of fisheries discards (Allain et al., 2003).

Large epi-pelagic fish (tunas, swordfishes and sharks) are not dealt with in this section.

Birds and Mammals

The only possible location for bird breeding in the advisory region is the Azores where, the main breeding species are the Cory's shearwater, *Calonectris diomedea* (189000 breeding couples), common tern, *Sterna hirundo* (4000), yellow-legged gull, *Larus cachinnans* (3000), little shearwater, *Puffinus assimilis* (1200), Madeiran storm-petrel, *Oceanodroma castro* (1000), roseate tern, *Sterna dougalii* (700) and Manx shearwater, *Puffinus puffinus* (180).

Common marine mammals species in the advisory region are *Delphinus dephis*, *Stenella coeruleoalba*, *Globicephala melas*, *Grampus griseus*, *Balaenoptera physalus*, *Physeter macrocephalus*. Population numbers are not available for all species and have wide confidence intervals. Amongst species for which estimates exist, the most abundant might be *G. melas*, *B. physalus* and *L. acutus* (ICES, 2005b).

Uncommon occasional or rare species occurring are *Stenella frontalis, Stenella longirostris, Lagenorhynchus acutus, Lagenorhynchus albirostris, Lagenodelphis hosei Globicephala macrorhynchus, Pseudorca crassidens, Orcinus orca, Peponocephala electra, Kogia breviceps, Kogia simus, Ziphius cavirostris, Hyperoodon ampullatus, Mesoplodon densirostris, Mesoplodon europaeus, Mesoplodon grayi, Mesoplodon bidens, Mesoplodon mirus, Eubalaena glacialis, Megaptera novaeangliae, Balaenoptera acutorostrata, Balaenoptera borealis, Balaenoptera musculus.*

9.1.2 Major environmental influences on ecosystem dynamics

The deepsea environmental is considered to be less variable that the surface systems. Moreover, due to the long life span of exploited species, variations in annual recruitment have a minor effect on the standing biomass so that in these deep systems the variability of the environment is not considered to have short term effects. How the deepseas will be impacted in the long term by the global warming is not known.

9.2 The human impacts on the ecosystem

9.2.1 Fishery effects on benthos and fish communities

The blue whiting stock is fished in Subareas II, V, VI, and VII and by a number of countries, mainly by Norway, Russia, Iceland, Denmark, Faroe Islands, United Kingdom, and Ireland. Most of the catches are taken in the directed pelagic trawl fisheries. The main fishery has traditionally been in the spawning and post-spawning areas (Divisions Vb, VIa,b, and VIIb,c). The catches in this area have increased from 0.55 million tonnes in 1995 to 2.33 million tonnes in 2004 t.

The Norwegian spring-spawning herring is fished in Subareas I and II, mainly by Norway, Iceland, Russia, Faroe Islands, Denmark, Netherlands, UK, Germany, and Sweden. The 2005 catches were around 1000 thousand t. Most of the catches were landed for human consumption.

The North Eastern Atlantic mackerel is fished in Subareas II, IV, V, VI, VII, VIII, and IX mainly by Norway, Russia, Ireland, UK, Ireland, Denmark, Netherlands, Germany, and the Faroe Islands. Most of the catches are taken in directed trawl fisheries in the Norwegian Sea, in the northern part of the North Sea and to the west of the British Isles. There are smaller-scale fisheries in Biscay and the Iberian Peninsula, where they are often taken in mixed fisheries with other pelagic species like horse mackerel, sardine, and anchovy.

The western horse mackerel stock is fished in Subareas II, III IV, VI, VII, and VIII mainly by Norway, Ireland, UK, Ireland, Denmark, France, Netherlands, and Germany. Most of the catches are taken in directed trawl or purse seine fisheries in the Norwegian Sea, along the western shelf edge, in the English channel and in the Bay of Biscay. The estimated landings in 2005 was 182 000 t.

The northern hake landings were around 90 000 tonnes in the early 1960s but have been substantially lower since then. Recent landingshave fluctuated around 40 000 t. All information available suggest that discard rates could be high (up to 95%) in some years and areas and for some fleets. The fishery employs a variety of different gears in different areas, including longlines and gillnets.

Since the 1980s, dwindling resources on the continental shelves of the North Atlantic have encouraged the development of fisheries in deeper waters. There has been a tendency for fisheries for species such as anglerfish and Greenland halibut to extend into deeper waters, and new fisheries have developed to target the new deepwater species that have been found there. Deepwater species such as the argentine or greater silver smelt (Argentina silus) and roundnose grenadier (Coryphaenoides rupestris), which were previously bycatch species have been targeted within the ICES area for the last two decades. Orange roughy (Hoplostethus atlanticus) has been a target species since the early 1990s.

Modern fishing fleets are capable of causing a very significant reduction in demersal deepsea fish biomass in just a few years, this as resulted in the collapse of several fisheries (Koslow et al., 2000). Along the MAR, fishery for roundnose grenadier depleted the stock in the 70s (Merrett and Haedrich, 1997). However, Polish fleets have been exploiting the same species over recent year on the MAR, it is not know if the fishing areas in the 70s and the 90-00s were the same.

It is likely that large predators populations on oceanic bathymetric features are particularly sensitive to overfishing, due to low productivity and in some cases high catchability. On the southern part of the MAR and adjacent seamounts, populations of alphonsinos were depleted too in the 70s. More recently, longline fisheries seem to have depleted seamounts populations of "giant" redfish of seamounts of the northern MAR (Hareide and Garnes, 2001).

These depletions of dominant species induce major changes to demersal deepsea fish communities that loose their larger predators and the corresponding ecological functions. In addition to catching target species, deepwater fisheries by-catch unwanted species that are either too small or unpalatable. Discarding rates are often high (in the order of 50%) and the bulk of the discards is made of smoothheads (Alepocephalidae) because of their high abundance (Allain et al., 2003).

In some parts of the northeast Atlantic where the continental shelf is narrow, such as off Portugal (including Madeira and the Azores), there are traditional fisheries, for example for black scabbardfish (Aphanopus carbo) and red (=blackspot) seabream (Pagellus bogaraveo), which have been exploiting deepwater species for many years. Other traditional species are ling, blue ling, and tusk, which have supported large fisheries in wide areas for several decades. The existence of other potentially exploitable stocks in the ICES area has been known since the 1960s and 1970s. However, before the 1980s, with the exception of a fishery for species such as roundnose grenadier (Coryphaenoides rupestris) there was little interest from the fishing industry in exploiting stocks in international waters.

Deep-water trawling impacts deepsea benthic communities. Over recent years attention was particularly drawn to the impact of trawling on *Lophelia* reefs. Measures to reduce the impact and protect some areas were taken. Fishery impact

to such communities are ancient (Joubin, 1922) and extent shallower than what we currently term "deepwater", the original extend and role of these reefs in the fish production is unknown. At least under some conditions (long soaking time, operation of hundredths km of nets, deployments over coral reefs) deep-water set nets was also shown to have severe impact mainly on the fish community by generating ghost fishing and targeting more vulnerable species such as sharks. High discards of monkfish may also occur (Hareide et al., 2005). As a result deepwater netting is banned in ICES divisions VIa,b, VIIb,c,j,k and part of sub-area XII in 2006, based on the annual TAC regulation (COUNCIL REGULATION (EC) No 51/2006) and is subject to further introduction of management measure.

Concluding remarks

Over the last 15 to 20 years, the deep-water ecosystem was significantly impacted by fishing as and when fishery extended deeper partly as a result of overexploitation of shelf stocks. Deepwater stock are typically low productive and their sustainable levels of exploitation are much smaller lower than those of shelf stocks.

Towed fishing gears have severe impacts on benthic communities; this is a major problem on structurally complex habitat including biogenic reefs. On the same kind of reefs netting is also considered undesirable as it can generate (i) habitat disturbance because of lots nets and dumping of used nets and (ii) ghost fishing. Therefore deepwater trawling should be restricted to primarily sedimentary bottoms and where possible fisheries should shift to longlining and closely managed netting (out of coral areas) as was successfully done in some southern hemisphere fisheries (fishery for Patagonian toothfish, *Disostichus eleginoides*, in the South Georgia and South Shetland Islands).

Although this is probably improving thanks to the Data Collection Regulation (Council Regulation (EC) No 1543/2000 of 29 June 2000) and on-board observers programs (Council Regulation (EC) N° 2347/2002 of 16 December 2002) there are serious gaps in the knowledge of exploited stocks structure and biomass. Better reporting of catches and effort data is necessary especially in International waters (NEAFC regulatory area). VMS (Vessel Monitoring System) data should be made available to National Research Institutions.

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9.3 Assessment and advice

9.3.1 Assessment and advice regarding fisheries

Exploitation boundaries in relation to widely distributed and migratory stocks and in relation to deepwater stocks are presented in the two text tables on the following pages.

Table 1. Single-stock exploitation boundaries: Exploitation boundaries in relation to widely distributed and migratory species.

Species	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary for agreed management plan or in relation to precautionary limits. Tonnes or effort in 2007
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long term yield	In relation to agreed management plan	In relation to precautionary limits	in relation to high long-term yield and low risk to the stock	
Hake – Northern stock	Full reproductive capacity	Harvested sustainably	Overexploited	According to Article 5.5a, the annual increase of TAC should be limited to 15% between any two years. This corresponds to a TAC of 50 485 t in 2007 and an expected SSB in 2008 of 160 600 t.	Fishing at F_{pa} is expected to lead to landings of 53 800 t in 2007 and SSB around 158 000 t in 2008.	Fishing mortality is aboveF0.1 and F_{max}.	50 454 t
Northeast Atlantic Mackerel	Uncertain	Harvested unsustainably	Overexploited	The agreed management plan implies catches between 390 000 t and 509 000 t in 2007.	None.	None.	390 000 t to 509 000 t
Western Horse Mackerel	Unknown	Unknown	Unknown	No agreed management plan	catches should be limited to less than 150 000 t.	None.	< 150 000 t
Blue Whiting	full reproductive capacity	harvested unsustainably	Overexploited	The maximum catch in 2007 corresponding to the existing management plan is 1.9 million tonnes.	Fishing at F_{pa} implies catches of less than 980 thousand t in 2007.	Fishing mortality is above $F_{0.1}$	< 980 000 t
Norwegian spring-spawning herring	Full reproductive capacity	Harvested sustainably	Unknown	The management plan implies maximum catches of 1 280 000 t in 2007.	The current long-term management plan is considered to be precautionary.	The target defined in the management plan is consistent with high-term yield and have a low risk of depletion production potential.	1 280 000 t
Northeast Atlantic spurdog	Unknown	Unknown	Unknown		Targeted fisheries should not be permitted to continue and bycatch in mixed fisheries should be reduced to the lowest possible level.	Spurdog are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality.	Prevent bycatch. Zero TAC.
Northeast Atlantic porbeagle	Unknown	Unknown	Unknown		Ttargeted fisheries should not be permitted and bycatch in mixed fisheries should be reduced to the lowest possible level, particularly in the depleted northern areas.	Porbeagles are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality.	Prevent bycatch. Zero TAC.
Northeast Atlantic basking shark	Unknown	Unknown	Unknown		No targeted fishing for basking shark should be permitted and additional measures should be taken to prevent bycatch of basking shark in fisheries targeting other species.	Basking sharks are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality.	Prevent bycatch. Zero TAC.

Table 2. Exploitation boundaries on deepwater stocks.

Species	Area	Stock id.	(Basis for) Stock status	Advice
Ling (*Molva molva*) Depth range: 200–500 m Longevity: 20 years	**I & II**	No information on genetically distinct populations. Ling at separate fishing grounds may be sufficiently isolated to be considered as individuals stocks. Bathymetric isolation.	CPUE trends	The CPUE shows an increasing trend while the catches have been stable. However, the CPUE also suggests a lower current abundance than in the 1980s. Therefore, advice in a precautionary context is to maintain catches below the recent level of about 6000 t, which is assumed to permit an increase in abundance.
	Va (Iceland)	No information on genetically distinct populations. Ling at separate fishing grounds may be sufficiently isolated to be considered as individuals stocks. Bathymetric isolation.	Survey trends (fishable stock and recruitment)	Catches in 2007 should not exceed the catches observed in 2001–2004, when the stock appears to have increased from a historical low. That corresponds to catches less than 3800 tonnes.
	Vb (Faroe)	No information on genetically distinct populations. Ling at separate fishing grounds may be sufficiently isolated to be considered as individuals stocks. Bathymetric isolation.	2 CPUE series	Based on the current perception of status and trends and as part of an adaptive management strategy, effort should not be allowed to increase.
	IV, VI, VII, VIII	The existence of distinguishable stocks along the continental shelf west and north of the British Isles and the northern North Sea (Subareas IV, VI, VII, and VIII) is less probable.	One CPUE series in each area (IVa, VI, VII)	Landings of ling have declined in recent years and the overall CPUE on ling has remained at a reduced level. ICES recommends to reduce catches to 10 000 t (about 30%) and to monitor if the indicators of stocks size increase.
Tusk (*Brosme brosme*) Longevity: 20 years	**I & II**	The scientific basis for stock identification remains uncertain. Tusk at widely separated fishing grounds may be sufficiently isolated to be considered as individual stocks. It is therefore suggested that Iceland (Va) and the Norwegian coast (II) have separate stocks	CPUE	Landings of tusk have declined in recent years and the overall CPUE on tusk has remained at a reduced level. ICES recommends to reduce catches to 5000 t (about 30%) and to monitor if the indicators of stocks size increase.
	Va (Iceland)	The scientific basis for stock identification remains uncertain. Tusk at widely separated fishing grounds may be sufficiently isolated to be considered as individual stocks. It is therefore suggested that Iceland (Va) and the Norwegian coast (II) have separate stocks	Survey indicator (fishable stock and recruitment)	The survey index shows an increasing trend in abundance while the catches have been stable. However, it also suggests a lower current abundance than in the 1980s. Therefore advice in a precautionary context is to maintain catches at the recent level (average 2001–2004) of about 5000 t, which is assumed to permit an increase in abundance.
	IV, VI, VII, VIII (Vb?)	The existence of distinguishable stocks along the continental shelf west and north of the British Isles and the northern North Sea (Subareas IV, VI, VII, and VIII) is less probable. It will be investigated whether tusk in the Faroese and Faroe Bank (Vb) may be considered as a separate stock unit.	CPUE indicator in 4 different areas	Landings of tusk have declined in recent years and the overall CPUE on tusk has remained at a reduced level. There has been no response in the CPUE series and a further reduction of 30% is advised. ICES recommends to limit catches to 5000 t and to monitor if the indicators of stocks size increase.

Table 2. Exploitation boundaries on deepwater stocks (continued).

Species	Area	Stock id.	(Basis for) Stock status	Advice
Blue ling (*Molva Dypterygia*) Longevity: 30 years	**Va (Iceland)**	Blue ling in the Northeast Atlantic can be separated into two stocks: one stock in Division Va and XIV and another stock in Subareas VI and VII. Blue ling in other areas are treated as one combined stock.	1 CPUE series, 1 (short) survey series.	There should be no directed fisheries and measures should be implemented to reduce/minimise catches in mixed fisheries. Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.
	Vb, VI and VII	Blue ling in the Northeast Atlantic can be separated into two stocks: one stock in Divisions Va and XIV and another stock in Subareas VI and VII.	Length distributions and CPUE information; Experimental CSA analysis.	There should be no directed fisheries and measures should be implemented to reduce/minimise catches in mixed fisheries to the lowest possible level. Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.
	I, II, IIIa, IV, VIII, IX, X and XII.	Blue ling im other areas are treated as one combined stock.	Only landings data.	There should be no directed fishereis and measures should be taken to mimimise the bycatch of this species in mixed fisheries. Such measures could include closing known spawning grounds during spawning.
Argentines Greater Silver Smelt (*Argentina silus*) Depth range: 100–700m Longevity: 35 years	**Va**	Icelandic life history studies suggest that a separate stock might exist in Subarea Va.	Only landings data and information on landings at depth.	Due to its low productivity Greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.
	I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, XIV.	Overall, stock identity cannot be determined for greater silver smelt in I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, XIV.	Only landings data. Some length frequencies available for Vb.	No stock-specific advice can be given due to uncertainty with regards to stock structure. Due to its low productivity Greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.
Roundnose grenadier (*Coryphaenoides rupestris*) Longevity: 60 years	**IIIa, IVa**	The Wyville-Thomson Ridge and fjord sills, between Western Scotland and the edge of the North Sea slope, could be natural physical boundaries.		Catches in IIIa have increased sharply and are estimated around 12 000 t. For this fishery, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared the level before the fishery expanded (1991–1999). This is interpreted as a reduction of 50% in landings and corresponds to a catch level around 1000 t in 2007.
	Vb, VI, VII, XIIb (Hatton bank)	The Wyville-Thomson Ridge and fjord sills, between Western Scotland and the edge of the North Sea slope, could be natural physical boundaries.	Landings data. Some CPUE data.	For the fishery in Divisions Vb, VI, VII, and XIIb, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared to the level before the expansion of the fishery started (1990–1996). This is interpreted as a reduction in catches of 50% over that period. This means that the catch level in 2007 should be at the most 6000 t.
	Mid Atlantic ridge (Xb, XIIc, Va1, XIIa1, XIVb1)	The Wyville-Thomson Ridge and fjord sills, between Western Scotland and the edge of the North Sea slope, could be natural physical boundaries.	Landings data and one CPUE series. Landings data are suspect.	In addition to their low productivity, Roundnose grenadier on the Mid-Atlantic Ridge (Xb, XIIc, Va1, XIIa1, XIVb1) and Va exhibit spatial distributions associated with seamounts and aggregating behaviour. Therefore these grenadiers are easily overexploited. Landings from this area appear to be low in recent years, but the quality of the landings data is suspect. Fishery on such species should be permitted only when accompanied by programmes to collect data. The expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.
	I, II, IV, Va, VIII, IX, and XIV	There is insufficient information to suggest different Subdivisions in Areas I, II, IV, Va, VIII, IX, and XIV.	Only landings data.	Roundnose grenadier in other areas has a low productivity and the species can only sustain a low fishing mortality. Recovery of depleted stock(s) will be slow. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.
Orange roughy (*Hoplostethus atlanticus*) Longevity: over 100 year	**All areas**	It is not known if individual aggregations are reproductively distinct.	Only landings data. One acoustic biomass in Area VII. Can be used to estimate virgin biomass?	Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends that there is no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

Species	Area	Stock id.	(Basis for) Stock status	Advice
Black Scabbardfish	**V, VI, VII, and XII**	The stock structure is uncertain. Two assessment units are considered: one in northern Subareas V,VI,VII and XII and the other in Subareas VIII and IX.	Landings data and one CPUE series.	Given the perceived decrease in stock abundance in the northern areas, ICES recommends a reduction in exploitation to the level before the expansion of the fishery started (1990–1996) in Subareas V, VI, VII, and XII, corresponding to landings of no more than 3500 t.
	VIII and IX	The stock structure is uncertain. Two assessment units are considered: one in northern Subareas V,VI,VII and XII and the other in Subareas VIII and IX.	Landings data and CPUE series.	In the Southern area (VIII and IX) a *status quo* exploitation level is advised.
	Other areas	There is insufficient information to suggest different subdivisions/areas.	Landings data only.	Any measure taken to manage this species in these areas should take into account the advice given for other species taken in the same mixed fishery. Fisheries on black scabbard should be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.
Greater Forkbeard	**All areas**	No information on stock identity.	Landings data only.	Fisheries on greater forkbeard should be accompanied by programmes to collect data. The fishery should not be allowed to expand unless it can be shown that it is sustainable.
Alfonsinos	**All areas**	No information on stock identity.	Landings, Standardized CPUE for Azores fisheries.	Due to their spatial distribution associated with seamounts, their life history and their aggregation behaviour, alfonsinos are easily overexploited by trawl fishing; and they can only sustain low rates of exploitation. Fisheries on such species should not be allowed to expand above current levels unless it can be shown that such expansion is sustainable. Exploiting new seamounts should not be allowed to prevent wiping out entire subpopulations that have not yet been mapped and assessed.
Red Seabream	**VI, VII, VIII & XII**	No information on stock identity.	Landings only.	Red seabream are hermaphroditic and are particularly susceptible to overexploitation; thus, measures to ensure balanced exploitation between younger fish (males) and older fish (females) are critical. Fisheries on red seabream should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable
	IX	No information on stock identity.	Landings only.	
	X	There are no genetic differences between populations from different ecosystems within the Azores region but there are genetic differences between Azores and mainland Portugal. The Area Xa2 component of this stock can be considered as a separate management unit.	Landings and CPUE.	
Roughhead grenadier (*Macrourus berglax*)	**All areas**	No information on stock identity.	Landings only.	There are no assessments of these stocks. The knowledge of the biology of the species is insufficient and it is unclear how vulnerable they are to exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data.
Smoothhead (*Alepocephalus* spp)	**All areas**	No information on stock identity.	Landings only.	
Rabbit fish (*Chimaera monstrosa* and *Hydrolagus* spp	**All areas**	No information on stock identity.	Landings only.	
Common Mora (*Mora moro*) and Moridae	**All areas**	No information on stock identity.	Landings only.	
Wreckfish (*Polyprion americanus*)	**All areas**	No information on stock identity.	Landings only.	

ICES advice for fishery management

ICES advice on widely distributed and migratory species

For the blue whiting combined stock (Subareas I–IX, XII, and XIV): ICES notes that the proposed management plan is not in accordance with the precautionary approach. ICES concludes that the exploitation boundaries for this stock should be based on the precautionary limits and that fishing at F_{pa} implies catches of less than 980 thousand t in 2007. This will result in a spawning stock biomass in 2008 well above B_{pa}.

For Norwegian spring-spawning herring: ICES advises that this fishery should be managed according to the agreed management plan with a fishing mortality of no more than F = 0.125, implying maximum catches of 1 280 000 t in 2006. This is expected to lead to a spawning stock of 10.2 million tonnes in 2008.

For NEA mackerel, ICES advises following the agreed management plan (F between 0.15 and 0.20) which would imply catches between 390 000 t and 509 000 t in 2007.

For western horse mackerel, ICES recommends that catches of horse mackerel in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa–c,e–k, and VIIIa–e be limited to less than 150 000 t.

For northern hake, ICES recomments to follow the agreed recovery plan because this plan is expected to have long-term gains in the present situation and is already implemented. According to Article 5.5a, the annual increase of TAC should be limited to 15% between any two years. This corresponds to a TAC of 50 485 t in 2007 and an expected SSB in 2008 of 160 600 t.

The NEA spurdog stock is depleted and may be in danger of collapse. Target fisheries should not be permitted to continue, and bycatch in mixed fisheries should be reduced to the lowest possible level. A TAC should cover all areas where spurdog are caught in the northeast Atlantic. This TAC should be set at zero for 2006.

For Northeast Atlantic porbeagle and Northeast Atlantic basking shark, ICES advises that given the apparent depleted state of these stocks, no fishery should be permitted on these stocks.

ICES advice on deepwater fisheries

Biomass (state) and fishing mortality (impact) are used as indicators in the ICES advisory framework. For the deep-sea species, the state and impact indicators are difficult to measure and in addition, because of the life cycle length, it will require a long time to monitor a response or before positive effects can be expected. Consequently, ICES recommends that pressure indicators such as effort be used supplementary in the management of these stocks. At present ICES does not have access to effort data that can be used as pressure indicators, but these indicators should be made available as a matter of urgency. In the absence of pressure indicators, ICES has generally recommended reductions in landings which should be coupled to reductions in fishing effort.

Most deep-sea species can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data and should expand very slowly until reliable indicators show that increased harvests are sustainable.

The recommended basic harvest control rule for deep-sea stocks is that fisheries on these species should only be allowed to expand when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented. An adaptive management strategy for these fisheries would thus consist of an initial low fishery which is closely monitored, and identification of a long-term strategy for sustainable harvest on the basis of this information. A gradual expansion of the fishery should only be allowed to the extent such a strategy can be identified and has been decided upon. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries.

The initial situation will be different for existing and new fisheries:

- For existing fisheries, the fishing pressure should in general be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that harvests are sustainable.
- When new fisheries develop or existing fisheries spread into new areas, relevant pressure, state, and impact indicators should be established on the basis of small, initial fisheries, which should only be allowed to expand very slowly if and when reliable indicators show that harvests are sustainable.

For both existing and new fisheries in the longer term, when state reference points such as $\mathbf{U}_{max}$ have been established through closely monitored fisheries at a low level, a harvest control rule on the basis of these reference points and including decision rules about maintaining the pressure within sustainable bounds could be implemented.

Management considerations

For several species there is a concern that catch rates can only be maintained by sequential depletion of relatively isolated concentrations/sub-units of a stock. The smallest unit for which data are reported at present is the ICES Subarea and Division, and this spatial resolution may not be appropriate for monitoring or managing this type of fishing activity. The depth range within an area may be very wide, and the sizes of the areas are very different. It is therefore recommended that systems are developed and implemented for recording effort and catches at a finer temporal and geographical scale, and that management actions are implemented that take into account spatial resolution at a finer scale than at present.

Regulations in force and their effects

In 2002 the EU, Faroe Islands, Iceland, and Norway agreed a long-term management plan for the fisheries of the blue whiting stock aimed at constraining the harvest within safe biological limits and designed to provide for sustainable fisheries and a greater potential yield. The management plan as a whole has not been implemented, because it has not been agreed between all countries participating in the fishery. The combined total of the catches exceeds the provisions of the agreed management plans.

For the Norwegian spring-spawning herring, there was no agreement between the Coastal States (European Union, Faroe Islands, Iceland, Norway, and Russia) regarding the allocation of the quota for 2005. The Norwegians increased their quota by 14%, as did the Icelanders and the Faroese. The sum of the total revised national quotas for 2005 amounts to about 1 million tonnes.

For NEA mackerel, Division IVa is closed to mackerel fishing from the 14th of February until late summer to protect the North Sea component. Management has aimed at a fishing mortality in the range of 0.15–0.2 since 1998. The fishing mortality realized since then has been in the range of 0.25 to 0.35.

For the western horse mackerel, the distributional range of this stock increased when the exceptional 1982 year class entered the fishery. This resulted in the development of unregulated fisheries outside the TAC area in the Northern North Sea. Catches outside the area covered by a TAC have been reduced in recent years. At present, the TAC for the Western areas includes Division Vb (EU waters only), Subareas VI and VII, and Divisions VIIIa,b,d,e. A separate TAC includes EU waters in Division IIa and Subarea IV. ICES allocates horse mackerel to the Western stock which is taken in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIe–k, and VIIIa-e.

For northern hake, the minimum legal sizes for fish caught in Subareas IV, VI, VII, and VIII is set at 27 cm total length (30 cm in Division IIIa). From 14th of June 2001, an Emergency Plan was implemented by the European Commission for the recovery of the northern hake stock (Council Regulations Nos. 1162/2001, 2602/2001, and 494/2002). In addition to a TAC reduction, 2 technical measures were implemented. A 100-mm minimum mesh size has been implemented for otter-trawlers when hake comprises more than 20% of the total amount of marine organisms retained on-board. This measure did not apply to vessels less than 12 m in length and which return to port within 24 hours of their most recent departure. Furthermore, two areas have been defined, one in Subarea VII and the other in Subarea VIII, where a 100-mm minimum mesh size is required for all otter-trawlers, whatever the amount of hake caught.

ICES has not been able to quantify the likely impact of the changes in mesh size. However, since hake is a late maturing fish, any improvement in the selection pattern that reduces the catch of younger fish is only expected to increase SSB in the medium term.

There are explicit management objectives for this stock under the EC Reg. No. 811/2004 implementing measures for the recovery of the northern hake stock. The aim is to increase the quantities of mature fish to values equal to or greater than 140 000 t. This is to be achieved by limiting fishing mortality to 0.25 and by allowing a maximum change in TAC between years of 15%. The TAC for northern hake has not appeared to be effective in controlling landings.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Areas VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002).

Deep-sea fisheries

National and international regulations have been introduced that to some extent regulate participation and landings. Some countries have licensing schemes for certain vessel categories and Iceland has introduced closed areas. An effort regulation system has been implemented in EU deep-sea fisheries. The regulation includes licences and stabilisation of effort at the recent level. NEAFC has in 2003 and 2004 proposed to freeze fishing effort for deep-sea species in the NEAFC Regulatory Area; however, discussions on implementation are still ongoing. In 2003, for Subareas VI–X (EU waters) EU unilaterally introduced a TAC management as an interim measure. The effects were seen in the preliminary landings that declined for some species in that year. The EU TACs only limit EU vessels.

For many years bilateral TAC agreements have been made between, e.g. EU and Norway, Norway and Iceland, Norway and Faroes, potentially affecting fisheries for several deepwater species (e.g. ling, tusk, blue ling), but it is uncertain if these TACs have limited the fisheries. In many cases the TACs are not species-specific but valid for a suite of species, hence it is difficult to list the exact TACs by species.

ICES has called for a reduction of the effort in the deepwater fisheries, and the regulations mentioned above all aim at stabilizing or curtailing effort. The regulations are expected to improve stock status or at least to slow the rate of depletion. However, their actual effects on the stocks cannot be quantified at present.

Quality of assessments and uncertainties

For blue whiting, the various models applied gave similar trends but a large divergence in the estimation of SSB and fishing mortality for the most recent years. Various model formulations could lead to estimates of SSB in 2005 varying from approximately 4 to 7 million tonnes. The assessments have shown marked upward revisions in SSB each year and downward revisions of fishing mortality. The new assessment model used for this stock is expected to be less sensitive to retrospective bias because the assessment is largely consistent with exploratory assessments that were carried out last year with that same methodology.

For Norwegian spring-spawning herring, ICES has investigated the use of a number of different models. When appropriately formulated, they all gave the same perception of the trajectory for stock size and fishing mortalities. Compared to last year, the SSB for 2004 is estimated to be about 20% higher and fishing mortality in 2004 to be about 30% lower. The changes in the present assessment compared to last year are partly the result of the exclusion of both the tagging information and the last four years in the winter surveys.

For NEA mackerel, due to the lack of fishery-independent data and the absence of age-disaggregated information for the spawning stock index, the levels of SSB are uncertain but F can be considered as indicative of the level and trend. In recent years, there has been a tendency to overestimate the SSB and to underestimate fishing mortality. The estimates of SSB and fishing mortality are becoming increasingly uncertain as there is no new fishery-independent data since 2004. The next egg survey is scheduled for 2007. There is a broad perception that there are substantial undeclared landings in this fishery. The assessment is strongly dependent on the catch information, both recently and in the past. Managers are encouraged to obtain reliable catch information.

For western horse mackerel, no fishery-independent estimates of SSB or recruitment are currently available. Therefore, it is not possible to determine the absolute level of SSB, recruitment, and fishing mortality. Accordingly, only relative trends in these quantities have been derived.

For northern hake, several sources of uncertainties remain for this stock. This concerns mainly growth, discards estimation, and CPUE indices in the earlier years. The CPUE series and surveys do not cover the whole area. There is a lack of reliable recruitment indices for this stock, which has implications for the quality of short-term forecasts. Northern hake is a wide ranging stock where the stock definition is considered to be problematic. There are concerns about the accuracy of aging data and the calculation of historic catch-at-age data.

Deepwater stocks

The situation on data for deepwater stocks is only slowly improving. However, the quality of the input data remains unsatisfactory for many species, and time-series are short.

In 2006 several CPUE series were updated or new ones were calculated. The attempts at assessment continue to rely very heavily on CPUE data and analyses, especially from commercial fleets, and this is not satisfactory. Few survey series are available, but if they are continued these series will become useful in the near future.

As mentioned earlier the smallest unit for which data are reported at present is the ICES Subareas and Divisions, and this spatial resolution is not appropriate for monitoring the status of deepwater fish. The recent initiatives from Eurostat,

NEAFC, and ICES on a redefinition of the divisions used for the reporting of fisheries catch and effort statistics will lead to more useful data.

Comparison with previous assessments and advice

Deepwater stocks

The basis for the advice is very similar to previous years, although the situation on data for deepwater stocks is slowly improving.

ICES has provided previously recommended management approaches for deepwater stocks in 2004 and 2005 which were largely based on effort measures. ICES recommended that: "Fisheries on these species should only be allowed to expand when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented. A management strategy for these fisheries would thus consist of an initial low fishery which is closely monitored, and identification of a long-term strategy for sustainable harvest on the basis of this information. A gradual expansion of the fishery should only be allowed to the extent such a strategy can be identified and has been decided. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries."

The advice on ling and tusk was for a 30% effort reduction compared to the 1998 level, and for blue ling the advice was for a closure of the directed fishery and a minimal bycatch.

The previous advice is reiterated in the current advice. ICES is still of the opinion that effort should be a driving management tool in these mixed deepwater fisheries. However, in the absence of pressure indicators, ICES has attempted to intepret the available landings and CPUE data in way that could be useful even when effort information is not available. This is trying to implement an adaptive approach by which ICES uses all available information—even if the basis is not very precise—to suggest approaches for the near future. Thus the perceived tendency of the stock indicators (CPUE, surveys) has been used to argue for the suggested changes to the landings. It is acknowledged that it is unlikely that there is a one-to-one relationship between catches and effort, but in the absence of information, ICES has interpreted the suggested reductions in landings to be directly translated into reductions in effort.

In some cases the outlook for the species has changed because of additional information being available (e.g. for ling in Va). In those cases the advice provided by ICES acknowledges this new information and builds on the new perception of the stock status, which could imply a different management advice.

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9.3.2 Special requests

9.3.2.1 NEAFC request concerning the spatial and temporal extent of deepwater fisheries in the Northeast Atlantic and a preliminary evaluation of areas closed to fishing by NEAFC

Fisheries definitions and spatial information by Subareas

The NEAFC Commission requested ICES to provide *"information on the spatial and temporal extent of all current deep-water fisheries in the NE Atlantic. ICES is also asked to develop suitable criteria for differentiating fisheries into possible management types (e.g. directed deep-water fisheries, by-catch fisheries etc) and to apply these criteria to categorise individual fisheries. This information is required to enable NEAFC to develop fishery-based management initiatives"*.

ICES considers that fisheries definitions should not be restricted to the deep-sea fraction, but should be approached on a broader scale. In the context of its Data Collection Regulation (DCR) programme, the EC has recently organized a number of workshops to standardize definitions of fleets and fisheries, including deep-sea fisheries. The methods and criteria used to make that segmentation shall be finalized by the end of 2006. Definitions of deepwater fisheries for EU countries should be consistent with the classification defined in relation to the DCR. For other countries, fisheries definitions should be worked out intersessionally, e.g. following the general guidelines provided by the ICES Study Group on Fisheries Forecasts (SGDFF 2004).

Some fisheries such as those for ling have existed for several decades and in such cases recent catch trends can be used to indicate if the current exploitation level has had a detrimental effect on the species in the area. However, many deepwater fisheries such as those for roundnose grenadier or especially orange roughy have been exploited only relatively recently, and in these cases the response of the stock to any level of catch may not be established. Even though a non-increasing amount is removed each year, there is no certainty that the species can sustain these catches, because the effects would only be observed many years later.

Spatial information was only available on the resolution of ICES Subareas. Higher resolution data from VMS was not yet available to ICES but will hopefully be available in the short term when the chairs of the relevant expert groups meet with the secretariat of NEAFC. This would allow an evaluation of the spatial components in the fisheries, thus enabling a better insight into potential stock trends derived from cpue information.

Table 9.3.2.1.1 summarises the qualitative information on fisheries harvesting deep-sea species in different areas. Tables 9.3.2.1.2a–d give an overview of technical interactions between deep-sea fisheries on the basis of landings by gear, area, and species in 2005.

Sources of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 2–11 May 2006, Vigo Spain (ICES CM 2006/ACFM:28).
Report of the Study Group on the Development of Fishery-Based Forecasts, 27–30 January 2004, Ostend, Belgium (ICES CM 2004/ACFM:11).

Table 9.3.2.1.1 Deep-sea fisheries in relation to their level of targeting.

ICES Subarea		**I+II**	**III+IV**	**VA**	**VB**	**VI+VII**	**VIII+IX**	**X**	**XII**	**XIV**
Trawl	Target		RNG			RNG BSF SKH BLI ORY			RNG	
	Bycatch					RNG BSF SKH BLI ORY				SKH
Longline	Target						BSF SBR	ALF SBR		
	Bycatch	LIN USK BLI		LIN USK BLI	LIN USK BLI					
Pelagic trawl	Target	ARG			ARG	ARG				
	Bycatch				LIN USK BLI					

RNG: Roundnose grenadier
BSF: Black scabbardfish
SKH: Siki (deepwater sharks: Portuguese dogfish *Centroscymnus coelolepis* and leafscale gulper shark *Centrophorus squamosus*)
BLI: Blue ling
ORY: Orange roughy
SBR: Black-spot seabream
USK: Tusk
LIN: Ling
ALF: Alfonsino
ARG: Argentines (Greater silver smelt)
FOR: Forkbeard
ZZZ: Other species
(ARU: misspelling for Argentines)

Table 9.3.2.1.2a Landings of bottom trawl gears in 2005 by area (kg). Source: WGDEEP 2006.

year	2005

Sum of Kg		species												
main gear	ICES area	ALF	ARG	ARU	BLI	BSF	FOR	LIN	ORY	RNG	SBR	USK	ZZZ	SKH
bottom trawl	I			7214	1000			13657				2902		
	IIa			8062492	20210		341	335858		1150		71846	3223	
	IIb			641	35			21044				3088	205	
	IIIa		454200	65	50419			54742		12959243		3985	445454	
	IVa			2661	21840	12	346	2186236		1634		263274	188	
	IVb				123			254394				2020	40	
	IVc						13	38475			8			
	IX	0		0	7651		39450	0	0	0	2024	0	81136	
	Va				55643			1737		83		8192		
	Vb			59000	97275	10871		90559		18015		12009	4817	
	Vb2				299000	55000	2000		9000	649000			39000	68000
	VI	63		0	135077		49895	56542	0	489	0	15946	42023	
	VIa			61192	2322002	2382573	395073	1093091	32905	1852573		107657	402224	523000
	VIb	210		4000	840163	77362	336374	241124	5720	227176	23630	90459	40413	18000
	VII	2503		0	16960		699347	171407	20	0	330	471	138146	
	VIIa				30	0	234	421440						
	VIIb				11087	4335	134931	612131	230	6380	2870	11113	27950	
	VIIc	5528		1527	59791	52416	492237	663872	19215	35444	3650	2348	354984	
	VIId				16		27	64303			4			
	VIIe				194		5333	1044971			1400			
	VIIf				45		5277	545428			5			
	VIIg			73	16	0	10950	606649					2614	
	VIIh				18436		15260	1703755						
	VIII	18732		32100	13626		96768	11705	0	43	15760	0	34032	
	VIIIa							10578			3883			
	VIIIb						14	5012			5015			
	VIIId							12						
	VIIj	10798		14355	87561	70668	925271	1806173	4483		2252	409	8375	
	VIIk	7608		800	146717	34675	1147632	670979	70058	13610	1320	1771	274180	
	X					65			350	1598000			250	
	XII	0		0	660338	189	60164	0	0	4804310	0	5000	9661071	
	XIIb				5000	8000	0		29000	291000			5000	11000
	XIV	0		0	0		0	0	0	13000	0	0	5000	
	XIVa				3297									
	XIVb				13012			332		7760		36	5686	
	Vb1a				1000	0	0		0	3000			0	1000
	Vb1b				351000	18000	2000		1000	76000			16000	32000
	VIb2				0	0	0		0	0			0	0
	VIIc2				0	1000	0		0	0			0	0
	VIIj1				1000	8000	4000		3000	0			3000	0

Table 9.3.2.1.2b Landings of longline gears in 2005 by area (kg). Source: WGDEEP 2006.

year	2005

Sum of Kg		species									
main gear	ICES area	ALF	ARU	BLI	BSF	FOR	LIN	RNG	SBR	USK	ZZZ
artisanal (lines)	IX				0	0			0		0
lines	I			1061		2555	92199	502		546920	4979
	IIa		60	2701		48776	3155588	6658		5451418	112731
	IIb					1820	79201	412		161382	2367
	IIIa			274			11850			20016	
	IVa			10106		82019	3291535	106		1438308	49589
	IVb						8685			3879	
	IX	0	0	0		46	0		333889	0	456163
	Other grounds										103414
	Va			19615		466	179890			303395	
	Vb			353							
	Vb1			14813		40463	1553416	610		1397913	
	Vb2			13636		2650	647322			359843	4010
	VI	0	0	63		1216	4382		0	0	0
	VIa			34685	16	128076	1991430	155		705916	5837
	VIb			1432		24946	976663			639368	611
	VII	50112	15	6742		180012	299255		3226	8	39485
	VIIa						13467				
	VIIb			49	27	6898	44185			2507	
	VIIc			2051	41	3566	55909			648	
	VIIe					38	127717		50		
	VIIf						1605				
	VIIg					4290	97283		34		
	VIIh			77	38	1272	556753			111	
	VIII	20693	3	2865		118300	47120		44318	0	14926
	VIIIa			37	196	663	226418		254		
	VIIIb						824				
	VIIj			12705	6936	63138	356693				
	VIIk					21854	92210				
	X				0	0			0		0
	XII	0	0	5000		0	0		0	0	0
	XIV	0	0	4000		0	0		0	8000	5000
	XIVa									4901	
	XIVb			788						35875	24622

Table 9.3.2.1.2c Landings of gillnets and net & line gears in 2005 by area (kg). Source: WGDEEP 2006.

year	2005

Sum of Kg		species									
main gear	ICES area	ALF	ARU	BLI	FOR	LIN	ORY	RNG	SBR	USK	ZZZ
gill nets	I			11		13				11885	
	IIa		265605	127200	11446	21879		2365		755232	6595
	IIb					1870					
	IIIa			171						6205	
	IVa	812		56848	9798	259764		156		83530	567
	IVb					56731				231	
	IVc					2315			5		
	IX	0		0	177	0	0	0	0	0	214
	Na			1426	5400						
	Other grounds										307974
	Vb			34912	2378	18211				691	
	VI	0		0	0	0	0	0	0	0	0
	VIa	8371		55527	112781	1171699	1313	7	928	13440	11317
	VIb			151365	112766	593326				11580	142
	VII	2091		1475	10218	13360	0	0	625	180	3344
	VIIa			8	15	98952				72	
	VIIb	180		15784	31889	424341	2223			9810	2933
	VIIc			69712	65475	302579	11779		3353	2898	4181
	VIId					2197					
	VIIe				586	3833906			46		
	VIIf				1847	2467624			1		
	VIIg				7538	1987225				793	
	VIIh				52086	3822224			24	196	41
	VIII	34562		7333	8066	16155	2	5	5568	0	2819
	VIIIa				2801	13255			8200		7756
	VIIIc			22	209						
	VIIId				34				9		
	VIIIe					14					
	VIIj	8173		52976	481769	1724132	2105		5722	31236	38937
	VIIk	7932		48996	272519	750284	7577		21457	4599	
	XII	0		3245	8995	42668	0	0	0	0	0
	XIV	0		0	0	0	0	0	0	0	0
net&line	VIIa					33489					
	VIIb					504					
	VIIc					942					
	VIId					95					
	VIIe				835	590827			27		
	VIIf				722	417117			1		
	VIIg				1112	511467					
	VIIh				97	299474					
	VIIj				39	192658					
	VIIk					307					

Table 9.3.2.1.2d. Landings of other gears in 2005 by area (kg). Source: WGDEEP 2006.

year	2005

Sum of Kg		species								
main gear	ICES area	ALF	ARU	BLI	FOR	LIN	RNG	SBR	USK	ZZZ
other gear	IX	6138	4130	0		31		28801		
	VI	0	0	0		0		0		
	VII	0	0	0		0		0		
	VIII	62130	12	23417		65546		24224		
	XII	0	0	0		0		0		
	XIV	0	0	0		0		0		
pel trawls	IIa		8313588	407		852	67		151	
	IVa					130568			9220	88
	IVb					80723			11965	750
	IVc					16		30		
	Vb								65	
	VIa		64380	258	282	58327			242	
	VIb					905				
	VIIa					228766			56	
	VIIb			129	89	984			60	
	VIIc			549	3292	19763			12131	
	VIId							104		
	VIIe							119		
	VIIf					78				
	VIIg					1544				
	VIIh					7114				
	VIIIa					699				
	VIIj		14000	11	325	1503				
	VIIk			11	274	275			58	
seines	I		50			152			366	
	IIa		240004	46		26620	767		6383	767
	IVa					23919			696	
	IVb					112				
	VIa					508				
	VIIa					524				
	VIIf					360				
	VIIg					19520				
	VIIj					2901				

Distribution of deepwater fisheries in the Northeast Atlantic

Request

"The NEAFC Commission requested that ICES provided, preferably not later than May 2006, information on the spatial and temporal extent of all current deep-water fisheries in the NE Atlantic. ICES was also asked to develop suitable criteria for differentiating fisheries into possible management types (e.g. directed deep-water fisheries, by-catch fisheries etc) and to apply these criteria to categorise individual fisheries. This information is required to enable NEAFC to develop fishery-based management initiatives."

Summary

ICES has plotted NEAFC's Vessel Monitoring System (VMS) data for the years 2003–2005. Examples of fisheries have been chosen based on the gear codes used by NEAFC. Unfortunately, only half of the available records in the dataset contained information on the gear used. Bottom trawls were the most frequently recorded gear. A method to differentiate the behaviour of (bottom) trawlers into steaming and fishing was applied. Maps of fishing activity by bottom trawls and by quarter and year are plotted.

Recommendations and advice

Fishery-independent data are an important source for describing the distribution of fishing activity. VMS data are currently the best form of this data, although ICES notes that it is still possible for such data to be manipulated by fishers. For a full understanding of the distribution of all types of fishing in the NEAFC area, it is essential that a gear code be associated with each VMS record. In the available dataset, only half of the records contained information on gear used. ICES recommends that NEAFC improves the gear recording of vessels fishing in the NEAFC area. For historical records, flag nations might be approached to add gear codes to existing (anonymous) vessel identifiers.

At present there is no code attached to a VMS signal that can be used to indicate whether a vessel is fishing or steaming. Ideally, the vessel would indicate via the VMS signal whether it is fishing or not. For vessels that are trawl fishing, fishing activity can be inferred from vessel speed and directional changes and direct transmission of these parameters in the VMS signal would improve ability to discriminate vessel behaviour. Further work is required to discriminate between fishing and steaming for vessels that are fishing with other gears than bottom trawls. ICES would be prepared to undertake this further work.

In consultation with NEAFC and the fishing industry, the current list of gear codes could be updated to identify a smaller number of 'metiers'. The metiers could be used as the basis for reporting effort data. ICES would be prepared to undertake further work over the coming year to describe these metiers and thereby to improve the mapping capability.

Scientific background

Introduction

ICES holds no independent data or information on the spatial or temporal distribution of fishing activity in the NEAFC region. The most appropriate data to describe fishing activity is either from collated logbooks or from Vessel Monitoring Systems (VMS). At present, there is no collation of logbook data in the NEAFC area. In September 2006, NEAFC responded to an explicit request from ICES by sending VMS data for all vessels fishing in the NEAFC Regulatory Area over the period 2002–2005. This VMS data contained geographic position (latitude/longitude), anonymous vessel ID, date and time, and gear code. The polling time was on average 2 hours. Unfortunately gear information for the 2002 dataset was missing entirely so data for this year were removed from subsequent analyses. The data were processed to standardize the geographic coordinates and create a single date and time field. VMS data associated with incorrect, missing, or duplicated geographic coordinates were removed (~3% of the data).

Methods

The 'cleaned' VMS data were mapped in a number of ways using IFREMER's GIS system.

In the first type of plot, all the available VMS data were plotted by gear code and for all available years together. In these plots there was no discrimination between fishing and steaming behaviour.

The second type of plot described the distribution of deepwater trawl fisheries in the NEAFC area by vessels using a demersal otter trawl (code 'OTB'). This gear type contributed to 36% of all the recorded effort and to 75% of the effort where the gear code was available (total effort was measured in terms of the number of pings, Table 9.3.2.1.3). The data on demersal otter trawl effort were then processed to remove VMS pings made while the vessel was steaming. When

vessel speed was less than 6 knots and the statistic measuring the variability in the track of the vessel was less than 0.95, the vessel was assumed to have been fishing. In other cases the vessel was assumed to be steaming (see Appendix 1 for a full description of the methods).

Table 9.3.2.1.3 Number of VMS positions for each gear code in 2005.

Gear Type	Gear Code	Total number of locations
Bottom otter trawl	OTB	93315
Mid-water otter trawl	OTM	11241
Purse seine with purse lines	PS	7504
Gillnet anchored	GNS	6750
Set line, longline	LLS	2839
Single-vessel purse seine	PS1	1405
Longline	LL	547
Pot	FPO	474
Bottom trawl *Nephrops*	TBN	442
Gill tangle net (not specified)	GEN	200
Bottom pair trawls	PTB	177
Drift nets	GND	155
Bottom trawl shrimp	TBS	117
Trammel nets	GTR	34
Boat dredges	DRB	4
Not recorded	UNKNOWN	132632

In 2005 there are records from 197 vessels.

Results

Distribution of fisheries

The spatial extent of the main deepwater fisheries in the NEAFC region is illustrated in Figure 9.3.2.1.1. In these maps there is no discrimination between fishing and steaming. The 'unknown' category is by far the largest 'fishery'. Because of the large 'unknown' category, it is impossible to be sure that the maps of fishing activity in other fisheries really represent the distribution of those fisheries.

The fisheries can be mapped by different time intervals. As an example the bottom trawl fisheries are shown by quarter and year in Figure 9.3.2.1.2. Only vessels predicted to have been trawling are plotted in this figure. A clear seasonal change in the distribution of fishing activity is apparent for the waters north of Iceland.

Bottom trawl gears are extensively deployed on the Hatton and Rockall Banks (west of Scotland) and the Goban and Austell Spurs (west of Brittany) throughout the year. The South Reykjanes Ridge (southwest of Ireland) and the Voring Plateau (west of Norway) areas are visited during quarters 2 and 3 (see Figure 9.3.2.1.2). Mid-water trawlers use the NEAFC waters west of Norway and areas west of the UK and Ireland heavily, and also operate on the Reykjanes Ridge (Figure 9.3.2.1.1). The shelf edge and slope west of UK, Ireland, and France is used most heavily by the fixed net and longline fleets (Figure 9.3.2.1.1).

It is not possible to determine whether there are interannual changes in fishing activity because there may be biases in the proportions of vessels being coded in different years.

Criteria for differentiating fisheries

This current analysis was based on the gear codes used by NEAFC. For the future, ICES recommends that 'metiers' are identified and that fishing activity is reported for these métiers. Metier characteristics would consist of both physical aspects of the vessel (e.g. size, engine power) and changeable aspects of the fishing strategy (e.g. gear, mesh size, depth).

Discussion

There are geographical differences in usage of the NEAFC area by fisheries using different gear types. Except for vessels using bottom-trawl gear, some of these differences may be obscured by the inability to distinguish vessels that are fishing from vessels that are steaming and from the absence of gear coding for about half of the registered fishing trips.

More detailed analysis of fleet distributions are likely to be misleading because of the high proportion of vessels that have no information on the gear used. In 2005, only 48% of VMS records could be allocated to a gear type. To improve the reliability and definition of areas used by the various fleets, it is important first of all to ensure that all vessels report the gear that they use. For the post-reporting classification of fishing types when no gear code is available, it could be investigated if vessel speed patterns per fishing trip could be used for discrimination of the major categories of fishing types. It would also be useful if fishing operations could be distinguished from non-fishing activities. This would ideally be achieved through coded VMS reporting or through the development of post-reporting methods of data analysis like the method presented for bottom-trawls.

Validation tests on VMS data are being carried out within the EU-funded CEDER project. Preliminary indications from these analyses suggest that the ability to discriminate between fishing and steaming was quite weak when 2-hour polling intervals were used. This was based on comparisons between VMS data and reliable information from the vessels personal logbooks. Work using more detailed data, e.g. from loggers suggested that in some fisheries a 15-minute (approx.) interval was needed to discriminate between fishing and steaming.

It appears that more recent VMS data can include the course and speed of the vessel. This would be very useful for subsequent analysis of the VMS data.

The reporting of effort distribution as density of VMS pings is only a first step towards a more full assessment of deep-water fisheries impacts. If an accurate distinction between steaming and fishing activities can be made, it may be argued that swept area is a better measure of the fishing impact of moving gears. With a more efficient use of information from NEAFC on vessel size and power, and on fishing gear and target species, a specialist evaluation of the most appropriate measures of effort for each metier in each area could provide a suite of parameters that define the impact on the system.

Source of information

Working document by Marchal, P., Eastwood, P., Laurans, M., and Mills, C. prepared in response to this request and developed with input from ICES and the Chair of the Working Group on Deepwater Ecology (WGDEC).

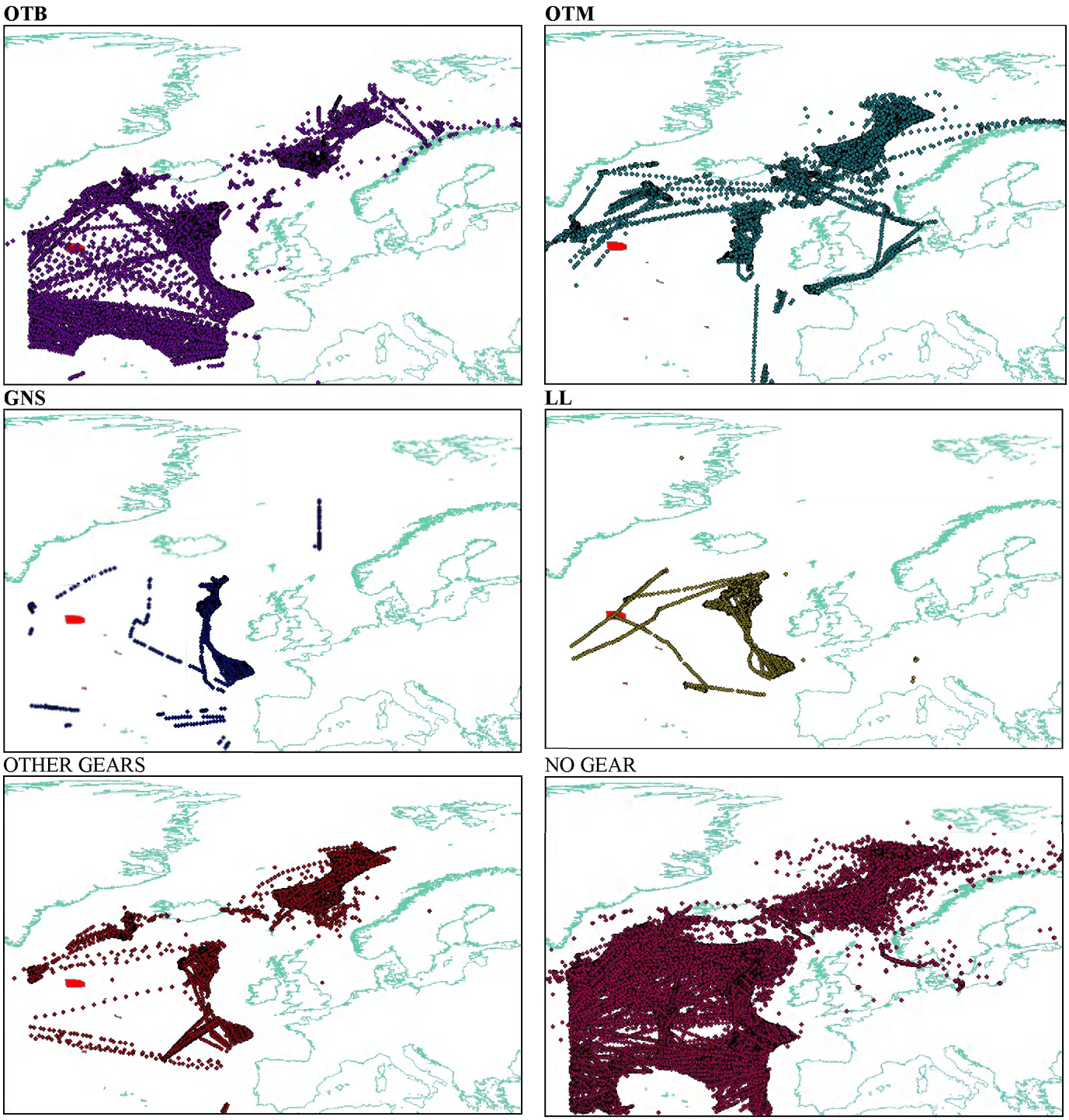

Figure 9.3.2.1.1 All VMS positions of vessels operating in the NEAFC Regulatory Area for the period 2003–2005. Fishing and non-fishing records are included. Gear codes as defined in Table 9.3.2.1.3. The closed areas are indicated in red.

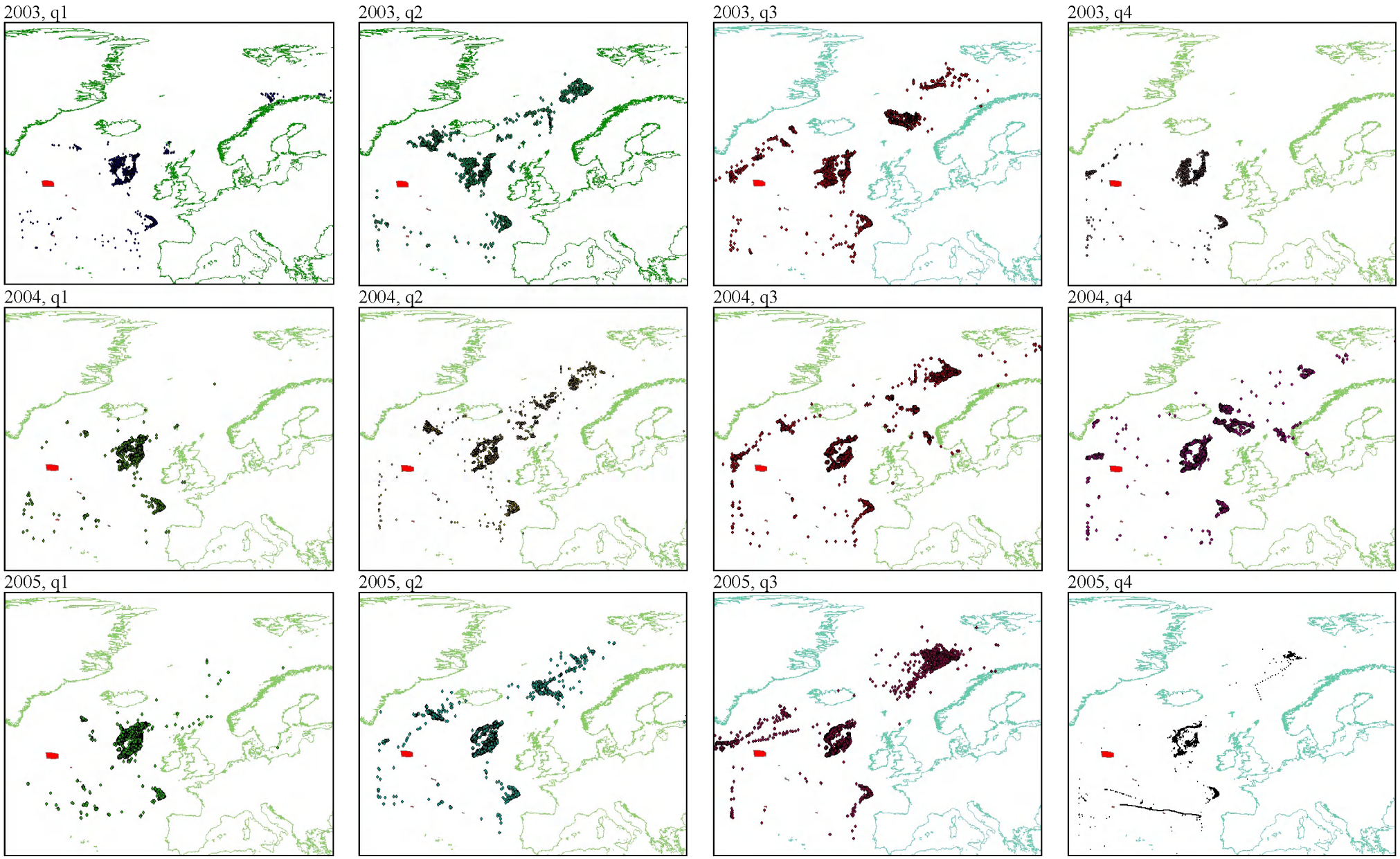

Figure 9.3.2.1.2 VMS positions of the fishing operations of the bottom-trawl gear (OTB) operating in the NEAFC Regulatory Area by quarter in 2003–2005. Fishing operations have been differentiated from steaming using the combined method described in Section 9.3.2.1 and Appendix 1. The closed areas are indicated in red.

Appendix 1: Determining vessel behaviour from analysis of successive VMS records

a) Using apparent speed

Speed rules were developed by identifying lower and upper trawling speed limits from speed frequency distributions for each year (Figure 9.3.2.1.3). Speed was calculated based on the time and distance between successive transmitted locations. A previous study on beam trawler behaviour demonstrated that the frequency distribution of a vessel's speed over numerous trips is bimodal, where a peak is found around suitable trawling speeds and again at steaming speeds (Mills *et al,* in press). This is apparent in the NEAFC dataset (Figure 9.3.2.1.3a–c) and is consistent from 2003–2005. When examining these distributions fishing speeds are assumed to vary between 1 and 6 knots. Above and below this speed range a vessel was considered not to be fishing.

b) Using apparent change in vessel direction

In some instances, speed alone may not be the most appropriate criteria for identifying fishing behaviour. Vessels can steam at 6 knots or less when slowing down on approach to port, between hauling and shooting the gear, when in close proximity to other boats, or during adverse weather (Dann *et al.*, 2002; Rijnsdorp *et al.*, 1998). An alternative method for identifying when vessels are trawling is to examine the spatial relationships between a moving window of position records. Movement statistics were calculated from four successive vessel locations consistent with the approach recommended in Mills *et al.* (in press). As found in previous research, trawling vessels will show directed movement to fishing grounds whilst steaming and show a far more erratic behaviour when fishing (e.g. Bertrand *et al.*, 2005). This type of movement can be quantified using the mean length of the vector (MLV) statistic as described by Batschelet (1981). The MLV method is a summary statistic based on deviation angles calculated along the path of a vessel. The mean deviation angle is not a useful measure of track movement due to the circular nature of the data. For example, the mean of 1° and 359° is 180° but suggests a movement opposite to that of the true direction of movement. If θ is the mean angle of movement over n (in this case n = 4) successive locations then MLV is calculated by the following equation:

$$MLV = \frac{\sqrt{S^2 + C^2}}{n}$$

where:

$$S = \sum \sin\theta$$
$$C = \sum \cos\theta$$

MLV reaches asymptotes at 0 to 1, where 1 represents a unidirectional movement and 0 is multidirectional. In the same way as fishing behaviour was determined from calculated speed, we inspected the frequency distribution of MLV to identify the range of MLV that corresponded with fishing (Figure 9.3.2.1.4a–c). In concordance with previous research, an MLV score of greater than 0.95 was assumed to represent steaming.

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Dann, J., Millner, R., and De Clerck, R. 2002. Alternative uses of data from satellite monitoring of fishing vessel activity in fisheries management: II. Extending cover to areas fished by UK beamers. Report of EC Project 99/002.

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Rijnsdorp, A. D., Buys, A. M., Storbeck, F., and Visser, E. G. 1998. Micro-scale distribution of beam trawl effort in the southern North Sea between 1993 and 1996 in relation to the trawling frequency of the sea bed and the impact on benthic organisms. ICES Journal of Marine Science, 55: 403–419.

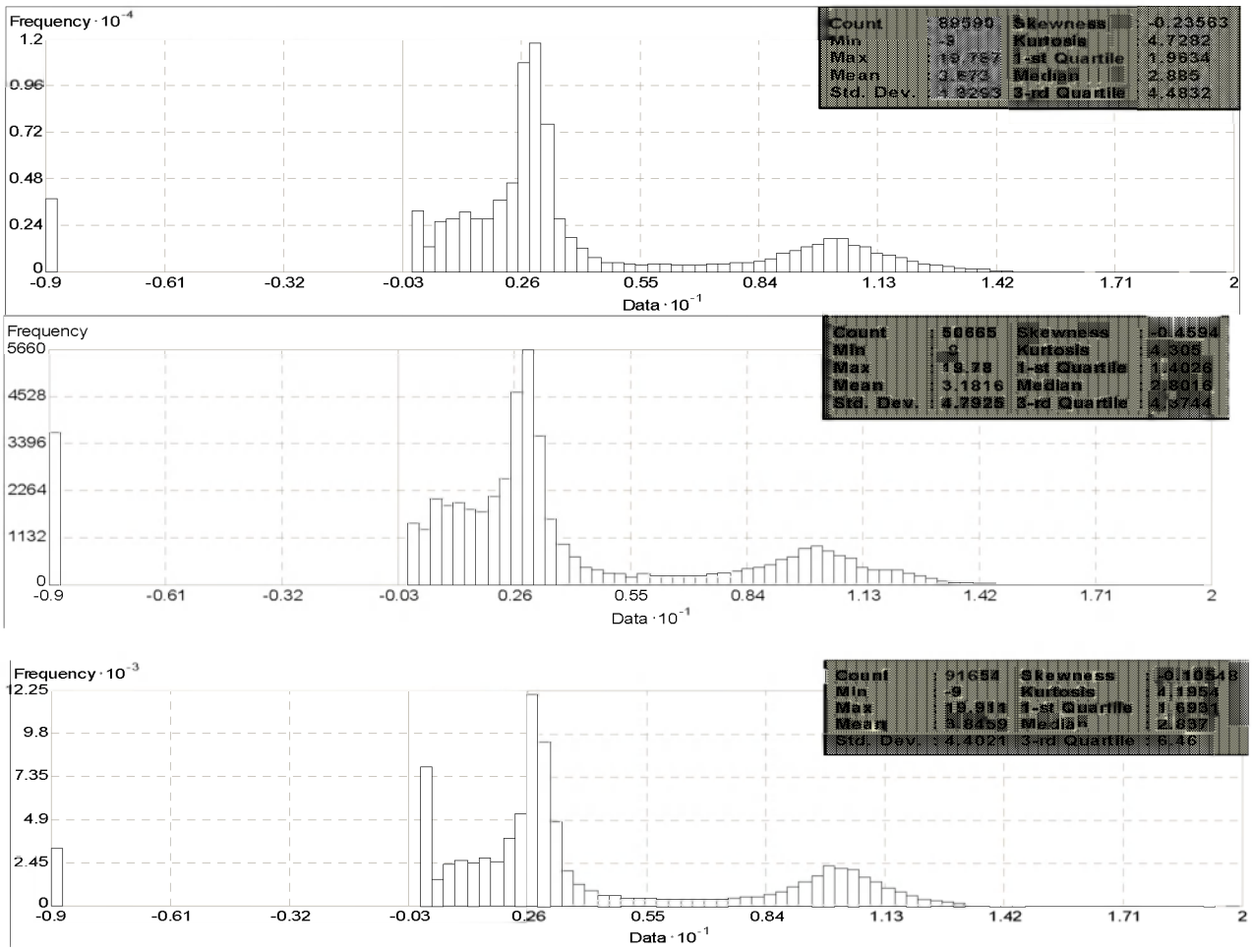


Figure 9.3.2.1.3 Frequency distributions of calculated vessel speed for (a) 2003, (b) 2004, and (c) 2005. Speeds are represented as 10^{-1}.

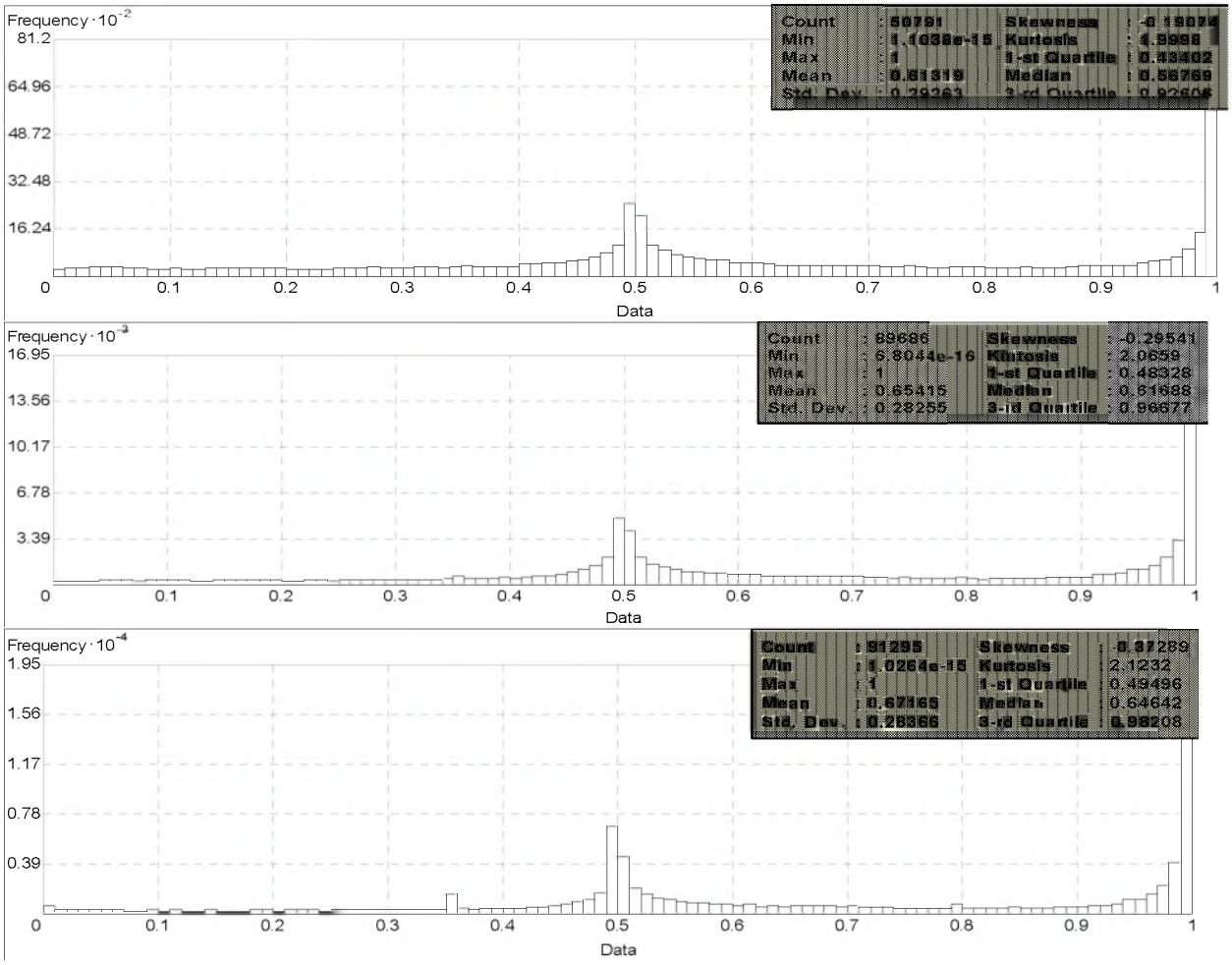


Figure 9.3.2.1.4 Frequency distribution of the mean length of vector (MLV) for (a) 2003, (b) 2004, and (c) 2005.

Preliminary evaluation of areas closed to fishing by NEAFC

Request

In 2005, the NEAFC Commission requested ICES to *"assist in evaluating the closures of the Faraday, Hekate, Antialtair, Altair seamounts and the area on the Southern Reykjanes Ridge not later than November 2007"*.

Summary

Mapping of VMS records using bottom-trawl coded data was carried out for the five closed areas in the NEAFC waters. These data are the only available information to assess the effects of these closures. No post-closure biological data were available. The VMS data were of limited quality because not all VMS records were associated with coded fishing activities. Future evaluations would be improved if VMS data were coded with gear type and if biological data were also collected. Based on the available data, no fishing with bottom trawls appeared to have occurred in any closed area in 2003 and 2004. In 2005, no bottom trawl fishing operation was recorded in either the Reykjanes ridge or the Hekate seamount closed areas, but some fishing seems to have occurred within or on the border of the closed areas associated with the Faraday, Altair, and Antialtair seamounts.

Recommendations and advice

If the true effects of closed areas are to be evaluated, a specific monitoring programme needs to be implemented prior to the closure and continued after the closure. Ideally a nearby 'control' area that is not closed should also be monitored so that 'natural' changes can be differentiated from those caused by fishing. No such programme has been designed or implemented in the NEAFC region. The only available data spanning the period of the closure are from VMS records. These data are limited in value owing to the incomplete coding of fishing gear associated with the VMS records and the need to distinguish fishing and non-fishing records after the VMS records have been received. Improved collection of gear and fishing/non-fishing information is recommended prior to a more complete evaluation of the effects of the closures in late 2007.

Scientific background

Introduction

ICES holds no independent data or information on the spatial or temporal extent of various fisheries in the area of the closures. Insufficient data are available on the habitats in these areas either before or after the closures. The MAR-ECO project (www.mar-eco.no) visited some of the areas later selected for closure, but this was in 2004 and prior to the closure. The sampling effort at each site was also too limited to provide a basis for evaluating the biological effects of protection, even if other data had been collected following the closure. ICES therefore examined the VMS data for vessels fishing in or near the closed areas over the period 2003–2005, to assess whether there had been any fishing activity in the closure area. These VMS data contained geographic position (latitude/longitude), anonymous vessel ID, date and time, and gear code for these years. The data were also processed to standardize the geographic coordinates and create a single date and time field. VMS data associated with incorrect, missing, or duplicated geographic coordinates were removed (~3% of the data).

Methods

The 'cleaned' VMS data were mapped in a number of ways using IFREMER's GIS system. In order to describe the distribution of current deepwater trawl fisheries in the NEAFC area (the fisheries that could have affected the closed areas), data relating only to those vessels using a demersal otter trawl (code 'OTB') were extracted from the dataset. This gear type contributed to 36% of all the recorded effort and to 75% of the effort where the gear code was available (total effort was measured in terms of the number of pings, Table 9.3.2.1.3). The data on demersal otter trawl effort were then processed to remove VMS pings made while the vessel was assumed to be not fishing (see Appendix 1 for methods). If the speed was <6 knots and if the statistic measuring the variability in the track of the vessel was less than 0.95, then ping locations were assumed to denote fishing. All other ping locations were assumed to represent steaming.

Results

The closed areas in the NEAFC area are shown in Figure 9.3.2.1.5. It can be seen that the five closed areas were visited by steaming bottom trawlers during 2003–2005. No fishing seems to have occurred in any closed area in 2003 and 2004. In 2005, no fishing operation was recorded in either the Reykjanes ridge or the Hekate seamount closed areas, but some trawl fishing seems to have occurred within, or on the border of, the closed areas associated to the Faraday, Altair, and Antialtair seamounts. This can be seen better at the larger scale shown in Figure 9.3.2.1.6.

Discussion

The number of trawling operations carried out within the closed areas was low before and after the closure in 2005. More trawling may have occurred after the closure. It must be noted though that the caveats mentioned in the first part of this advice relating to the quality of the VMS data also apply here. Thus a high proportion of the total fishing operations in the NEAFC area as recorded by VMS do not have a gear code attached. It may well be that considerably more trawling occurred in the closed areas than is recognised with the current mapping.

Proper evaluation of the ecological effects of the closure require monitoring programmes that focus on effects prior to the closure and are continued after the closures. Such monitoring programmes have not been implemented. The only available data spanning this period were the VMS data, and without further biological information they are inadequate for this evaluation. Revisiting international monitoring efforts covering a period from before the closure until now may provide data on sampling levels plus their variances inside and outside closures, and this could build the basis for power analyses to establish what levels of continued sampling are needed for statistical inference.

Source of information

Working document by Marchal, P., Eastwood, P., Laurans, M., and Mills, C. prepared in response to this request and developed with input from ICES and the Chair of Working Group on Deepwater Ecology (WGDEC).

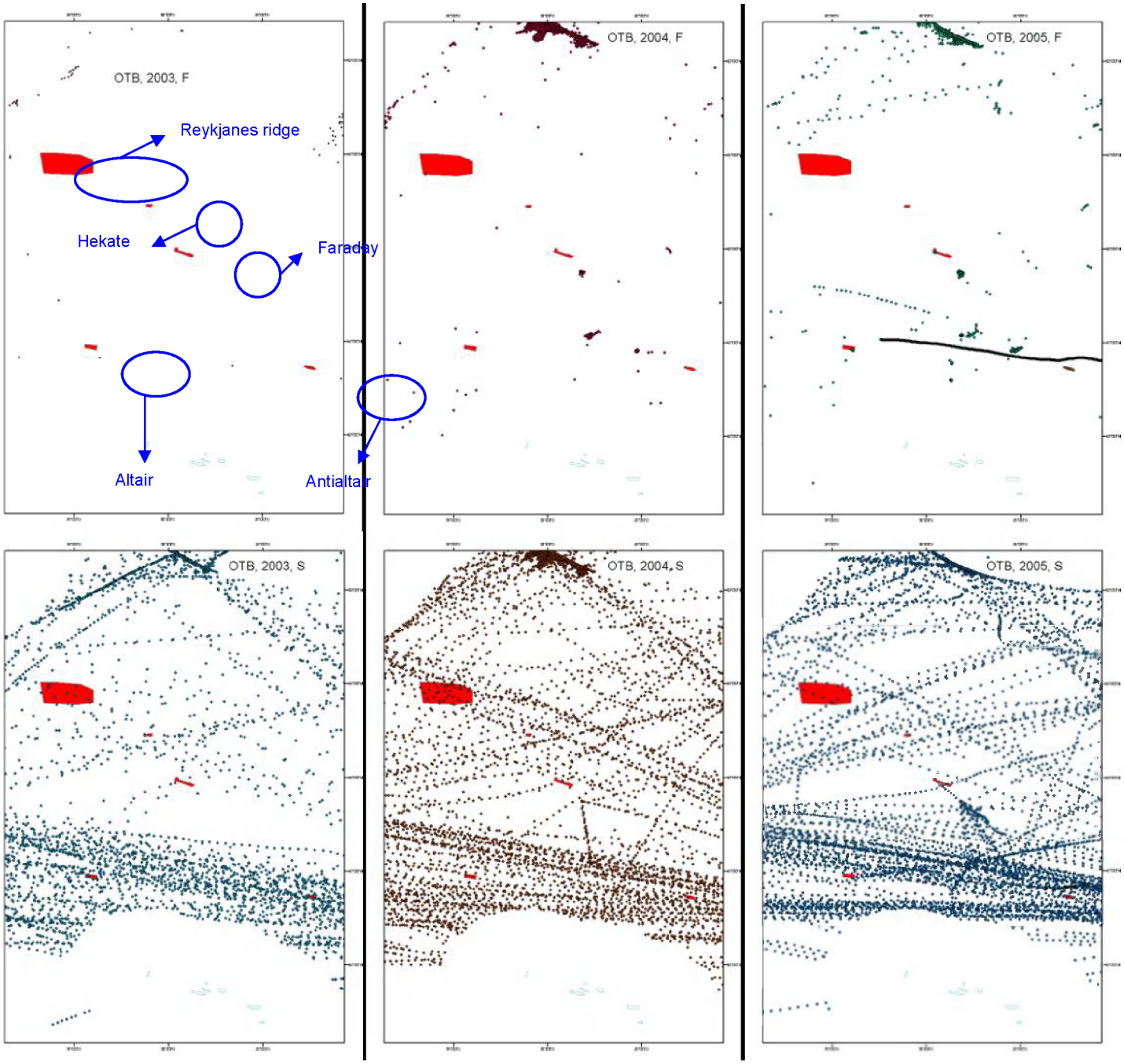


Figure 9.3.2.1.5 VMS positions by type of operation (F: fishing, S: steaming) and by year (2003, 2004, 2005), as recorded for the bottom trawling fleet operating around the NEAFC closed areas. The differentiation between steaming and fishing operations is carried out using the method described in Section 9.3.2.1. The closed areas are indicated in red.

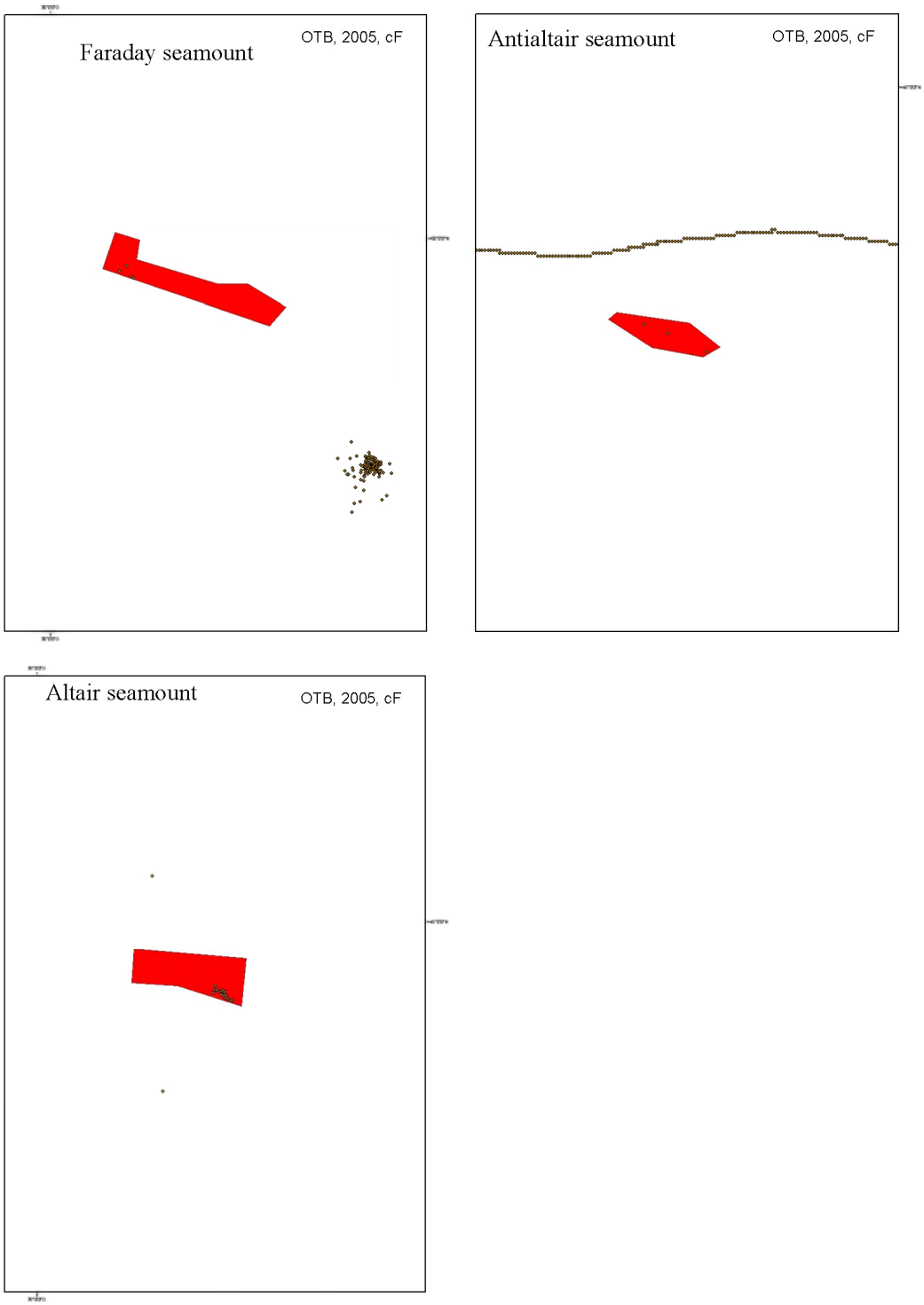


Figure 9.3.2.1.6 VMS positions of fishing operations of bottom trawlers in 2005, in and near the Faraday, Altair, and Antialtair seamount closed areas. The differentiation between steaming and fishing operations is carried out using the method described in Section 9.3.2.1. The closed areas are indicated in red.

9.3.2.2 EC request concerning the identification of key areas/species to be recorded on a dedicated internationally coordinated survey

During the EU Regional Coordination Meeting for the North-East Atlantic in 2005, it was recommended that "*ICES WGDEEP should be asked to propose key areas/species to be recorded on a dedicated internationally coordinated survey*". This request was formally sent to ICES from DG Fish 16.11.2005.

The choice of key species/areas could depend on a range of criteria, including value of fisheries, state of exploitation, and degree of vulnerability. No single species or area was *a priori* seen as having a higher priority than any other. This request was addressed for all deepwater stocks for which ICES gives advice. Given the size of the geographic area where these stocks are found, a single dedicated survey would not be feasible. ICES recommends a series of dedicated surveys and extensions to existing surveys which would provide appropriate data on the relevant deepwater species in each area.

In general terms, the survey(s) should cover the distribution area of the stocks. ICES recommends that surveys be conducted regularly for the fully- or heavily-exploited stocks. The frequency of these surveys would depend on the requirements for stock assessments and management.

- **Subareas I and II.** For these Subareas, a dedicated survey should focus on greater silver smelt, using acoustics in combination with mid-water trawls. This survey could operate in the troughs of the Norwegian continental shelf down to a depth of approximately 700 m. There may also be scope to extend the coverage of the existing Greenland halibut and redfish surveys.
- **Division IIIa.** In order to evaluate of the stocks of greater silver smelt and roundnose grenadier in this area, ICES recommends extending the coverage of the existing shrimp survey to include the complete distribution range of these stocks.
- **Division Va.** The groundfish survey in October covers the Icelandic shelf and slope down to a depth of 1200 meter (Division Va and XIV). The present coverage has been in place since 2001. Biological information is collected on all species that are retained by the gear. It is expected that in the coming years the survey will become valuable in assessing the stock trends of various deepwater species in Icelandic waters. A dedicated acoustic survey could also be carried out to evaluate the stock of greater silver smelt.
- **Division Vb.** The existing groundfish surveys in the Faroe Islands could be extended to below 500 m to cover the full depth range of ling, blue ling, and tusk. A dedicated acoustic survey could also be carried out to evaluate the stock of greater silver smelt.
- **Subareas VI–IX.** ICES suggests that a dedicated internationally coordinated trawl survey of the continental slope could be undertaken in this large area. This survey could consist of depth transects at selected reference sites, which should include the Hebridean slope, Rockall bank, Hatton Bank, Porcupine Bank, Bay of Biscay, and the area between the canyons of Nazare and Sesimbra, Meriadzec Terrace. The key species to be surveyed are roundnose grenadier, orange roughy, blue ling, black scabbardfish, and deep-sea sharks. The survey could build on the experience from the Scottish, Spanish, and Irish surveys which have been conducted in this area. The depth range of the survey should include the shelf break and the slope within the range 200–2000 m. In identifying reference sites, consideration should be given to the spawning areas identified for blue ling and orange roughy.
- **Subarea X.** A longline survey is currently conducted in the Azores EEZ, and it would be useful to extend the depth range of this survey to cover the full depth range of alfonsinos, *Mora mora*, and deepwater sharks.
- **Subarea XIV.** The existing Greenland halibut survey could be extended to obtain abundance estimates of deepwater sharks. An alternative would be to develop a longline survey which may be a more appropriate gear for sampling the deepwater sharks.
- **Mid-Atlantic Ridge:** ICES recommends that a survey be conducted regularly, but not necessary annually. If exploitation were to increase, then the survey could be upgraded to be conducted annually. The survey design could build on the outcomes of the MAR-ECO project (http://www.mar-eco.no/) and sites should include the NEAFC closed areas. The terrain and species mixture in this region would require the use of a variety of techniques including acoustics, visual survey methods, and trawling.

9.3.2.3 NEAFC pelagic shark advice

In 2005, NEAFC requested ICES to propose a sampling scheme and a list of information that should be obtained from the fisheries on "pelagic sharks", specifically basking shark, porbeagle and spurdog to allow ICES to improve the quality of assessment and advice. In its proposal, ICES was asked to take into account the nature of the fisheries, i.e both by-catch and directed fisheries. WGEF makes the following recommendations:

Porbeagle

NEAFC can have an important role in improving catch data for porbeagle.

Catch of porbeagle and effort from high seas fleets in the regulatory area could be reported to NEAFC. The NEAFC inspectorate could help with obtaining information on pelagic shark bycatch in high seas fleets.

ICES recommends that complete catch data be reported to ICES for this species. In particular, Spain should provide a complete dataset to ICES. Further data and analyses of French CPUE data are required. All countries having by-catch of this species in tuna and swordfish fisheries should provide ICES with reliable time series of by-catch and discards.

Studies to elucidate stock identity and population structure should proceed, including tagging studies. The biological characteristics of this species in the ICES area are unknown. A study on the biology of this species is required from the NEAFC convention area.

With respect to sampling requirements, data on length, weight, sex, location (rect, area, region), time (day, month), and effort (days at sea) by gear type would be necessary to fully assess porbeagle. Given that porbeagle are often caught as **a bycatch in fisheries for other species, the above information should be provided for all fish caught.**

Basking shark

Recent catch and effort data in the fishery should be provided. At present, the information is only available from Portugal and Norway. ICES recommends that by-catch be recorded and further recommends that accidental collisions be recorded and reported to ICES. Biological sampling of dead by-catch and stranded basking sharks should be initiated.

Novel means to obtain fisheries independent information should be explored, including; observations at oil platforms, observations from whale and dolpin watching programmes, and cetacean abundance surveys in the Northern seas. It is noted, however, that because basking shark is not confined to surface waters, observational data may not provide reliable estimates of abundance.

Studies to elucidate stock structure should proceed, including electronic tagging studies.

Catches, landings and discards should be recorded for basking shark (tonnes by gear and location). Historical catch data for this species is often in terms of liver weight and it is important to have data to convert to total weight, i.e. requirement for liver weight and total weight.

Spurdog

ICES recommends that all countries supply time series of species-specific data for spurdog. In particular, ICES was unable to identify what landings for spurdog were reported by France, because of the use of generic reporting codes. It is recommended that all parties report spurdog landings using the code DGS. For landings of mixed dogfishes, the code DGH should be used. The DGH code should not be used for single species landings or for deep-water sharks. The code DGX should not be used for spurdog landings.

ICES recommends that length frequency data be collected for this species, especially from directed and mixed trawl fisheries These data are particularly required for Ireland, Norway and France but also for any other nation taking catches on that species. With respect to sampling requirements, data on length, weight, sex, location (rect, area, region), time (day, month), and effort (days at sea) by gear type would be necessary to fully assess spurdog. Given that spurdog are also caught as a bycatch in fisheries for other species, the above information should be provided following standard sub-sampling rules used for finfish.

On a broader basis, the request asks for advice on "pelagic sharks", although it indicates priority species. With respect to broader sampling requirements, species-specific data on discards, length-weight, sex composition, size distribution, location (rect, area, region) for all species taken in surface longline fisheries by trip, time (month), and effort (days at sea, no of hooks?) would be necessary to fully assess porbeagle and other pelagic sharks. In other fisheries, where

porbeagle and other pelagic sharks are a by-catch, data on length, weight, sex, location (rect, area, region), time (day, month), and effort (days at sea) by gear type should be provided for all fish caught. Given that these fish are caught across a wide area of the northern Atlantic and are often implicated in tuna longlining in particular, it would be advantageous if NEAFC, ICES and ICCAT all had compatible approaches.

9.3.2.4 Answer to special request to evaluate "Arrangement for the multi-annual management of the blue whiting stock" in relation to the precautionary approach

In December 2005, the Delegations of the European Community, the Faroe Islands, Iceland, and Norway (referred to as the Parties) signed an Agreed Record on conclusions of fisheries consultations on the management of the blue whiting stock in the Northeast Atlantic. According to the Agreed Record, the Delegations decided to ask ICES to evaluate whether the multi-annual management arrangement is in accordance with the precautionary approach.

For 2006, the Delegations agreed to the arrangements specified in Annex I of the agreement. The management plan consists of the points specified in Annex II of the signed agreement:

ANNEX I:. ARRANGEMENT FOR THE REGULATION OF THE FISHERIES OF BLUE WHITING IN 2006

1. *In accordance with the multi-annual management arrangement for the fisheries of Blue Whiting set out in Annex II to this Agreed Record, the Parties agree to restrict their fisheries of Blue Whiting in 2006 to a maximum catch limit of 2,000,000 tonnes on the basis of the following quotas:*
    - *European Community 610,000 tonnes*
    - *Faroe Islands 522,500 tonnes*
    - *Iceland 352,600 tonnes*
    - *Norway 514,900 tonnes*
2. *Each Party may transfer unutilised quantities of up to 10% of the quota allocated to it for 2006 to 2007. Such transfer shall be in addition to the quota allocated to the Party concerned for 2007.*
3. *In the event of overfishing of the allocated quotas by any Party in 2006, the quantity shall be deducted from the quota allocated in 2007 for the Party or Parties concerned.*
4. *The Parties may fish Blue Whiting within the quotas laid down in paragraph 1 in their respective zones of fisheries jurisdiction and in international waters.*
5. *Further arrangements by the Parties, including arrangements for access, quota transfers and other conditions for fishing in the respective zones of fisheries jurisdiction, are regulated by bilateral arrangements.*

ANNEX II: ARRANGEMENT FOR THE MULTI-ANNUAL MANAGEMENT OF THE BLUE WHITING STOCK

1. *The Parties agree to implement a multi-annual management arrangement for the fisheries on the Blue Whiting stock which is consistent with the precautionary approach, aiming at constraining harvest within safe biological limits, protecting juveniles, and designed to provide for sustainable fisheries and a greater potential yield, in accordance with advice from ICES.*
2. *The management targets are to maintain the Spawning Stock Biomass (SSB) of the Blue Whiting stock at levels above 1.5 million tonnes (Blim) and the fishing mortality rates at levels of no more than 0.32 (Fpa) for appropriate age groups as defined by ICES.*
3. *For 2006, the Parties agree to limit their fisheries of Blue Whiting to a total allowable catch of no more than 2 million tonnes.*
4. *The Parties recognise that a total outtake by the Parties of 2 million tonnes in 2006 will result in a fishing mortality rate above the target level as defined in paragraph 2. Until the fishing mortality has reached a level of no more than 0.32, the Parties agree to reduce their total allowable catch of Blue Whiting by at least 100,000 tonnes annually.*
5. *When the target fishing mortality rate has been reached, the Parties shall limit their allowable catches to levels consistent with a fishing mortality rate of no more than 0.32 for appropriate age groups as defined by ICES.*
6. *Should the SSB fall below a reference point of 2.25 million tonnes (Bpa), either the fishing mortality rate referred to in paragraph 5 or the tonnage referred to in paragraph 4 shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2.25 million tonnes.*

This multi-annual management arrangement shall be reviewed by the Parties on the basis of ICES advice.

Interpretation of the Arrangement

The management plan was evaluated by ICES in 2006. In evaluating the Arrangement, ICES interprets it as follows:

- Paragraph 4 (Annex II) in the agreed record includes a rule for the intermediate phase between the 2006 TAC and the year when F reaches a target of 0.32. This paragraph is interpreted as the TAC should be decreased by 100 000 t until the mean F is at or below $\mathbf{F}_{pa}$ for the first time.
- Paragraph 5 (Annex II) is interpreted as $\mathbf{F}_{pa}$ is used as a target F, such that the TAC would correspond to a F equal to $\mathbf{F}_{pa}$ when possible.
- Paragraph 6 (Annex II) uses $\mathbf{B}_{pa}$ as a trigger point for SSB, and it is interpreted as SSB should reach $\mathbf{B}_{pa}$ after the TAC is taken. "Rapid recovery" is interpreted as within one year, such that the TAC should be set to produce a SSB of $\mathbf{B}_{pa}$ after implementation. It is interpreted that paragraph 6 overrules the initial condition defined by paragraph 4 if SSB drops below $\mathbf{B}_{pa}$ in any year.

Results of the evaluation

The plan was evaluated using the Stochastic Multi-Species model, the same model which is at present used for blue whiting stock assessment. When evaluating the plan, the following uncertainties were taken into account: uncertainty in stock assessment (including bias), uncertainty in stock-recruitment relationship, and uncertainty in implementation of the TAC.

The simulations were carried out with respect to two recruitment scenarios. Prior to 1996, recruitment was generally low (Fig 9.3.2.4.b) – the average recruitment was approximately 9.5 billion individuals per year. From 1996 onwards, recruitment averaged approximately 35 billion individuals per year. Given the substantial differences between these two periods, ICES considered that it was not appropriate to carry out the evaluations using the long-term mean recruitment (20 billion approx. individuals per year). The evaluation was thus done separately for the two observed recruitment periods. No external explanations have been found for the change around 1996 and a return to the situation prior to 1996 should be considered possible.

The simulations show that, given the high recruitment level observed for the period 1996–2005, the management plan is robust to uncertainties in both assessment and implementation. For low recruitment scenarios, the management plan is not robust to these uncertainties, unless there are unrealistically low levels of noise and bias in both stock assessment estimates and implementation of the TAC.

ICES concludes that the management plan is not precautionary as the lower recruitment scenario is plausible (given that it was the case in the past) and, under this scenario for range of realistic assessment and implementation bias, there is higher than 5% probability that the spawning stock biomass will fall below $\mathbf{B}_{lim}$. Figure 9.3.2.4.a shows the SSB, yield, fishing mortality (F), and probability of SSB being below biomass reference points for a range of implementation bias, assuming low recruitment level and an assessment overestimation by 20% (bias of 1.2).

In the case of a low recruitment period, paragraph 4 of the management plan will apply only to the first years of the implementation of the agreement. Low recruitment combined with high TACs will lead to a fast decline in SSB towards a situation where paragraph 6 will apply. Changing the value of the minimum annual reduction of 100 000 tonnes to a much higher value (e.g. 500 000 tonnes) may extend the period until paragraph 6 is invoked but will not make the plan precautionary. Because of the bias in the stock assessment and in implementation of the TAC, using $\mathbf{B}_{pa}$ as trigger point for the actions specified in paragraph 6 is expected to lead to a higher than 5% probability that the spawning stock biomass will fall below $\mathbf{B}_{lim}$. This suggests that the trigger point for management action should be higher than $\mathbf{B}_{pa}$.

These simulations also suggest that, during a period of low recruitment, it is necessary to reduce fishing mortality to well below $\mathbf{F}_{pa}$ to maintain the spawning biomass at or above $\mathbf{B}_{pa}$. In order to make the management plan precautionary, the fishing mortality should be lowered and, accordingly, there is a need to specify what "rapid recovery" means in Paragraph 6 of Annex II.

In summary, to make it precautionary, the harvest rule will need 1) to define in Paragraph 6 what actions will be taken to recover the stock when the SSB falls below $\mathbf{B}_{pa}$, 2) to amend Paragraph 4 so as to secure a reduction in fishing mortality to or below $\mathbf{F}_{pa}$ as soon as possible, 3) to ensure that the target fishing mortality is reduced to well below $\mathbf{F}_{pa}$ (i.e. to about two-thirds of $\mathbf{F}_{pa}$) to reduce the risk (less than 5%) of the SSB falling below $\mathbf{B}_{lim}$, and/or 4) to use a trigger point for management action that is higher than $\mathbf{B}_{pa}$. A variety of solutions or combinations of items 1) to 4) are possible, and ICES can provide advice on what changes would be required to make the management plan precautionary. The revised management plan should be re-evaluated in relation to the precautionary approach.

ICES recognizes the efforts made by the parties to develop a precautionary management plan and encourages a dialogue between the parties and ICES to ensure that the management plan is precautionary in the light of the new findings described here.

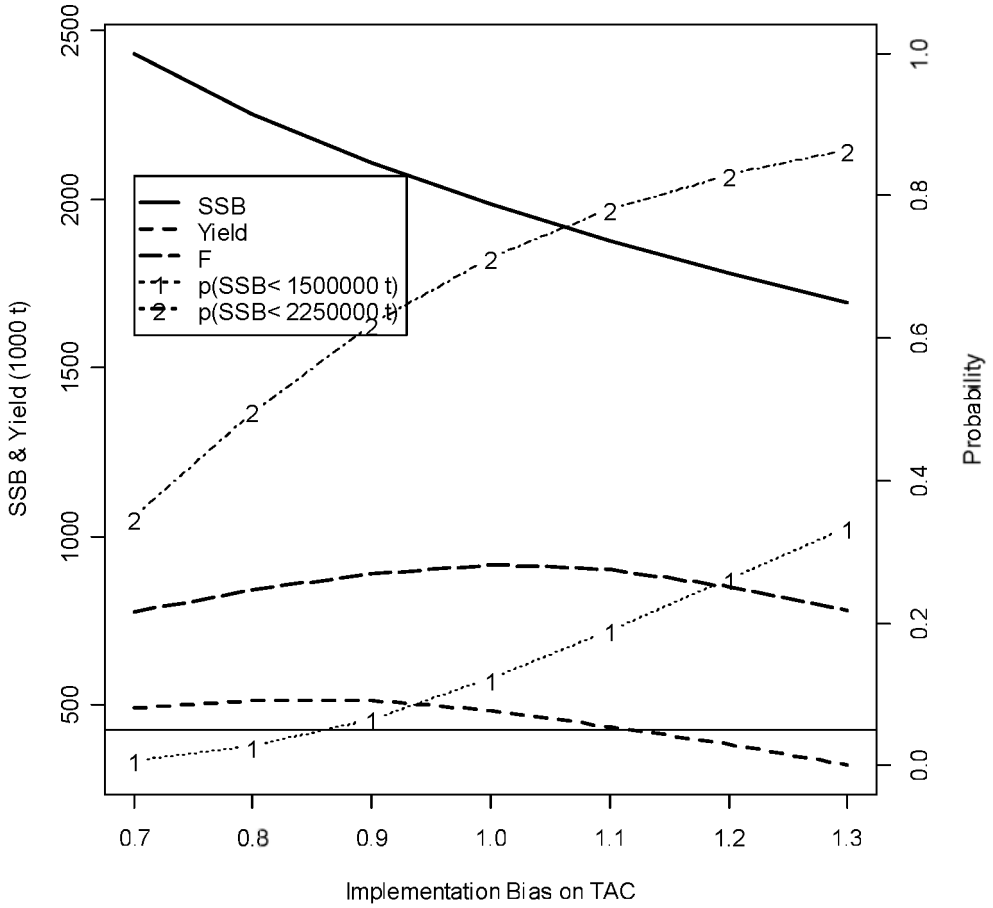


Figure 9.3.2.4.a. The average SSB, yield, and F at equilibrium and probability of SSB being below biomass reference points ($\mathbf{B}_{lim}$ and $\mathbf{B}_{pa}$) for a range of implementation bias, **assuming low recruitment level** and an assessment bias of 1.2 (**overestimation by 20%**). The horizontal line indicates 5% probability.

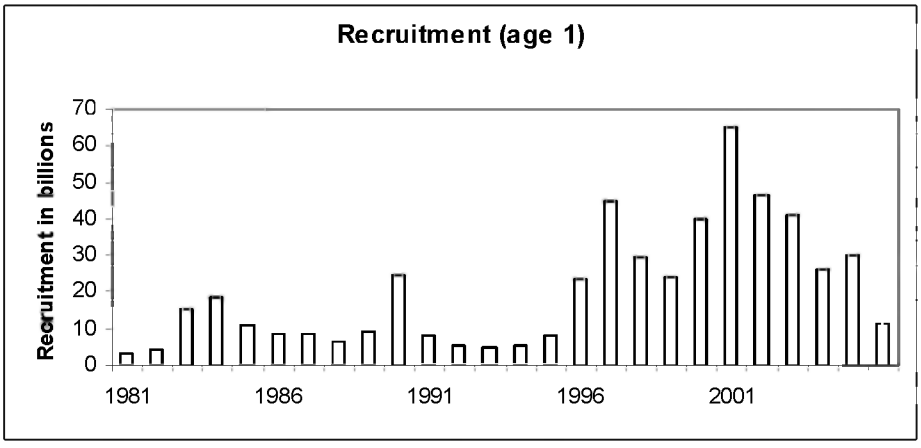


Figure 9.3.2.4.b Time-series of recruitment for blue whiting.

9.4 Stock Summaries (Widely Distributed and Migratory Stocks)

9.4.1 Hake – Northern Stock (Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target (=0.25)	Comment
Full reproductive capacity	Harvested sustainably	Overexploited	F is around agreed target	

Based on the most recent estimates of SSB and fishing mortality ICES classifies the stock as being at full reproductive capacity and being harvested sustainably. SSB appears to have been very close to $\mathbf{B}_{pa}$ over the last 3 years, and F has been around $\mathbf{F}_{pa}$ since 2001. As the growth rate and thus the age determination and productivity of northern hake stocks are uncertain, absolute estimates of SSB and F have to be considered with caution.

Management objectives

There are explicit management objectives for this stock under the EC Reg. No 811/2004 establishing measures for the recovery of the northern hake stock.

The main Articles of interest adopted by this Regulation are:

"***Article 1. Subject matter.*** *This Regulation establishes a recovery plan for the northern hake stock which inhabits the ICES division III a, ICES subarea IV, ICES divisions V b (Community waters), VI a (Community waters), ICES subarea VII and ICES divisions VIII a, b, d, e (the northern hake stock).*

Article 2. Purpose of the recovery plan. *The recovery plan referred to in Article 1 shall aim to increase the quantities of mature fish of the northern hake stock concerned to values equal to or greater than* ***140 000*** *tonnes.*

Article 3. Reaching of target levels. *Where the Commission finds, on the basis of advice from ICES and following agreement on that advice by the Scientific Technical and Economic Committee for Fisheries (STECF), that for two consecutive years the target level for the northern hake stock concerned has been reached, the Council shall decide by qualified majority on a proposal from the Commission to replace the recovery plan by a management plan for the stock in accordance with Article 6 of Regulation (EC) No 2371/2002.*

Article 4. Setting of TACs. *A TAC shall be set in accordance with Article 5 where, for the northern hake stock concerned the quantities of mature northern hake have been estimated by the STECF, in the light of the most recent report of ICES, to be equal to or above* ***100 000*** *tonnes.*

Article 5. Procedure of setting TACs.
1. Each year, the Council shall decide by qualified majority on a proposal from the Commission on a TAC for the following year for the northern hake stock concerned.

2. For 2004, the TAC shall be set at a level corresponding to a fishing mortality of ***0,25****, 4 % less than status quo fishing mortality. For the subsequent years of the recovery plan, the TAC shall not exceed a level of catches which scientific evaluations carried out by the STECF, in the light of the most recent reports of ICES, indicate will correspond to a fishing mortality rate of 0,25.*

3. The Council shall not adopt a TAC whose capture is predicted by the STECF, in the light of the most recent report of the ICES, to lead to a decrease in spawning stock biomass in its year of application.

4. Where it is expected that the setting of the TAC for a given year in accordance with paragraph 2 will result in a quantity of mature fish at the end of that year in excess of the target level indicated in Article 2, the Commission will carry out a review of the recovery plan and propose any adjustments necessary on the basis of the latest scientific evaluations. Such a review shall in any event be carried out not later than three years following the adoption of this Regulation with the aim of ensuring that the objectives of the recovery plan are achieved.

5. Except for the first year of application of this Regulation, the following rules shall apply:

(a) where the rules provided for in paragraph 2 or 4 would lead to a TAC for a given year which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which shall not be more than 15 % greater than the TAC of that year or;

(b) where the rule provided for in paragraph 2 or 4 would lead to a TAC for a given year which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is not more than 15 % less than the TAC of that year.

Article 6. Setting of TACs in exceptional circumstances. *Where the quantities of mature fish of the northern hake stock concerned have been estimated by the STECF, in the light of the most recent report of the ICES, to be less than 100 000 tonnes, the following rules shall apply:*

(a) Article 5 shall apply where its application is expected to result in an increase in the quantities of mature fish of the northern hake stock concerned, at the end of the year of application of the TAC to a quantity equal to or greater than 100 000 tonnes;

(b) where the application of Article 5 is not expected to result in an increase in the quantities of mature fish of the northern hake stock concerned, at the end of the year of application of the TAC, to a quantity equal to or greater than 100 000 tonnes, the Council shall decide by a qualified majority, on a proposal from the Commission, on a TAC for the following year that is lower than the TAC resulting from the application of the method described on Article 5."

ICES has not fully evaluated the current recovery plan in relation to the precautionary approach. The preliminary evaluation indicated that the plan would be successful in meeting its aims with a high probability (>95%) if it were perfectly implemented and if the recruitment remains at the recent higher level.

Reference points

Precautionary reference points were updated in 2003 following a revision of the assessment model and input data in recent years. The basis for setting reference points remained unchanged.

	ICES considers that:	**ICES proposed that:**
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 100 000 t.	$\mathbf{B}_{pa}$ be set at 140 000 t.
	$\mathbf{F}_{lim}$ is 0.35.	$\mathbf{F}_{pa}$ be set at 0.25.
Target reference points		Not defined.

Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average last 3 years	0.237	0.297	0.781
$\mathbf{F}_{max}$	0.165	0.305	1.026
$\mathbf{F}_{0.1}$	0.095	0.285	1.309
$\mathbf{F}_{med}$	0.292	0.284	0.663

Candidates for reference points which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of $\mathbf{F}_{0.1}$–$\mathbf{F}_{max}$.

Technical basis:

$\mathbf{B}_{lim}$ = $\mathbf{B}_{loss}$ the lowest observed biomass in the 2003 assessment.	$\mathbf{B}_{pa} \sim \mathbf{B}_{lim} * 1.4$.
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$.	$\mathbf{F}_{pa} \sim \mathbf{F}_{lim} * 0.72$.

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

Applying a fishing mortality of F = 0.25 as defined in Article 5.2 of the agreed recovery plan is expected to lead to an SSB of around 158 000 t in 2008, with estimated landings in 2007 of 53 800 t. This would imply an increase in TAC of 23%. According to Article 5.5a, the annual increase of TAC should be limited to 15% between any two years. This corresponds to a TAC of 50 485 t in 2007 and an expected SSB in 2008 of 160 600 t. If the conditions in Article 3 of the recovery plan have been reached this year, there would be a scope to replace the recovery plan with a management plan.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality, estimated at 0.24, is above fishing mortalities that are expected to lead to high long-term yields and low risk of stock depletion ($\mathbf{F}_{0.1}$ = 0.10 and $\mathbf{F}_{max}$ = 0.17). This indicates that long-term yield is expected to increase at fishing mortalities well below the historic values. Fishing at such a lower mortality is expected to lead to higher SSB and therefore lower the risk of observing the stock to be outside precautionary limits.

Exploitation boundaries in relation to precautionary limits

A fishing mortality of $\mathbf{F}_{pa}$ = 0.25 is expected to lead to landings of 53 800 t in 2007 and SSB around 158 000 t in 2008, which is above $\mathbf{B}_{pa}$.

Conclusion on exploitation boundaries

ICES uses the exploitation boundaries in relation to the recovery plan as basis for the advice for 2007, as this plan is expected to have long-term gains in the present situation, and is already implemented.

Short-term implications

Outlook for 2007
Basis: $\mathbf{F}_{sq}$ =mean F(03–05)=0.237; R04-06 = GM 1990–2003=192 millions; landings (2006) =50.6; SSB(2007) = 150.1. The fishing mortality applied according to the agreed recovery plan (F(recovery plan)) is 0.25. The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.25. The fishing mortality which is consistent with taking high long-term yield and achieving low risk of depleting the productive potential of the stock (F(long-term yield)) is 0.17.

Rationale	Landings (2007)	Basis	F total (2007)	SSB (2008)	%SSB change 1)	%TAC change 2)
Zero catch	0.0	F=0	0.00	217.4	45%	-100%
High long-term yield	38.6	F(long-term yield)	0.17	174.8	16%	-12%
Status quo	6.0	$\mathbf{F}_{sq}$ *0.1	0.02	210.8	40%	-86%
	11.7	$\mathbf{F}_{sq}$ *0.2	0.05	204.4	36%	-73%
	27.9	$\mathbf{F}_{sq}$ *0.5	0.12	186.6	24%	-36%
	40.2	$\mathbf{F}_{sq}$ *0.75	0.18	173.1	15%	-9%
	47.1	$\mathbf{F}_{sq}$ *0.9	0.21	165.5	10%	7%
	51.5	$\mathbf{F}_{sq}$ *1	0.24	160.6	7%	17%
	55.8	$\mathbf{F}_{sq}$ *1.1	0.26	156.0	4%	27%
	61.9	$\mathbf{F}_{sq}$ *1.25	0.30	149.2	-1%	41%
Agreed recovery plan	6.3	F(prec limits) *0.1	0.03	210.5	40%	-86%
	15.3	F(prec limits) *0.25	0.06	200.5	34%	-65%
	29.2	F(prec limits) *0.5	0.13	185.1	23%	-33%
	42.1	F(prec limits) *0.75	0.19	171.0	14%	-4%
	49.2	F(prec limits) *0.9	0.23	163.1	9%	12%
	50.485	F(prec limits) *0.94	0.24	160.6	7%	15%
	53.8	$\mathbf{F}_{pa} = \mathbf{F}_{sq}$ *1.05	0.25	158.1	5%	23%
	58.2	F(prec limits) *1.1	0.28	153.3	2%	33%
	64.6	F(prec limits) *1.25	0.31	146.3	-3%	47%
Precautionary limits	6.3	F(prec limits) *0.1	0.03	210.5	40%	-86%
	15.3	F(prec limits) *0.25	0.06	200.5	34%	-65%
	29.2	F(prec limits) *0.5	0.13	185.1	23%	-33%
	42.1	F(prec limits) *0.75	0.19	171.0	14%	-4%
	49.2	F(prec limits) *0.9	0.23	163.1	9%	12%
	53.8	$\mathbf{F}_{pa} = \mathbf{F}_{sq}$ *1.05	0.25	158.1	5%	23%
	58.2	F(prec limits) *1.1	0.28	153.3	2%	33%
	64.6	F(prec limits) *1.25	0.31	146.3	-3%	47%
	74.5	F(prec limits) *1.5	0.38	135.5	-10%	70%
	83.7	F(prec limits) *1.75	0.44	125.7	-16%	91%
	93.5	F(prec limits) *2	0.50	115.0	-23%	113%
	105.2	F(prec limits) *2.25	0.56	102.1	-32%	140%

All weights in '000 tonnes.
1) SSB 2008 relative to SSB 2007.
2) Predicted landings 2007 relative to TAC 2006 (43.9 thousand tonnes).
Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

Hake is caught in nearly all fisheries in Subareas VII and VIII and also in some fisheries in Subareas IV and VI.

The Northern hake emergency plan (EC 1162/2001, EC 2602/2001 and EC 494/2002) has been followed up by a recovery plan in 2004 (EC 811/2004). The recovery plan is aimed at achieving a SSB of 140 000 tonnes (B_{pa}). This is to be achieved by limiting fishing mortality to F=0.25 and by allowing a maximum change in TAC between years of 15%. Targeting F well below F=0.25 is expected to increase the long-term yield. The current assessment indicates that the SSB is close to the rebuilding target. The increase appears to be due to a combination of good recruitment and moderate fishing mortality.

For the future, a management plan should be developed, as indicated in Article 3 of the recovery plan. It should be noted that the absolute values of the current assessment are uncertain, because of problems with growth and ageing of hake. However, the recent trends in both biomass and fishing mortality appear to be less sensitive to this problem. Therefore, it is recommended to consider management plans that are not critically dependent on precise annual estimates of abundance and mortality in absolute terms, but rather use trends in these parameters as guidance. The problem with ageing of hake should be further addressed; in particular, further tagging studies are recommended.

The TAC has been overshot considerably since 2001, but the overshoot has been reduced from 60% in 2001 to 9% in 2005.

Discards of juvenile hake can be substantial in some areas and fleets, mainly in the *Nephrops* fishery in the Bay of Biscay. Surveys suggest that juvenile hake may be much more widespread than hitherto assumed. Improvements in the selection pattern are expected to offer more protection of juvenile hake. Some trawler fleets previously targeting juvenile hake in the Bay of Biscay have diverted their effort to other species and gears in recent years.

Evaluation of the recovery plan

A preliminary evaluation of the recovery plan indicated that it would be successful in meeting its aims with a high probability (>95%), if perfectly implemented. However, a complete evaluation of the recovery plan requires more information and /or more explicit modelling regarding the major sources of uncertainty, including stock recruitment relationships, discarding, TAC overshoot, and growth rates. If a full evaluation is still considered relevant, further work is needed to obtain information on these issues and to evaluate the potential effects on assessment and management.

Ecosystem considerations

Hake movements have been studied from the seasonal distribution of catches. From the beginning of the year until March/April adult hake are present in the North of the Bay of Biscay. They appear on the shelf edge in the Celtic Sea in June and July. Between August and December, a large hake fishery is centred to the west and southwest of Ireland, with a decline in catch rates in shallower waters.

Hake belongs to a diverse community of species including megrim, anglerfish, *Nephrops*, sole, seabass, ling, blue ling, greater forkbeard, tusk, whiting, blue whiting, *Trachurus spp*, conger, pout, cephalopods (octopus, *Loligidae*, *Ommastrephidae* and cuttlefish), and rays. The relative importance of these species in the hake fishery varies between years depending on gears, sea areas, and biological conditions.

Hake is preyed upon by sharks and other fishes. Cannibalism on juveniles by adults is well known. Adults feed on fish (mainly on blue whiting and other gadoids, sardine, anchovy, and other small pelagic fish); juvenile hake prey mainly upon planktonic crustaceans (above all euphausids, copepods, and amphipods).

Factors affecting the fisheries and the stock

The effects of regulations

The minimum mesh size for trawls in the Bay of Biscay was increased from 55 mm ("*Nephrops* fishery")/65 mm ("otter trawlers") to 70 mm in 2000.

In June 2001 an Emergency Plan was implemented for the Northern hake stock (Council Regulations No 1162/2001, 2602/2001 and 494/2002). Firstly, a 100-mm minimum mesh size has been implemented for otter-trawlers when hake comprises more than 20% of the total amount of marine organisms retained onboard. This measure did not apply to vessels less than 12 m in length and which return to port within 24 hours of their most recent departure. Secondly, two areas have been defined, one in Subarea VII (SW of Ireland) and the other in Subarea VIII (Bay of Biscay), where a 100-mm minimum mesh size is required for all otter-trawlers, regardless of the amount of hake caught. The fishing mortality of juvenile hake (in the landings) is estimated to have decreased between 1997 and 2001 and has remained low since.

Council Regulation (EC) No 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Subareas VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002).

The hake recovery plan (EC Reg. No 811/2004) came into operation in 2004 and replaced the emergency plan. It aims at increasing the quantity of mature fish to values equal to or greater than 140 000 t. This is to be achieved by limiting fishing mortality to 0.25, or to an F preventing any decline in SSB, and by allowing a maximum change in TAC between consecutive years of 15%.

For 2006 and in Sub area VIII, otter-trawlers using a squared mesh panel are allowed to use a 70-mm mesh size in the area defined in Council Regulations No 1162/2001, 2602/2001 and 494/2002, where 100-mm minimum mesh size is required for all otter-trawlers. Furthermore, a ban on gillnets has been implemented in Subareas VIa,b and VIIb,c,j,k for fishing at depths of more than 200 m (EC Reg. No 51/2006).

All of these regulations, which were expected to reduce fishing mortality and discarding, may have contributed to the recovery of the stock, although the extent of the effect of the measures cannot be precisely quantified.

Changes in fishing technology and fishing patterns

Since the introduction of the high opening trawls in the mid-1990s, no significant changes in fishing technology have been observed.

Due to quota restrictions, the Spanish fleet stopped fishing for up to two months in 2001, 2002, and 2003, and one month in 2004 and 2005. However, this temporary cessation of the fishery is not mirrored in the overall trends in fishing effort.

Other factors

The main part of the fishery (close to 80% of the total landings) was conducted in five Fishery Units, three of them from Subarea VII: FU 4 (Non-*Nephrops* trawling in medium to deep water in Subarea VII), FU 1 (Long-line in medium to deep water in Subarea VII), and FU 3 (Gill nets in Subarea VII), and two from Subarea VIII: FU 13 (Gill nets in shallow to medium water) and FU 14 (Trawling in medium to deep water in Subarea VIII), representing 19%, 18%, 16%, 14%, and 12% of the total in 2005, respectively.

Spain accounts for the main part of the landings with 58% of the total in 2005. France is now taking 29% of the total, UK 6%, Denmark 3%, Ireland 2%, and other countries (Norway, Belgium, Netherlands, Germany, and Sweden) contribute small amounts.

Scientific basis

Data and methods

An age-based assessment (XSA) was performed using 4 commercial CPUE series and 4 surveys. This year, the Spanish Ground Fish Survey from the Porcupine Bank (SP-PGFS) has been used in the assessment.

Discards were not included in the assessment. Some discard data (partial samples from some years and some fleets) were available, but it was not possible to incorporate these in a consistent way.

There are indications for a strong 2004 year class from discard sampling and the FR-EVHOES survey, but the assessment estimates were considered too uncertain to be used for predictions and therefore replaced by geometric mean recruitment.

Information from the fishing industry

The fishing industry and scientists have met at the national level to discuss information that can be used in the assessments. National industries have not provided any additional quantitative information that can be used in the assessment. However, the perception of the stock trends by the industry generally supports the signals given by the data used in this year's assessment.

Uncertainties in assessment and forecast

Preliminary studies of growth and the accuracy of age determination from otolith reading indicate that growth may be severely underestimated and age overestimated for hake. However, the small size of the sample analysed for the most important source of this information and its limited spatial and temporal coverage makes it difficult to draw reliable conclusions. Further studies, notably extensive tag-recapture studies, are mandatory to draw any firm conclusions on these matters.

Following concerns over the accuracy of aging data and the calculation of historic catch-at-age data, an alternative assessment was explored assuming faster growth. The results indicate that the perception of trends in stock dynamics is similar, but the absolute levels are heavily dependent on the ageing criteria. If growth of hake is underestimated, the stock is likely to be smaller and fishing mortality higher and reference points would need to be revisited.

Discards were not included in those assessments. Some improvement in discard data availability (number of fleets sampled and area coverage) has been observed. However, sampling does not cover all fleets contributing to hake catches, discard rates of several fleets are simply not known and when data are available, it is not possible to incorporate them in a consistent way.

Comparison with previous assessment and advice

The assessment and advice are very consistent with last year. SSB has increased since the low value observed in 2000 and appears to have reached B_{pa} in 2005 and 2006, while F has decreased since the mid-1990s. High variability in the most recent recruitment estimates is moderated as more data are available for those year classes.

A deviation between this year's and last year's short-term forecast was caused by a miscalculation, which was corrected this year.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, 10–19 May 2006 (ICES CM 2006/ACFM:29).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp to advice	Predicted catch corresp to single-stock exploitation boundaries	Agreed TAC[1]	ACFM landings	Disc. slip.	ACFM Catch***
1987	Precautionary TAC; juvenile		-		63.5	63.4	2.0	65.3
1988	Precautionary TAC; juvenile		54		66.2	64.8	2.0	66.8
1989	Precautionary TAC; juvenile		54		59.7	66.5	2.3	68.8
1990	Precautionary TAC; juvenile		59		65.1	59.9	1.5	61.4
1991	Precautionary TAC; juvenile		59		67.0	57.6	1.7	59.3
1992	If required, precautionary		61.5		69.0	56.6	1.7	58.3
1993	Enforce juvenile protection		-		71.5	52.1	1.5	53.6
1994	F significantly reduced		<46		60.0	51.3	1.9	53.1
1995	30% reduction in F		31		55.1	57.6	1.2	58.9
1996	30% reduction in F		39		51.1	47.2	1.5	48.8
1997	20% reduction in F		54		60.1	42.6	1.8	44.4
1998	20% reduction in F		45[2]		59.1	35.0	0.8	35.8
1999	Reduce F below F_{pa}		<36[2]		55.1	39.8	0.8	40.6
2000	50% reduction in F		<20[2]		42.1	42.0	0.6	42.6
2001	Lowest possible catch, recovery		-		22.6	36.7	0.5	37.2
2002	Lowest possible catch / recovery		-		27.0	40.0	0.3	40.3
2003	Lowest possible catch / recovery		-		30.0	41.8	- **)	-
2004	*)70% reduction in F or recovery		*)	<13.8	39.1	47.1		-
2005	F=0.19			33	42.6	46.4		
2006	F=0.25			44	43.9			
2007	Recovery plan limits			50.5				

Weights in '000 t.

[1]Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only). [2]Landings.

*) Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.

**) in 2003, no estimations of discards were available.

***) ACFM catch not used in the assessment. Assessment based on landings only.

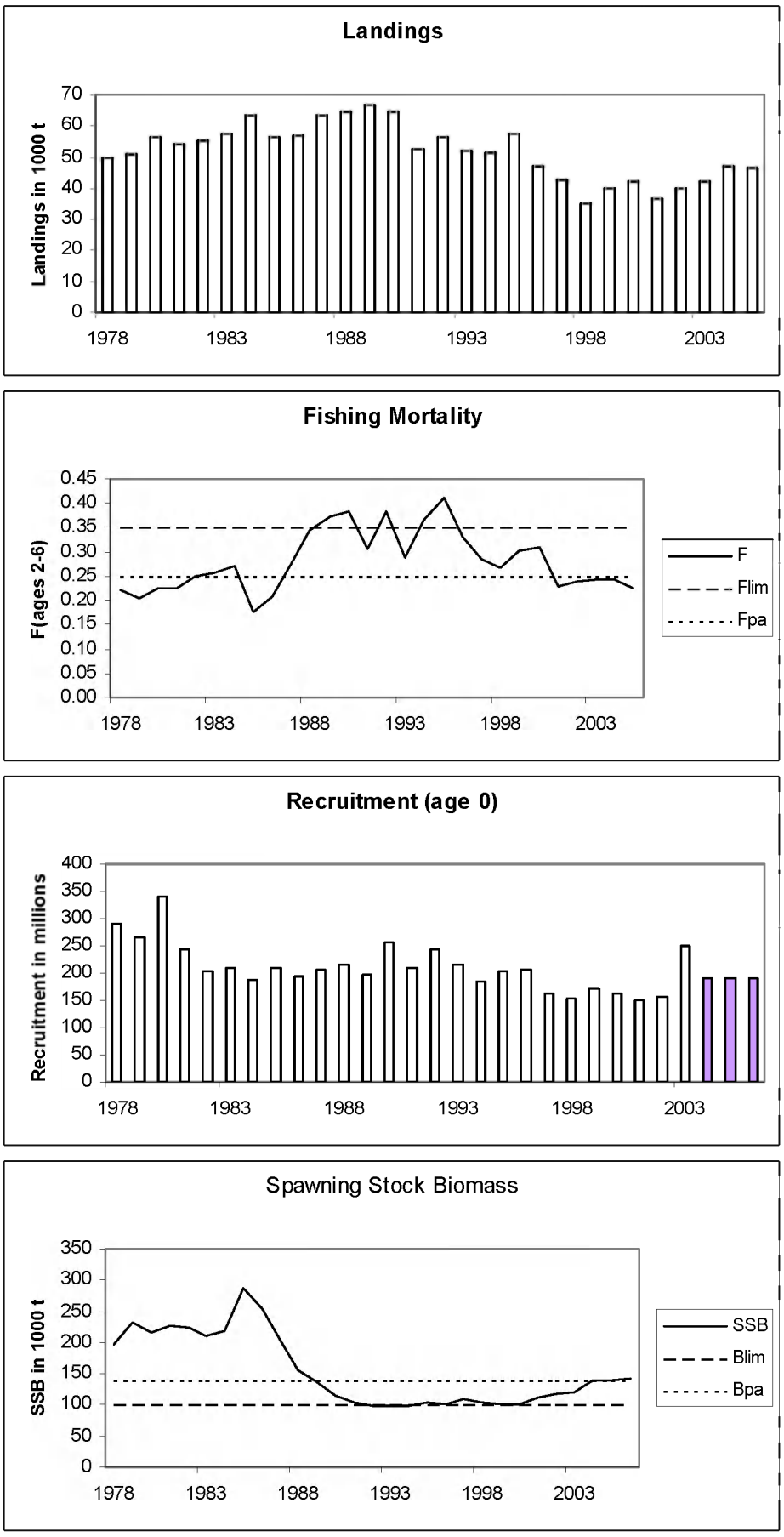


Figure 9.4.1.1 Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b). Landings, fishing mortality, recruitment and SSB.

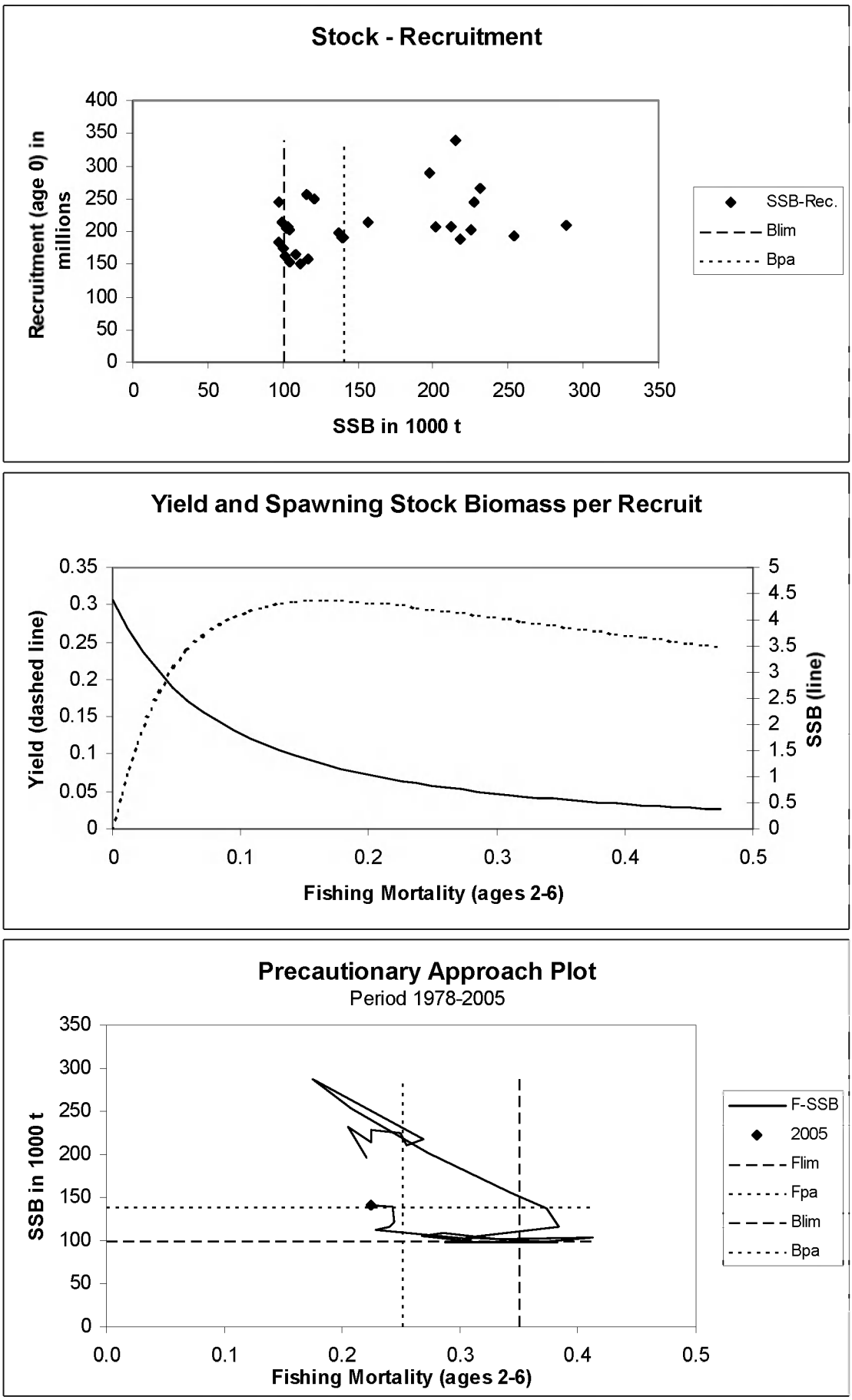


Figure 9.4.1.2 Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b).Stock and recruitment; Yield and SSB per recruit.

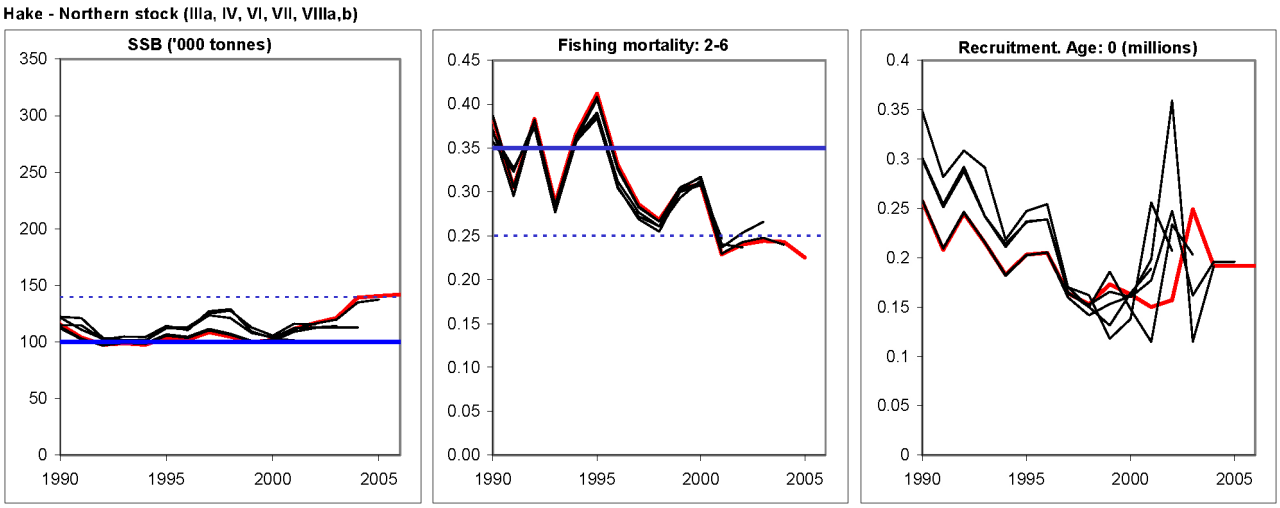


Figure 9.4.1.3 Hake Northern Stock. Historical performance of the assessment (SSB, Fishing mortality and recruitment)

Table 9.4.1.1 Estimates of catches ('000 t) for the Northern Hake by area for 1961–2005.

	Landings (1)					Discards (2)	Catches (3)
Year	IVa+VI	VII	VIIIa,b	Unallocated	Total	VIIIa,b	Total
1961	-	-	-	95.6	95.6	-	95.6
1962	-	-	-	86.3	86.3	-	86.3
1963	-	-	-	86.2	86.2	-	86.2
1964	-	-	-	76.8	76.8	-	76.8
1965	-	-	-	64.7	64.7	-	64.7
1966	-	-	-	60.9	60.9	-	60.9
1967	-	-	-	62.1	62.1	-	62.1
1968	-	-	-	62.0	62.0	-	62.0
1969	-	-	-	54.9	54.9	-	54.9
1970	-	-	-	64.9	64.9	-	64.9
1971	8.5	19.4	23.4	0	51.3	-	51.3
1972	9.4	14.9	41.2	0	65.5	-	65.5
1973	9.5	31.2	37.6	0	78.3	-	78.3
1974	9.7	28.9	34.5	0	73.1	-	73.1
1975	11.0	29.2	32.5	0	72.7	-	72.7
1976	12.9	26.7	28.5	0	68.1	-	68.1
1977	8.5	21.0	24.7	0	54.2	-	54.2
1978	8.0	20.3	24.5	-2.2	50.6	2.4	52.9
1979	8.7	17.6	27.2	-2.4	51.1	2.7	53.8
1980	9.7	22.0	28.4	-2.8	57.3	3.2	60.5
1981	8.8	25.6	22.3	-2.8	53.9	2.3	56.3
1982	5.9	25.2	26.2	-2.3	55.0	3.1	58.1
1983	6.2	26.3	27.1	-2.1	57.5	2.6	60.1
1984	9.5	33.0	22.9	-2.1	63.3	1.9	65.1
1985	9.2	27.5	21.0	-1.6	56.1	3.8	59.9
1986	7.3	27.4	23.9	-1.5	57.1	3.0	60.1
1987	7.8	32.9	24.7	-2.0	63.4	2.0	65.3
1988	8.8	30.9	26.6	-1.5	64.8	2.0	66.8
1989	7.4	26.9	32.0	0.2	66.5	2.3	68.8
1990	6.7	23.0	34.4	-4.2	59.9	1.5	61.4
1991	8.3	21.5	31.6	-3.9	57.6	1.7	59.3
1992	8.6	22.5	23.5	2.1	56.6	1.7	58.3
1993	8.5	20.5	19.8	3.3	52.1	1.5	53.6
1994	5.4	21.1	24.7	0	51.3	1.9	53.1
1995	5.3	24.1	28.1	0	57.6	1.2	58.9
1996	4.4	24.7	18.0	0	47.2	1.5	48.8
1997	3.3	18.9	20.3	0	42.6	1.8	44.4
1998	3.2	18.7	13.1	0	35.0	0.8	35.8
1999	4.3	24.0	11.6	0	39.8	0.8	40.6
2000	4.0	26.0	12.0	0	42.0	0.6	42.6
2001	4.4	23.1	9.2	0	36.7	0.5	37.2
2002	2.9	21.1	15.9	0	40.1	0.3	40.4
2003	2.8	23.7	15.3	0	41.9	-	41.9
2004	4.4	27.2	15.5	0	47.1	-	47.1
2005	5.3	26.7	14.4	0	46.4	-	46.4

(1) Spanish data for 1961–1972 not revised, data for Subarea VIII for 1973–1978 include data for Divisions VIIIa,b only. Data for 1979–1981 are revised based on French surveillance data. Includes Divisions IIIa, IVb,c from 1976.
There are some unallocated landings moreover for the period 1961–1970.
(2) Discards have been estimated from 1978 and only for Divisions VIIII a,b.
(3) From 1978 total catches used for the Working Group.

Table 9.4.1.2 Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b).

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-6
1978	290000	197300	49500	0.221
1979	267000	231400	50600	0.205
1980	340000	214700	56500	0.224
1981	245000	227700	53900	0.224
1982	203000	224900	55000	0.249
1983	208000	211500	57500	0.255
1984	189000	217800	63300	0.269
1985	210000	288200	56100	0.175
1986	194000	254100	57100	0.208
1987	207000	201300	63400	0.273
1988	215000	156200	64800	0.343
1989	197000	137500	66500	0.373
1990	257000	115300	64300	0.384
1991	208000	103800	52400	0.305
1992	245000	97600	56600	0.383
1993	215000	98900	52100	0.287
1994	183000	97600	51300	0.367
1995	203000	104000	57600	0.412
1996	205000	102100	47200	0.331
1997	164000	108600	42600	0.286
1998	153000	104800	35000	0.268
1999	173000	99900	39800	0.303
2000	163000	101700	42000	0.309
2001	150000	111800	36700	0.229
2002	157000	116800	40100	0.240
2003	249000	121200	41900	0.244
2004	*191517	139300	47100	0.243
2005	*191517	140700	46400	0.225
2006	*191517	141968		
Average	209122	154092	51689	0.280

*GM for 1990–2003.

9.4.2 Northeast Atlantic Mackerel (combined Southern, Western, and North Sea spawning components)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to target fishing mortality (F)	Comment
Uncertain	Harvested unsustainably	Exploited above F0.1	Above target	

Based on the most recent estimates of fishing mortality, ICES classifies the stock as being harvested unsustainably. Fishing mortality in 2005 is estimated to be at $\mathbf{F}_{lim}$ (0.26). Because of the unknown levels of underreporting in the catch, SSB in recent years relative to $\mathbf{B}_{pa}$ cannot be accurately estimated, but indications are that SSB has increased over the last 3 years and is now around $\mathbf{B}_{pa}$. The stock has been showing much more variable recruitment over the recent four years compared to the past. The 2000 and 2003 year classes are estimated to be poor, while both the 2001 and the 2002 year classes are above average. The 2002 year class is estimated to be the highest in the time-series. There is insufficient information on the size of the 2004 and 2005 year classes.

Management objectives

The agreed record of negotiations between Norway, Faroe Islands, and EU in 1999, states:

"For 2000 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality in the range of 0.15 - 0.20 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of the fishing mortality rate."

"Should the SSB fall below a reference point of 2 300 000 tonnes (B_{pa}), the fishing mortality rate, referred to under paragraph 1, shall be adapted in the light of scientific estimates of the conditions prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2 300 000 tonnes."

"The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES."

ICES considers the agreement to be consistent with the precautionary approach, if F on average is kept below 0.17. The rationale for ICES proposing $\mathbf{F}_{pa}$ = 0.17 is to have a high probability of avoiding exploiting the stock above $\mathbf{F}_{lim}$. In addition, projections indicate that F = 0.17 will optimize long-term yield and at the same time result in a low risk of the stock decreasing below $\mathbf{B}_{pa}$. However, the management plan does not specify measures that would apply under poor stock conditions that preclude further evaluation. Furthermore, the management plan assumes that catch information is unbiased so that absolute estimates of SSB can be produced. This condition has not been met for a number of years.

Reference points

Precautionary Approach reference points (established in 1998):

ICES considers that:	**ICES proposes that:**
There is no biological basis for defining $\mathbf{B}_{lim}$.	$\mathbf{B}_{pa}$ be set at 2.3 million t.
$\mathbf{F}_{lim}$ is 0.26, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.17. This F is considered to provide approximately 95% probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty in the assessments.
Target reference points	$\mathbf{F}_{y}$ is not defined.

Technical basis:

	$\mathbf{B}_{pa}$ = $\mathbf{B}_{loss}$ in Western stock raised by 15%: = 2.3 million t.
$\mathbf{F}_{lim}$ = $\mathbf{F}_{loss}$ = 0.26.	$\mathbf{F}_{pa}$ = $\mathbf{F}_{lim}$ * 0.65.

The estimate of $\mathbf{F}_{0.1}$ is 0.19.

Single stock exploitation boundaries

ICES advises that any agreed TAC should cover all areas where Northeast Atlantic mackerel are fished. ICES advises that the existing measures to protect the North Sea spawning component remain in place. These are:

- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year.
- There should be no fishing for mackerel in Division IVa during the period 15 February–31 July.
- The 30-cm minimum landing size at present in force in Subarea IV should be maintained.

Exploitation boundaries in relation to existing management plans

The agreed management plan (F between 0.15 and 0.20) would imply catches between 390 000 t and 509 000 t in 2007.

Short-/medium-term implications

Outlook for 2007

Basis: Catch(2006) = 429 (TAC plus 20 reported discards minus 35 that the UK and Ireland have agreed not to fish); F(2006) = 0.18; SSB(2006) = 2449.

Projections are based on uncertain estimates of stock size, but indicate that a catch corresponding to F = 0.17 in 2007 would allow continued rebuilding.

The fishing mortality applied according to the agreed management plan [F(management plan)] is 0.15–0.20.

Rationale	Catches(2007)	F(2007 & 2008)	Basis	SSB(2007) Spawning time	SSB(2008) Spawning time
Zero catch	0	0	F=0	2628	3118
Status quo	646	0.260	2005	2407	2374
	136	0.050	F(management plan upper bound) *0.25	2584	2955
	265	0.100	F(management plan upper bound) *0.5	2541	2802
	390	0.150	F(management plan lower bound)	2498	2659
	438	0.170	$\mathbf{F}_{pa}$	2481	2604
	509	0.200	F(management plan upper bound)	2456	2525
	555	0.220	F(management plan upper bound) *1.1	2440	2473
	623	0.250	F(management plan upper bound) *1.25	2415	2398
	817	0.340	$\mathbf{F}_{pa}$ *2	2343	2190

Weights in '000 t. Catches for 2007 include minimum discards estimated at about 5%.
Shaded scenarios are not considered consistent with the management plan.

Management considerations

The exploitation boundaries in relation to the management plan given above are based on ICES interpretation that the fishing mortality (F) should not exceed 0.20. However, the management plan does not explicitly prioritise the F-based over the biomass-based decision rule, or vice versa. ICES evaluation of the decision rule as being in accordance with the PA is based on the assumption that F should have an upper boundary of 0.20.

Between 1992 and 2002, there was a downward trend in SSB, reflecting that the exploitation has not been sustainable in the sense that removals from the stock have repeatedly exceeded the annual production of the stock. The current assessment indicates that the biomass has increased since 2002. Also, currently the stock appears to be subject to increased variability in recruitment and, should this continue, the stock trajectory may be more variable in the future. This should be taken into consideration in developing a harvest control rule.

The estimates of catches by ICES have exceeded the annual TACs in most years, sometimes by a considerable amount, in particular when the TACs are lower.

There are indications of substantial underreporting of catches for this stock which is a matter of concern. The stock projections have been performed using the TAC for 2006 (444 kt) plus known discarding (20 kt) and minus 35 kt which UK & Ireland agreed not to fish. This results in a catch estimate of 429 kt. The estimate of discarding and slipping is based on actual observation and is not raised to the fleet, as it is not clear whether the observations are representative. Important initiatives in enforcement were taken by the UK and Ireland in 2005/06, which included severe punitive measures. ICES expects that these will lead to better compliance, at least in these countries in 2006 and beyond, and therefore lead to a closer correspondence between predictions and ACFM catch. The preliminary analyses carried out by ICES suggest an underestimation of catch by 60% or more compared to the ACFM catches that included discarding and additions for known misreporting. Such an underestimation of the catches by 60% or more is not taken into consideration in the estimates of SSB as well as the predicted landings, and their actual values would be scaled accordingly.

These observations imply that estimates of SSB, the forecast landings, and probably even $\mathbf{B}_{pa}$ are biased. The advice on landings from a given SSB relative to the $\mathbf{B}_{pa}$ is only meaningful in relative terms.

The doubts about the absolute stock abundance and the large year-to-year variations in the assessments invite a reflection on long-term management strategies that are less dependent on the annual analytic assessments. Mackerel was previously considered to be a candidate for a multi-year TAC management plan because the stock appeared relatively stable. In addition, survey data are available only for a three-year cycle. Multiannual management strategies can reduce some of the problems for management and industry caused by the instability in mackerel assessments. The data and preliminary tools to evaluate such management regimes by simulations are available. Underreporting of catches, both at present and in the past causes problems that need further exploration. Further development along these lines should be done in dialogue with managers and the industry. ICES is prepared to enter such a dialogue.

The ICES is not able to provide a reliable estimate of $\mathbf{F}_{msy}$ directly. A suitable proxy would be $\mathbf{F}_{0.1}$ which has been stable at 0.19 for the last 5 years at least.

The measures advised by ACFM to protect the North Sea spawning component aim at setting the conditions for making a recovery of this component possible. Before the late 1960s, the North Sea spawning biomass of mackerel was estimated at above 3 million tonnes. Due to overexploitation, recruitment has failed since 1969, leading to a decline in the stock. The North Sea spawning component has increased since 1999 but continued protection is needed as it is still very small. Given that the stock is currently increasing, it is recommended that a new management plan be developed.

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year is designed to protect the North Sea component in this area and also the juvenile Western mackerel which are numerous, particularly in Division IVb,c during the second half of the year. This closure has unfortunately resulted in increased discards of mackerel in the non-directed fisheries (especially horse mackerel fisheries) in these areas as vessels at present are permitted to take only 10% of their catch as mackerel bycatch. No data on the actual amount of mackerel bycaught are available, but the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 onwards might seriously underestimate catches due to discarded bycatch.

The advised closure of Division IVa for fishing during the first half of the year is based on the perception that the western mackerel enter the North Sea in July/August, and stay there until December before migrating back to their spawning areas. Updated observations taken in the late 1990s suggested that this return migration actually started in mid- to late February. This was believed to result in large-scale misreporting from the northern part of the North Sea (Division IVa) to Division VIa. It was recommended that the closure date for IVa be extended to the 15th February and not the 1st February, as stated in the advice in 2002. This was adopted for the 1999/2000 fishing season onwards. However, misreporting from IVa to VIa continues to occur.

In the southern part of the distribution area, Atlantic mackerel (*Scomber scombrus*) can be caught together with Spanish mackerel (*Scomber japonicus*). In recent years, catches of Spanish mackerel have increased. The catch in 2005 was the highest since 1982. Catches of both species are landed separately. ICES advice applies to Atlantic mackerel only.

Factors affecting the fisheries and the stock

Mackerel is mainly exploited in a directed fishery for human consumption. This fishery tends to target bigger fish and this could potentially cause discarding of smaller, marketable fish (high-grading).

The effects of regulations

Management has aimed at a fishing mortality in the range of 0.15–0.2 since 1998. The fishing mortality realised since then has been in the range of 0.23 to 0.44. The current assessment shows reduced F and increased biomass after the reductions in reported catches in 2003 and beyond.

Other factors

Stock components: ICES currently uses the term "North East Atlantic Mackerel" to define the mackerel present in the area extending from ICES Division IXa in the south to Division IIa in the north, including mackerel in the North Sea and Division IIIa. The spawning areas of mackerel are widely spread, and only the stock in the North Sea is sufficiently distinct to be clearly identified as a separate spawning component. Tagging experiments have demonstrated that after spawning, fish from Southern and Western areas migrate to feed in the Norwegian Sea and the North Sea during the second half of the year. In the North Sea they mix with the North Sea component. Since it is at present impossible to allocate catches to the stocks previously considered by ICES, they are at present, for practical reasons, considered as one stock: the North East Atlantic Mackerel Stock. Catches cannot be allocated specifically to spawning area components on biological grounds, but by convention the catches from the Southern and Western components are separated according to the area where they are taken.

In order to be able to keep track of the development of the spawning biomasses in the different spawning areas, the North East Atlantic mackerel stock is divided into three area components: the Western Spawning Component, the North Sea Spawning Component, and the Southern Spawning Component:

Northeast Atlantic Mackerel			
Distributed and fished in ICES Subareas and Divisions IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa.			
Spawning component	**Western**	**Southern**	**North Sea**
Spawning Areas	VI, VII, VIIIa,b,d,e.	VIIIc, IXa.	IV, IIIa.

The Western Component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, VIII a,b,d,e). This component currently comprises 85% of the entire North East Atlantic Stock. Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa). Although the North Sea component has been at an extremely low level since the early 1970s, ACFM regards the North Sea Component as still existing. This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIa). Current knowledge of the state of the spawning components is summarised below

Western Component: The catches of this component were low in the 1960s, but increased to more than 800 000 t in 1993. The main catches are taken in directed fisheries by purse seiners and mid-water trawlers. Large catches of the western component are taken in the northern North Sea and in the Norwegian Sea. The 1996 catch was reduced by about 200 000 t compared with 1995, because of a reduction in the TAC. The catches since 1998 have been stable. The SSB of the Western Component declined in the 1970s from above 3.0 million t to 2.2 million t in 1994, but was estimated to have increased to 2.7 million t in 1999. A separate assessment for this stock component is no longer required, as a recent extension of the time-series of NEA mackerel data now allows the estimation of the mean recruitment from 1972 onwards. Estimates of the spawning stock biomass, derived from egg surveys, indicate a decrease of 14% between 1998 and 2001 and a 6% decrease from 2001 to the 2004 survey.

North Sea Component: Very large catches were taken in the 1960s in the purse seine fishery, reaching a maximum of about 1 million t in 1967. The component subsequently collapsed and catches declined to less than 100 000 t in the late 1970s. Catches during the last five years have been assumed to be about 10 000 t. The 2002 and 2005 egg surveys in the North Sea with limited spatial and temporal coverage both indicate a higher egg production in the North Sea area than in 1999. Though the North Sea spawning component has increased since 1999, it is still very small.

Southern Component: Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one-third of the total catches are taken. It is taken as a bycatch in other fleets. The highest catches (87%) from the Southern Component are taken in the first half of the year, mainly from Division VIIIc, and consist of adult fish. In the second half of the year catches consist of juveniles and are mainly taken in Division IXa. Catches from the Southern Component increased from about 20 000 t in the early 1990s to 44 000 t in 1998, and were close to 50 000 t in 2002. Estimates of the spawning stock biomass, derived from egg surveys, indicate a decrease of about 50% between 1998 and 2001. However, the SSB estimated in 2001 is similar to the survey estimates in 1995. The SSB estimated in 2004 showed a decrease of 36% over the 2001 survey.

Scientific basis

Data and methods

This assessment is based on catch numbers-at-age for the period 1972–2005 and egg survey estimates of SSB from 1992, 1995, 1998, 2001, and 2004. Exploratory assessments using different assessment models gave comparable results. The estimate of total mortality in the past is in line with estimates from tag recapture studies. The results are sensitive to the way the surveys are used in the models. This year's assessment is an update of last year's assessment.

For mackerel, fishery-independent data of the stock size becomes available only once every 3 years from egg surveys. Inclusion of a new independent data point may result in quite large revisions of the stock size, fishing mortality, and consequently catch predictions and TAC advice.

Sampling for discards has been initiated in the EU in 2002 by legal regulations. Sampling of discards and slipping is problematic in pelagic fisheries due to high variability in discard and slipping practices. Better information on these practices is required in the future.

Acoustic surveys are available for this stock but have not been used in the assessment because 1) they do not cover the entire geographic range, 2) there are difficulties with the estimation of fish density, and 3) there could be species identification issues in some areas.

Uncertainties in assessment and forecast

Due to the lack of fishery-independent data and the absence of age-disaggregated information for the spawning stock index, the levels of SSB are uncertain but F can be considered as indicative of the level and trend. In recent years, there has been a tendency to overestimate the SSB and to underestimate fishing mortality.

The recruitment since 2000 has been considerably more variable than that observed since the mid-1980s. This adds to the uncertainty in the forecast.

The estimates of SSB and fishing mortality are becoming increasingly uncertain as there is no new fishery-independent data since 2004. The next egg survey is scheduled for 2007.

There is no information on the size of the 2004 and 2005 year classes from the commercial catches. Such information is obtained from surveys. Existing surveys have the potential to estimate recruitment, but this will need to be investigated further.

Preliminary studies of the total levels of fishing mortality and natural mortality using egg surveys and tag mortality have provided a clear indication of substantial levels of unaccounted removals. It is furthermore shown to be unlikely that natural mortality is underestimated and that there is a substantial unaccounted fishing mortality, implying a 95% probability of catches being underestimated by at least 60%. There is a broad perception that there are substantial undeclared landings in this fishery. The assessment is strongly dependent on the catch information, both recently and in the past. Managers are encouraged to obtain reliable catch information.

Comparison with previous assessment and advice

This year's assessment was an update of last year's assessment, with some revision of catch from 1999 to 2004 following information on underreporting, and catch numbers-at-age for 2005 added. The result is in line with last year's assessment with a small downward revision in recent SSB and upward revision in F. Comparative assessments performed with different models gave similar results.

In 2004, the use of the egg production indices in the assessment was changed by assuming that they were relative measures of the spawning stock instead of absolute. This change in the use of indices led to a change in the perception of the trajectory of the stock. In 2005, ICES tested, by simulation, the trade-off between using the survey estimates as absolute or relative indices of the spawning biomass, assuming biases in either the catches or the surveys. The results of this exercise confirmed that using the egg survey as relative indices when there is substantial misreporting of catches leads to unbiased estimates of fishing mortalities and underestimates of the spawning stock in the terminal year. Treating the indices as absolute leads, on the other hand, to an underestimation of the fishing mortality. As the management agreement is based on fishing mortality, the most appropriate model formulation to use is with the egg survey estimates as relative indices.

Furthermore, taking the egg survey estimates as absolute measures of the spawning stock biomass leads to a potential conflict between two sources of information about stock abundance in absolute terms. In practice, the information from the catches will dominate the abundance estimates in the past while the information from the most recent egg surveys will dominate the abundance estimate for the present. This leads to estimates of abundance and SSB that are inconsistent over time. Taking the egg survey estimates as relative removes that internal inconsistency by relying on the catch data as the only source of information about absolute levels. Hence, the estimates of abundance, and accordingly, the predicted catches for the future, are scaled to the reported catches. If catches have been consistently underreported, this is reflected in both the abundance estimates and the catch predictions. The advice, as derived from the present assessments, does reflect the level of reported catches.

Some information on the estimated level of discards is available and was included in the assessment, but the amount included does not appear to be sufficient to capture the scale of the problem. The forecasts have only been provided in terms of landings and not, as in the past, in terms of catches.

Source of information

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, Galway, Ireland, 5–14 September 2006 (ICES CM 2006/ACFM:36).

Catch data for combined area

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC[3]	Official landings	Disc.[1] slip	ACFM catch[2,4]
1987	Given by stock component		442	589	11	655
1988	Given by stock component		610	621	36	680
1989	Given by stock component		532	507	7	590
1990	Given by stock component		562	574	16	628
1991	Given by stock component		612	599	31	668
1992	Given by stock component		707	723	25	760
1993	Given by stock component		767	778	18	825
1994	Given by stock component		837	792	5	821
1995	Given by stock component		645	660	8	756
1996	Significant reduction in F	-	452	493	11	564
1997	Significant reduction in F	-	470	434	19	570
1998	F between 0.15 and 0.2	498	549	647	8	667
1999	F of 0.15 consistent with PA	437	562	595	n/a	616
2000	F=0.17: $\mathbf{F}_{pa}$	642	612	579	2	675
2001	F=0.17: $\mathbf{F}_{pa}$	665	670	620	1	687
2002	F=0.17: $\mathbf{F}_{pa}$	694	683	688	24	727
2003	F=0.17: $\mathbf{F}_{pa}$	542	583	580	9	617
2004	F=0.17: $\mathbf{F}_{pa}$	545	532	559	11	611
2005	F=0.15 to 0.20	[320-420]	422	458	20	543
2006	F=0.15 to 0.20	[373-487]	444			
2007	F=0.15 to 0.20	[390-509]				

Weights in '000 t.
[1]Data on discards and slipping from only two fleets. [2]Landings and discards from IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa. [3]All areas except some catches in international waters in II. [4]Catches updated in 2003 with revisions from SGDRAMA in 2002.
n/a=not available.

Catch data for western component

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Disc. slip	ACFM catch[2,4]
1987	SSB = 1.5 mill. t; TAC	380	405	11	633
1988	F = $\mathbf{F}_{0.1}$; TAC; closed area; landing size	430	573	36	656
1989	Halt SSB decline; TAC	355	495	7	571
1990	TAC; F = $\mathbf{F}_{0.1}$	480	525	16	606
1991	TAC; F = $\mathbf{F}_{0.1}$	500	575	31	647
1992	TAC for both 1992 and 1993	670	670	25	742
1993	TAC for both 1992 and 1993	670	730	18	805
1994	No long-term gains in increased F	831[3]	800	5	796
1995	20% reduction in F	530	608	8	728
1996	No separate advice	-	422	11	529
1997	No separate advice	-	416	19	529
1998	No separate advice	-	514	8	623
1999	No separate advice	-	520	0	572
2000	No separate advice	-	573	2	639
2001	No separate advice	-	630	1	644
2002	No separate advice	-	642	24	677
2003	No separate advice	-	548	9	592
2004	No separate advice	-	500	11	577
2005	No separate advice	-	397	20	494
2006	No separate advice	-	392		
2007	No separate advice	-			

Weights in '000 t.
[1]TAC for mackerel taken in all areas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, IVa. [2]Landings and discards of Western component; includes some catches of North Sea component. [3]Catch at *status quo* F. [4]Catches updated in 2003 with revisions from SGDRAMA in 2002.

Catch data for North Sea component

Year	ICES Advice	Predicted catch corresp. to advice[1]	Agreed TAC[2]	ACFM catch[3]
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; bycatch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; bycatch regulations	LPL	49.2	7
1990	Closed areas and seasons; min. landing size; bycatch regulations	LPL	45.2	10
1991	Closed areas and seasons; min. landing size; bycatch regulations	LPL	65.5	-[4]
1992	Closed areas and seasons; min. landing size; bycatch regulations	LPL	76.3	-[4]
1993	Maximum protection; closed areas and seasons; min landing	LPL	83.1	-[4]
1994	Maximum protection; closed areas and seasons; min landing	LPL	95.7	-[4]
1995	Maximum protection; closed areas and seasons; min landing	LPL	76.3	-[4]
1996	Maximum protection; closed areas and seasons; min landing	LPL	52.8	-[4]
1997	Maximum protection; closed areas and seasons; min landing	LPL	52.8	-[4]
1998	Maximum protection; closed areas and seasons; min landing	LPL	62.5	-[4]
1999	Maximum protection; closed areas and seasons; min landing	LPL	62.5	-[4]
2000	Maximum protection; closed areas and seasons; min landing	LPL	69.7	-[4]
2001	Maximum protection; closed areas and seasons; min landing	LPL	71.4	-[4]
2002	Maximum protection; closed areas and seasons; min landing	LPL	72.9	-[4]
2003	Maximum protection; closed areas and seasons; min landing	LPL	62.5	-[4]
2004	Maximum protection; closed areas and seasons; min landing	LPL	57.7	-[4]
2005	Maximum protection; closed areas and seasons; min landing	LPL	44.9	-[4]
2006	Maximum protection; closed areas and seasons; min landing	LPL	47.1	-[4]
2007	Maximum protection; closed areas and seasons; min landing			

Weights in '000 t.
[1]Subarea IV and Division IIIa. [2]TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone).
[3]Estimated landings of North Sea component. [4]No information.

Catch data for southern component

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Catch[2]
1987	Reduce juvenile exploitation	-	36.57	22
1988	Reduce juvenile exploitation	-	36.57	25
1989	No advice	-	36.57	18
1990	Reduce juvenile exploitation	-	36.57	21
1991	Reduce juvenile exploitation	-	36.57	21
1992	No advice	-	36.57	18
1993	No advice	-	36.57	20
1994	No advice	-	36.57	25
1995	No advice	-	36.57	28
1996	No separate advice	-	30.00	34
1997	No separate advice	-	30.00	41
1998	No separate advice	-	35.00	44
1999	No separate advice	-	35.00	44
2000	No separate advice	-	39.20	36
2001	No separate advice	-	40.18	43
2002	No separate advice	-	41.10	50
2003	No separate advice	-	35.00	26
2004	No separate advice	-	32.31	35
2005	No separate advice	-	24.87	50
2006	No separate advice	-	26.18	
2007	No separate advice	-		

Weights in '000 t.
[1]Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EU waters only). [2]Catches updated in 2003 with revisions from SGDRAMA in 2002.

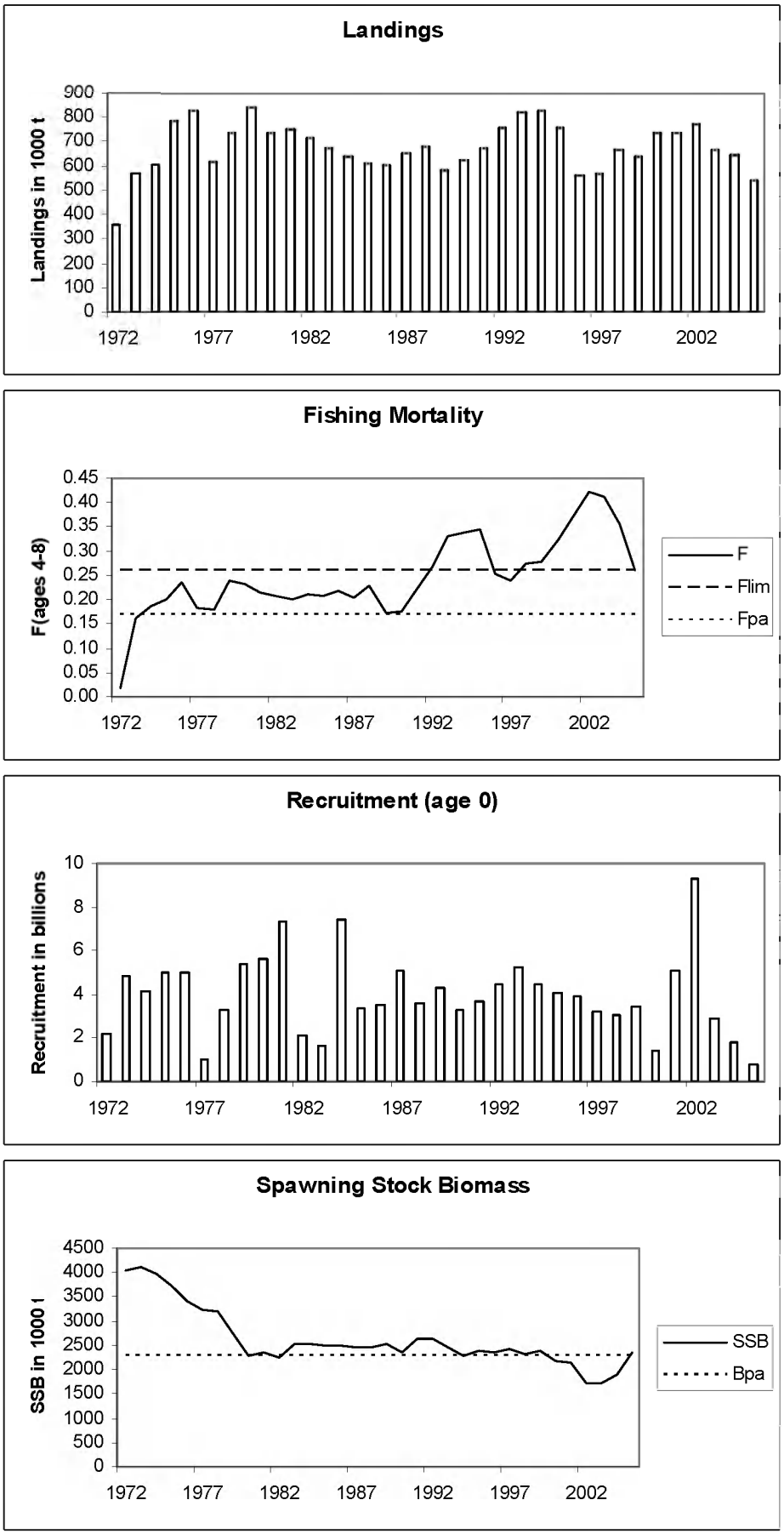
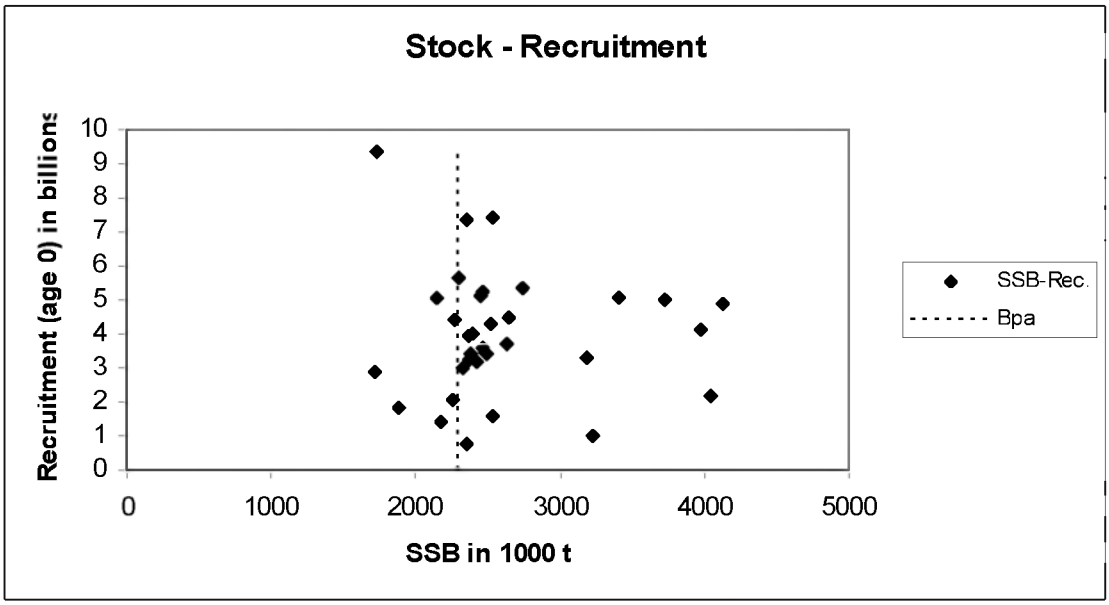


Figure 9.4.2.1 Mackerel (combined Southern, Western & N.Sea spawn.comp.). Landings, fishing mortality, recruitment and SSB



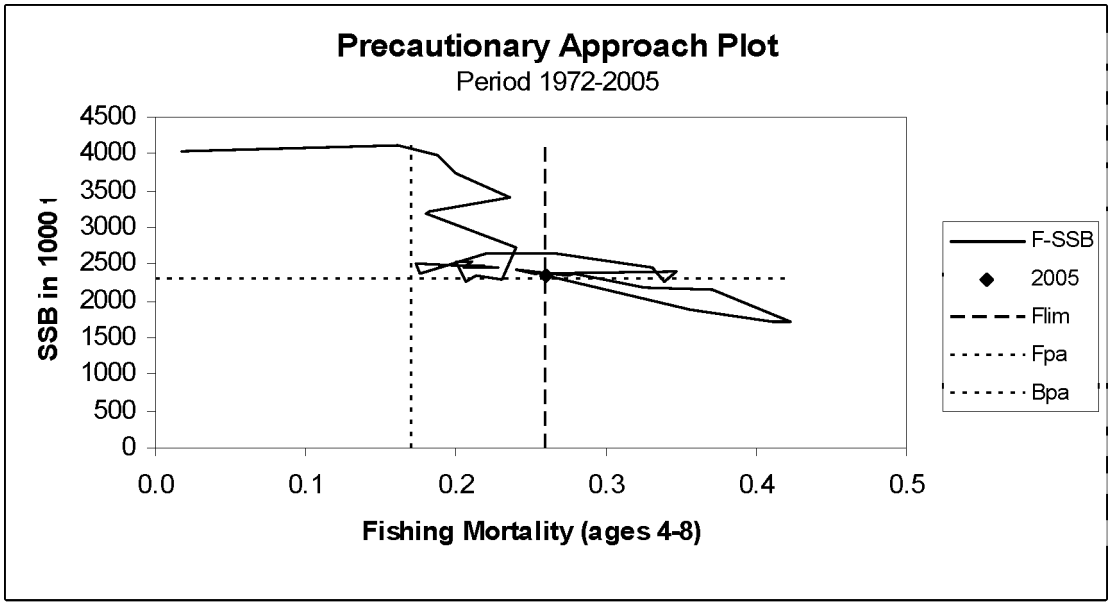


Figure 9.4.2.2 Mackerel (combined Southern, Western & N.Sea spawn.comp.). Stock and recruitment; and Yield

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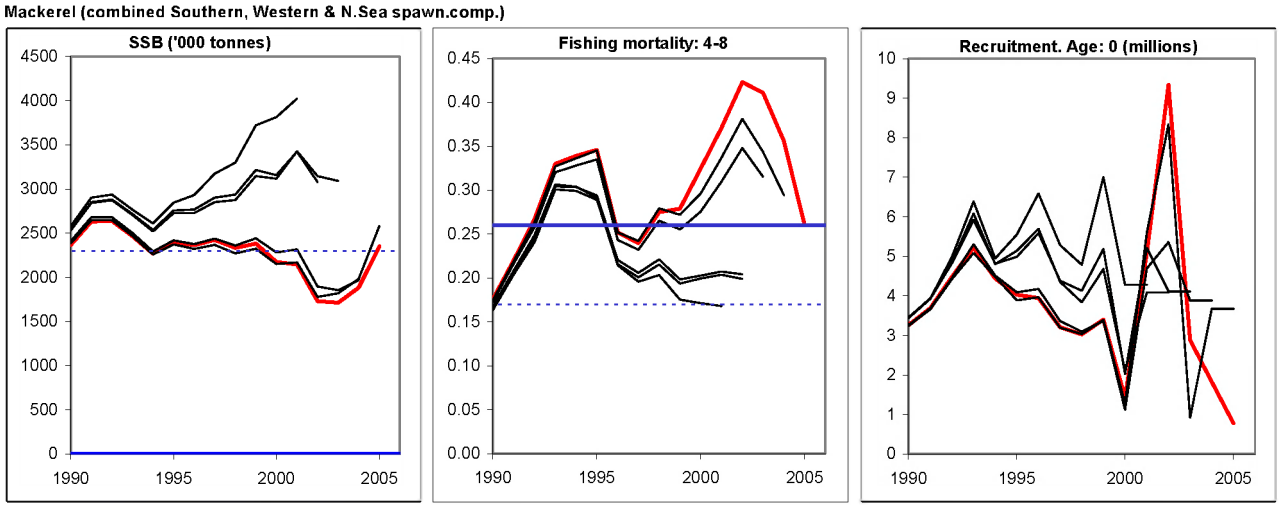


Figure 9.4.2.3 Mackerel (combined Southern, Western & N.Sea spawn.comp.) Historical performance of the assessment (SSB, Fishing mortality and recruitment)

Table 9.4.2.1 NEA Mackerel. Catches (in tonnes) by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Subarea VI			Subarea VII and Divisions VIIIa,b,d,e			Subareas IV and III			Subareas I,II & Divs.Vb[1]	Divs. VIIIc, IXa	Total		
	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Landings	Landings	Discards	Catch
1969	4,800		4,800	47,404		47,404	739,175		739,175	7	42,526	833,912	0	833,912
1970	3,900		3,900	72,822		72,822	322,451		322,451	163	70,172	469,508	0	469,508
1971	10,200		10,200	89,745		89,745	243,673		243,673	358	32,942	376,918	0	376,918
1972	13,000		13,000	130,280		130,280	188,599		188,599	88	29,262	361,229	0	361,229
1973	52,200		52,200	144,807		144,807	326,519		326,519	21,600	25,967	571,093	0	571,093
1974	64,100		64,100	207,665		207,665	298,391		298,391	6,800	30,630	607,586	0	607,586
1975	64,800		64,800	395,995		395,995	263,062		263,062	34,700	25,457	784,014	0	784,014
1976	67,800		67,800	420,920		420,920	305,709		305,709	10,500	23,306	828,235	0	828,235
1977	74,800		74,800	259,100		259,100	259,531		259,531	1,400	25,416	620,247	0	620,247
1978	151,700	15,100	166,800	355,500	35,500	391,000	148,817		148,817	4,200	25,909	686,126	50600	736,726
1979	203,300	20,300	223,600	398,000	39,800	437,800	152,323	500	152,823	7,000	21,932	782,555	60600	843,155
1980	218,700	6,000	224,700	386,100	15,600	401,700	87,931		87,931	8,300	12,280	713,311	21600	734,911
1981	335,100	2,500	337,600	274,300	39,800	314,100	64,172	3,216	67,388	18,700	16,688	708,960	45516	754,476
1982	340,400	4,100	344,500	257,800	20,800	278,600	35,033	450	35,483	37,600	21,076	691,909	25350	717,259
1983	320,500	2,300	322,800	235,000	9,000	244,000	40,889	96	40,985	49,000	14,853	660,242	11396	671,638
1984	306,100	1,600	307,700	161,400	10,500	171,900	43,696	202	43,898	98,222	20,208	629,626	12302	641,928
1985	388,140	2,735	390,875	75,043	1,800	76,843	46,790	3,656	50,446	78,000	18,111	606,084	8191	614,275
1986	104,100		104,100	128,499		128,499	236,309	7,431	243,740	101,000	24,789	594,697	7431	602,128
1987	183,700		183,700	100,300		100,300	290,829	10,789	301,618	47,000	22,187	644,016	10789	654,805
1988	115,600	3,100	118,700	75,600	2,700	78,300	308,550	29,766	338,316	120,404	24,772	644,926	35566	680,492
1989	121,300	2,600	123,900	72,900	2,300	75,200	279,410	2,190	281,600	90,488	18,321	582,419	7090	589,509
1990	114,800	5,800	120,600	56,300	5,500	61,800	300,800	4,300	305,100	118,700	21,311	611,911	15600	627,511
1991	109,500	10,700	120,200	50,500	12,800	63,300	358,700	7,200	365,900	97,800	20,683	637,183	30700	667,883
1992	141,906	9,620	151,526	72,153	12,400	84,553	364,184	2,980	367,164	139,062	18,046	735,351	25000	760,351
1993	133,497	2,670	136,167	99,828	12,790	112,618	387,838	2,720	390,558	165,973	19,720	806,856	18180	825,036
1994	134,338	1,390	135,728	113,088	2,830	115,918	471,247	1,150	472,397	72,309	25,043	816,025	5370	821,395
1995	145,626	74	145,700	117,883	6,917	124,800	321,474	730	322,204	135,496	27,600	748,079	7721	755,800
1996	129,895	255	130,150	73,351	9,773	83,124	211,451	1,387	212,838	103,376	34,123	552,196	11415	563,611
1997	65,044	2,240	67,284	114,719	13,817	128,536	226,680	2,807	229,487	103,598	40,708	550,749	18864	569,613
1998	110141	71	110,212	105,181	3,206	108,387	264,947	4,735	269,682	134,219	44,164	658,652	8012	666,664
1999[2,3]	116,362	§	116,362	94,290	§	94,290	313,014	§	313,014	72,848	43,796	640,311	§	640,311
2000[2,3]	187,595	1	187,595	115,566	1,918	117,484	285,567	165	304,898	92,557	36,074	736,524	2084	738,608
2001[2,3]	143,142	83	143,142	142,890	1,081	143,971	327,200	24	339,971	67,097	43,198	736,274	1,188	737,462
2002[2,3]	136,847	12,931	149,778	102,484	2,260	104,744	375,708	8,583	394,878	73,929	49,576	749,131	23,774	772,905
2003[3]	142,728	91	142,819	89,492		89,492	334,639	9,390	357,766	53,701	25,823	660,119	9,481	669,600
2004[3]	134,251	240	134,491	99,922	1,862	101,784	300,768	8,870	316,620	62,486	34,840	639,248	10,972	650,221
2005	79,960	11,400	91,361	90,278	5,878	96,156	249,740	2,482	252,223	54,129	49,618	523,726	19,760	543,486

*Preliminary.

[1]For 1976–1985 only Division IIa. Subarea I, and Division IIb included in 2000 only.

[2] Data revised for Northern Ireland; [3]Data revised for unallocated catch.

[§] Discards reported as part of unallocated catches.

Table 9.4.2.2 Mackerel (combined Southern, Western & N.Sea spawn.comp.)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1972	2190480	4038603	361262	0.018
1973	4880250	4128482	570719	0.161
1974	4113000	3976210	607473	0.188
1975	5014750	3724320	784329	0.200
1976	5035560	3400480	828434	0.236
1977	1014280	3230685	620016	0.182
1978	3288700	3192117	736519	0.180
1979	5363800	2740188	842739	0.240
1980	5664020	2300859	734950	0.231
1981	7365370	2349329	754045	0.213
1982	2080800	2256416	716987	0.206
1983	1613650	2529253	672283	0.200
1984	7398800	2528343	641928	0.210
1985	3385430	2493292	614371	0.206
1986	3482600	2483426	602200	0.218
1987	5090890	2455434	654992	0.205
1988	3588520	2461642	680491	0.228
1989	4294500	2520997	585920	0.173
1990	3258290	2368842	626107	0.176
1991	3688430	2632082	675665	0.220
1992	4480660	2638896	760690	0.267
1993	5218570	2467288	824568	0.330
1994	4437980	2268604	829087	0.339
1995	4028980	2402407	756277	0.346
1996	3945160	2364841	563472	0.252
1997	3204550	2424819	573029	0.240
1998	3026300	2333705	666316	0.275
1999	3400800	2383006	640309	0.279
2000	1426200	2175396	738606	0.325
2001	5087070	2145921	737463	0.371
2002	9335000	1731017	772905	0.423
2003	2882660	1712998	669600	0.411
2004	1827930	1884198	650221	0.356
2005	780230	2352719	543486	0.260
Average	3967477	2620495	677572	0.246

9.4.3 Western horse mackerel (*Trachurus trachurus*) (Divisions IIa, IVa, Vb, VIa, VIIa–c,e–k, VIIIa-e)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Comment
Unknown	Unknown	Unknown	Uncertainty of absolute level of SSB and F; SSB shows a decrease in the stock since the late 1980s.

Based on recent research information on stock identity, the Western horse mackerel stock unit has been redefined and now includes Division VIIIc.

In the absence of defined reference points and a full analytical assessment, the state of the stock is unknown. Data exploration indicates that the SSB shows a decrease since the late 1980s, as the outstanding 1982 year class was depleted. Relative high catch rates of the 2001 year class in 2002–2005 indicate that this year class is stronger than those observed in recent years. Fishing mortality is also believed to be relatively low.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No reference points have been defined for the revised stock unit.

Single-stock exploitation boundaries

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Exploitation boundaries in the past were based on $\mathbf{F}_{0.1}$. In view of the absence of a reliable selection profile, $\mathbf{F}_{0.1}$ cannot be estimated at the present time.

Exploitation boundaries in relation to precautionary considerations

ICES has advised that in the absence of a strong year class sustainable yield is unlikely to be higher than 130 000 t for the traditional stock areas. This corresponds to catches less than 150 000 t in the revised stock area (i.e. 130 000 t for the traditional stock area, plus 20 000 t for the inclusion of Division VIIIc in the stock definition). Despite indications of a strong 2001 year class and given the uncertainty in stock levels, ICES recommends that catches of horse mackerel in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e be limited to less than 150 000 t.

Short-term implications

Given the uncertainty of the absolute levels of SSB, F, and R, and in the absence of a full analytical assessment, short-term forecasts cannot be provided.

Management considerations

There are indications that the 2001 year class is relatively strong and at a similar level as those in the mid-1990s which arrested the decline of the stock at that time. This year class is now well recruited to the fishery and does appear in the fisheries over a wide area. Because of the wide distribution of the 2001 year class, ICES has some confidence in the estimates of its strength. However, this year class does not appear to be as strong as the 1982 year class.

The TAC has only been given for parts of the distribution and fishing areas (EU waters). ICES advises that if a TAC is set for this stock, it should apply to all areas where western horse mackerel are caught, i.e. Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa–c, e–k and VIIIa-e. Note that Division VIIIc is now included in the Western stock distribution area. If the management area limits were revised, measures should be taken to prevent misreporting of catch taken in VIIe,h and VIId (the latter then belonging to the North Sea stock management area). This could be done for example by

imposing a separate TAC for the areas where juveniles occur for both neighbouring stocks. The management areas do not reflect the stock distribution and this causes distortions in the exploitation rates.

Simulations carried out this year indicate that for a constant catch strategy, the risk to SSB rises significantly when catches exceed 150 000 t. Harvest Control Rules based on the trend in the egg survey data were also tested and appear promising. This needs to be evaluated and explored in a dialogue between managers and ICES.

Factors affecting the fisheries and the stock

The effects of regulations

The geographical range of this stock increased when the exceptional 1982 year class entered the fishery. This resulted in the development of unregulated fisheries outside the TAC area in the Northern North Sea. At present, the TAC for the Western areas only includes Division Vb (EU waters), Subareas VI and VII, and Divisions VIIIa-e. A separate TAC includes EU waters in Division IIa and Subarea IV. Horse mackerel taken in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIe–k, and VIIIa-e are allocated by ICES to the Western stock. ICES recommends that the TAC should cover catches from the full distribution of the stock.

Changes in fishing technology and fishing patterns

So far, the juvenile fishery in the Western stock distribution area has mainly taken place in Divisions VIIe,f,g,h and VIIIa-d. From about 1994 onwards, the fishery on juveniles expanded resulting in a change in exploitation pattern for the stock. This may be due to the lack of older fish (decline of the 1982 year class) and the development of a market for juveniles. The fishing pattern appears to have changed again in recent years, but it is not clear if this is due to the strong 2001 year class or a response to actual changes in fishing practices (targeting). The percentage of catch (in weight) in the juvenile areas increased gradually from about 40% in 1997 to about 65% in 2003 and dropped to 38% in 2005.

The environment

Research over the last decade has shown strong links between horse mackerel migration into northern areas and water mass transport patterns in the northeastern Atlantic (see Section 1.2, this volume).

Other factors

Western horse mackerel is taken in a variety of fisheries exploiting juvenile fish for the human consumption market (with mid-aged fish mostly for the Japanese market), and older fish either for human consumption purposes (mostly for the African market) or for industrial purposes.

The history of this stock reflects the development of a single large year class within the period of 23 years for which data are available. The frequency of the occurrence of such large year classes cannot be evaluated on the basis of the short time-series.

Scientific basis

Two assessment approaches have been explored this year, none of which are considered to provide a reliable assessment of absolute abundance. Nevertheless, these are indicative of relative trends.

The egg production index has been extended to include Division VIIIc to reflect the new stock definition.

Data and methods

As in previous years and despite the data sampling regulation for EU countries, some countries with major catches did not carry out biological sampling programmes. Though this has improved since 1998, the lack of biological data severely hampered the assessment in earlier years. It is important to note that a sufficient sampling coverage is a prerequisite for the timely detection of a strong recruiting year class. Only this would allow for the implementation of management measures early enough to protect such a year class from being overexploited or discarded.

Discard information is incomplete for this stock.

Uncertainties in assessment and forecast

As it is not possible to determine the absolute level of recruitment, abundance, and fishing mortality, only relative trends in these quantities have been derived and no catch forecasts are provided.

Comparison with previous assessment and advice

The perception of historical stock trends is consistent with last year's estimates. For recent years, the trends are slightly different, showing a stable or slightly increasing spawning biomass.

Source of information

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, Galway, Ireland, 5–14 September 2006 (ICES CM 2006/ACFM:36).

Year	ICES Advice	Predicted catch corresp. to advice[2]	Agreed TAC[1]	ACFM Landings[2]	Disc. Slip[2]	ACFM Catch[2]
1987	Not assessed	-	155	157	-	157
1988	No increase in catches	102	169	184	4	188
1989	If sustained catches required; TAC	100	153	267	1	269
1990	TAC	~200	203	363	10	373
1991	Within safe biological limits	-	230	328	5	334
1992	Within safe biological limits	-	250	369	2	371
1993	Within safe biological limits	-	250	424	9	433
1994	Prudent not to increase F	-	300	385	4	389
1995	Reduction in catch	-	300	509	2	511
1996	Reduction in catch	-	300	379	17	397
1997	Reduction in F	173	300	440	3	443
1998	Reduction in F to 0.15	150	320	296	1	304
1999	Effectively limit catches to 200 000 t	<200	265	274	-	274
2000	Effectively limit catches to 200 000 t	<200	240	175	-	175
2001	Effectively limit catches to 224 000 t	<224	233	191	-	191
2002	Effectively limit catches to 98 000 t	<98	150	172	-	172
2003	Effectively limit catches to 113 000 t	<113	137	190[3]	-[3]	190[3]
2004	Limit catches to less than 130 000 t	<130	137	157[3]	1[3]	158[3]
2005	Limit catches to less than 150 000 t	<150[3]	137	182	-	182
2006	Limit catches to less than 150 000 t	<150[3]	137			
2007	Limit catches to less than 150 000 t	<150[3]				

Weights in '000 t.
[1]Division Vb (EU waters only), Subareas VI and VII, Divisions VIIIa,b,d,e.
[2]Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, VIII a,b,d,e .
[3]Including VIIIc.

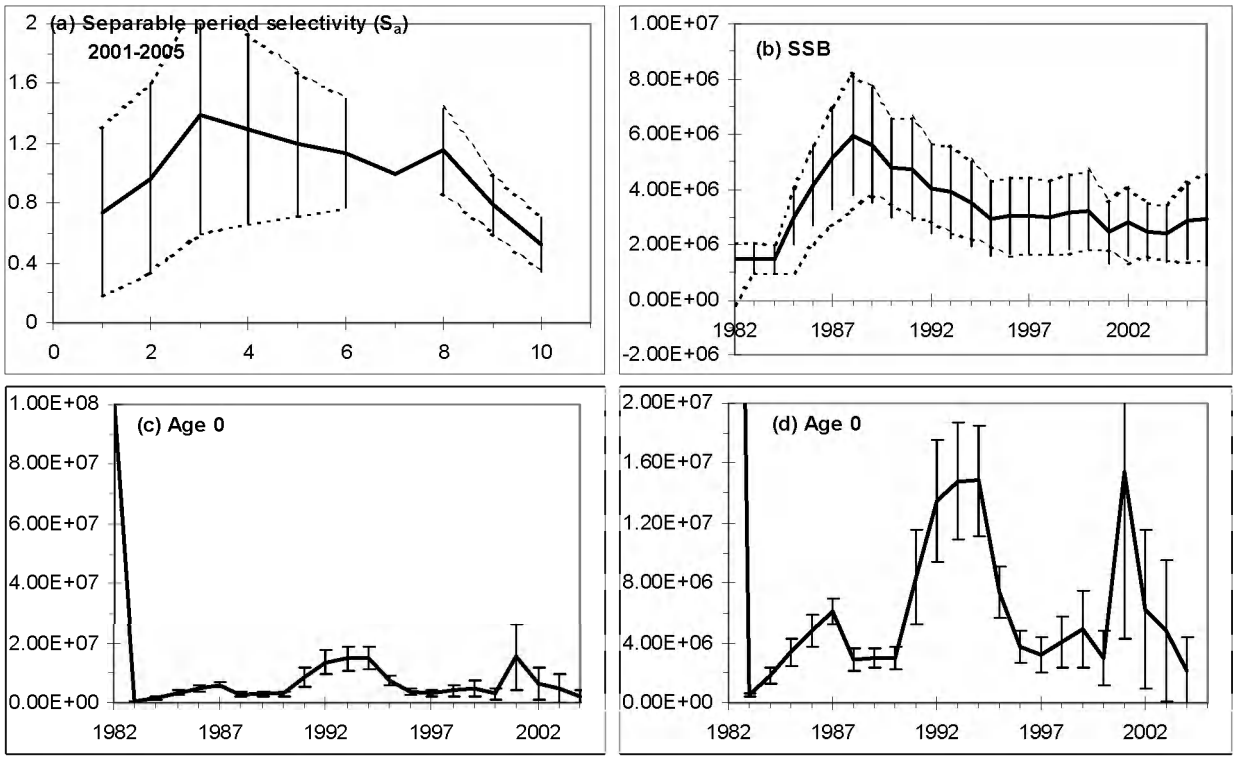


Figure 9.4.3.1 Western horse-mackerel. Plots of (a) the selectivity pattern, (b) the SSB trajectory, (c) numbers at age 0, and (d) the same as (c) but scaled to capture more detail. The error bars are 2 standard deviations (indicating roughly 95% confidence bounds).

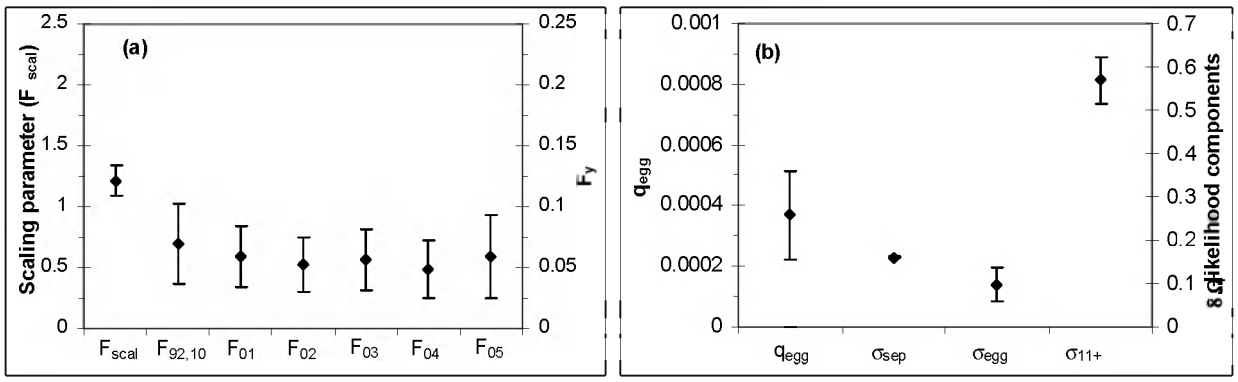


Figure 9.4.3.2 Western horse-mackerel. Estimates for some key parameters, with (a) corresponding to fishing mortality parameters (the scaling parameter F_{scal}, fishing mortality at age 10 in 1992, $F_{92,10}$, and the fishing mortality year effects for the separable period, F_y), and (b) the catchability parameter q_{egg}, and estimates of variance, plotted as standard deviations, for the three components of the likelihood (σ_{sep}, σ_{egg} and σ_{11+}). The error bars are 2 standard deviations (indicating roughly 95% confidence bounds).

Table 9.4.3.1 HORSE MACKEREL general. Landings (t) in Subarea II. (Data as submitted by Working Group members.)

Country	1980	1981	1982	1983	1984	1985	1986	1987
Denmark	-	-	-	-	-	-	-	39
France	-	-	-	-	1	1	-[2]	-[2]
Germany, Fed.Rep	-	+	-	-	-	-	-	-
Norway	-	-	-	412	22	78	214	3,272
USSR	-	-	-	-	-	-	-	-
Total	-	+	-	412	23	79	214	3,311

	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	-	-	9643	1,115	9,157[3]	1,068	-	950
Denmark	-	-	-	-	-	-	-	200
France	-2	-	-	-	-	-	55	-
Germany, Fed. Rep.	64	12	+	-	-	-	-	-
Norway	6,285	4,770	9,135	3,200	4,300	2,100	4	11,300
USSR / Russia (1992 -)	469	27	1,298	172	-	-	700	1,633
UK (England + Wales)	-	-	17		-	-	-	-
Total	6,818	4,809	11,414	4,487	13,457	3,168	759	14,083

	1996	1997	1998	1999	2000	2001	2002	2003
Faroe Islands	1,598	799[3]	188[3]	132[3]	250[3]	-		
Denmark	-	-	1,755[3]			-		
France	-	-	-			-		
Germany	-	-	-			-		
Norway	887	1,170	234	2,304	841	44	1,321	22
Russia	881	648	345	121	84[3]	16	3	2
UK (England + Wales)	-	-	-			-		
Estonia	-	-	22					
Total	3,366	2,617	2,544	2557	1175	60	1,324	24

	2004	2005[1]
Faroe Islands	-	-
Denmark	-	-
France	-	-
Germany	-	-
Norway	42	176
Russia		
UK (England + Wales)	-	-
Estonia	-	-
Total	42	176

[1]Preliminary.
[2]Included in Subarea IV.
[3]Includes catches in Division Vb.

Table 9.4.3.2 HORSE MACKEREL general. Landings (t) in North Sea Subarea IV and Skagerrak Division IIIa by country. (Data submitted by Working Group members). Catches partly concern the North Sea horse mackerel.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	8	34	7	55	20	13	13	9	10
Denmark	199	3,576	1,612	1,590	23,730	22,495	18,652	7,290	20,323
Faroe Islands	260	-	-	-	-	-	-	-	-
France	292	421	567	366	827	298	231[2]	189[2]	784[2]
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	2,029[3]	824	160[3]	600[3]	850[4]	1,060[3]
Norway[2]	119	2,292	7	322	[3]	203	776	11,728[4]	34,425[4]
Poland	-	-	-	2	94	-	-	-	-
Sweden	-	-	-	-	-	-	2	-	-
UK (Engl. + Wales)	11	15	6	4	-	71	3	339	373
UK (Scotland)	-	-	-	-	3	998	531	487	5,749
USSR	-	-	-	-	489	-	-	-	-
Total	2,151	7,253	2,788	4,420	25,987	24,238	20,808	20,895	62,877

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	10	13	-	+	74	57	51	28	-
Denmark	23,329	20,605	6,982	7,755	6,120	3,921	2,432	1,433	648
Estonia	-	-	-	293	-		17	-	-
Faroe Islands	-	942	340	-	360	275	-	-	296
France	248	220	174	162	302		-	-	-
Germany, Fed.Rep.	506	2,469[5]	5,995	2,801	1,570	1,014	1,600	7	7,603
Ireland	-	687	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	14,172	1,970	3,852	3,000	2,470	1,329	5,285	6,205	37,778
Norway	84,161	117,903	50,000	96,000	126,800	94,000	84,747	14,639	45,314
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	102	953	800	697	2,087	-	95	232
UK (Engl. + Wales)	10	10	132	4	115	389	478	40	242
UK (N. Ireland)	-	-	350	-	-		-	-	-
UK (Scotland)	2,093	458	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR / Russia (1992 -)	-	-	-						
Unallocated + discards	12,482[4]	-317[4]	-750[4]	-278[6]	-3,270	1,511	-28	136	-31,615
Total	112,047	145,062	77,904	114,133	140,383	112,580	98,452	26,125	79,161

Country	1998	1999	2000	2001	2002	2003	2004	2005[1]
Belgium	19	21	19	19	1,004	5	4	6
Denmark	2,048	8,006	4,409	2,288	1,393	3,774	8,735	4,258
Estonia	22	-	-					
Faroe Islands	28	908	24	-	699	809		35
France	379	60	49	48	-	392	174	3,876
Germany	4,620	4,071	3,115	230	2,671	3,048	4,905	1,811
Ireland	-	404	103	375	72	93	379	753
Netherlands	3,811	3,610	3,382	4,685	6,612	17,354	21,418	24,679
Norway	13,129	44,344	1,246	7,948	35,368	20,493	10,709	24,937
Russia	-	-	2	-	-	-		
Sweden	3,411	1,957	1,141	119	575	1,074	665	239
UK (Engl. + Wales)	2	11	15	317	1,191	1,192	2,552	1,778
UK (Scotland)	3,041	1,658	3,465	3,161	255	1	1	22
Unallocated + discards	737	-325	14613	649	-149	-14,009	-19,103	-21,830
Total	31,247	64,725	31583	19,839	49,691	34,226	30,435	40,564

[1]-Preliminary. [2] Includes Division IIa. [3] Estimated from biological sampling. [4] Assumed to be misreported. [5] Includes 13 t from the German Democratic Republic. [6] Includes a negative unallocated catch of -4000 t.

Table 9.4.3.3 HORSE MACKEREL general. Landings (t) in Subarea VI by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	734	341	2,785	7	-	-	-	769	1,655
Faroe Islands	-	-	1,248	-	-	4,014	1,992	4,450[3]	4,000[3]
France	45	454	4	10	14	13	12	20	10
Germany, Fed. Rep.	5,550	10,212	2,113	4,146	130	191	354	174	615
Ireland	-	-	-	15,086	13,858	27,102	28,125	29,743	27,872
Netherlands	2,385	100	50	94	17,500	18,450	3,450	5,750	3,340
Norway	-	5	-	-	-		83	75	41
Spain	-	-	-	-	-		-[2]	-[2]	-[2]
UK (Engl. + Wales)	9	5	+	38	+	996	198	404	475
UK (N. Ireland)						-	-	-	-
UK (Scotland)	1	17	83	-	214	1,427	138	1,027	7,834
USSR	-	-	-		-	-	-	-	-
Unallocated + disc.						-19,168	-13,897	-7,255	-
Total	8,724	11,134	6,283	19,381	31,716	33,025	20,455	35,157	45,842

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	973	615	-	42	-	294	106	114	780
Faroe Islands	3,059	628	255	-	820	80	-	-	-
France	2	17	4	3	+	-	-	-	52
Germany, Fed. Rep.	1,162	2,474	2,500	6,281	10,023	1,430	1,368	943	229
Ireland	19,493	15,911	24,766	32,994	44,802	65,564	120,124	87,872	22,474
Netherlands	1,907	660	3,369	2,150	590	341	2,326	572	498
Norway	-	-	-	-	-	-	-	-	-
Spain	-2	-2	1	3	-	-	-	-	-
UK (Engl. + Wales)	44	145	1,229	577	144	109	208	612	56
UK (N.Ireland)	-	-	1,970	273	-	-	-	-	767
UK (Scotland)	1,737	267	1,640	86	4,523	1,760	789	2,669	14,452
USSR/Russia (1992-)	-	44	-	-	-	-	-	-	-
Unallocated + disc.	6,493	143	-1,278	-1,940	-6,960[4]	-51	-41,326	-11,523	837
Total	34,870	20,904	34,456	40,469	53,942	69,527	83,595	81,259	40,145

Country	1998	1999	2000	2001	2002	2003	2004	2005[1]
Denmark	-	-	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	-	-	-
France	221	25,007	-	428	55	209	172	41
Germany	414	1,031	209	265	149	1,337	1,413	1,958
Ireland	21,608	31,736	15,843	20,162	12,341	20,915	15,702	12,395
Netherlands	885	1,139	687	600	450	847	3,701	6,039
Spain	-	-	-	-	-	-	-	-
UK (Engl. + Wales)	10	344	41	91	-	46	5	52
UK (N.Ireland)	1,132	-	-			453		210
UK (Scotland)	10,447	4,544	1,839	3,111	1,192		377	62
Unallocated +disc.	98	1,507	2,038	-21	3	-553	559	1,298
Total	34,815	65,308	20,657	24,636	14,190	23,254	21,929	22,055

[1]Preliminary.
[2]Included in Subarea VII.
[3]Includes Divisions IIIa, IVa,b and VIb.
[4]Includes a negative unallocated catch of -7000 t.

Table 9.4.3.4 HORSE MACKEREL general. Landings (t) in Subarea VII by country. Data submitted by the Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	-	1	1	-	-	+	+	2	-
Denmark	5,045	3,099	877	993	732	1,477[2]	30,408[2]	27,368	33,202
France	1,983	2,800	2,314	1,834	2,387	1,881	3,801	2,197	1,523
Germany, Fed.Rep.	2,289	1,079	12	1,977	228	-	5	374	4,705
Ireland	-	16	-	-	65	100	703	15	481
Netherlands	23,002	25,000	27,500[2]	34,350	38,700	33,550	40,750	69,400	43,560
Norway	394	-	-	-	-	-	-	-	-
Spain	50	234	104	142	560	275	137	148	150
UK (Engl. + Wales)	12,933	2,520	2,670	1,230	279	1,630	1,824	1,228	3,759
UK (Scotland)	1	-	-	-	1	1	+	2	2,873
USSR	-	-	-	-	-	120	-	-	-
Total	45,697	34,749	33,478	40,526	42,952	39,034	77,628	100,734	90,253

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Faroe Islands	-	28	-	-	-	-	-	-	-
Belgium	-	+	-	-	-	1	-	-	18
Denmark	34,474	30,594	28,888	18,984	16,978	41,605	28,300	43,330	60,412
France	4,576	2,538	1,230	1,198	1,001	-	-	-	27,201
Germany, Fed.Rep.	7,743	8,109	12,919	12,951	15,684	14,828	17,436	15,949	28,549
Ireland	12,645	17,887	19,074	15,568	16,363	15,281	58,011	38,455	43,624
Netherlands	43,582	111,900	104,107	109,197	157,110	92,903	116,126	114,692	81,464
Norway	-	-	-	-	-	-	-	-	-
Spain	14	16	113	106	54	29	25	33	-
UK (Engl. + Wales)	4,488	13,371	6,436	7,870	6,090	12,418	31,641	28,605	17,464
UK (N.Ireland)	-	-	2,026	1,690	587	119	-	-	1,093
UK (Scotland)	+	139	1,992	5,008	3,123	9,015	10,522	11,241	7,931
USSR / Russia (1992-)	-	-	-	-	-	-	-	-	-
Unallocated + discards	28,368	7,614	24,541	15,563	4,0103	14,057	68,644	26,795	58,718
Total	135,890	192,196	201,326	188,135	221,000	200,256	330,705	279,100	326,474

Country	1998	1999	2000	2001	2002	2003	2004	2005[1]
Faroe Islands	-	-	550	-	-	-	-	3,660
Belgium	18	-	-	-	1	-	+	+
Denmark	25,492	19,223	13,946	20,574	10,094	10,867	11,529	9,939
France	24,223	-	20,401	11,049	6,466	7,199	8,083	8,469
Germany	25,414	15,247	9,692	8,320	10,812	13,873	16,352	10,437
Ireland	51,720	25,843	32,999	30,192	23,366	13,533	8,470	20,406
Netherlands	91,946	56,223	50,120	46,196	37,605	48.222	41,123	31,156
Spain	-	-	50	7	0	1	27	12
UK (Engl. + Wales)	12,832	8,885	2,972	8,901	5,525	4,186	7,178	4,752
UK (N.Ireland)	-	-	-	-	-			217
UK (Scotland)	5,095	4,994	5,152	1,757	1,461	268	1,146	59
Unallocated + discards	12,706	31,239	1,884	11,046	2,576	24,897	18,485	18,368
Total	249,446	161,654	137,766	138,042	97,906	123,046	112,393	107,475

[1]Provisional.
[2]Includes Subarea VI.

Table 9.4.3.5 HORSE MACKEREL general. Landings (t) in Subarea VIII by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	446	3,283	2,793
France	3,361	3,711	3.073	2,643	2,489	4,305	3,534	3,983	4,502
Netherlands	-	-	-	-	-[2]	-[2]	-[2]	-[2]	-
Spain	34,134	36,362	19,610	25,580	23,119	23,292	40,334	30,098	26,629
UK (Engl. + Wales)	-	+	1	-	1	143	392	339	253
USSR	-	-	-	-	20	-	656	-	-
Total	37,495	40,073	22,684	28,223	25,629	27,740	45,362	37,703	34,177

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	6,729	5,726	1,349	5,778	1,955	-	340	140	729
France	4,719	5,082	6,164	6,220	4,010	28	-	7	8,690
Germany, Fed. Rep.	-	-	80	62	-		-	-	-
Netherlands	-	6,000	12,437	9,339	19,000	7,272	-	14,187	2,944
Spain	27,170	25,182	23,733	27,688	27,921	25,409	28,349	29,428	31,081
UK (Engl. + Wales)	68	6	70	88	123	753	20	924	430
USSR/Russia (1992 -)	-	-	-	-	-	-	-	-	-
Unallocated + discards	-	1,500	2,563	5,011	700	2,038	-	3,583	-2,944
Total	38,686	43,496	46,396	54,186	53,709	35,500	28,709	48,269	40,930

Country	1998	1999	2000	2001	2002	2003	2004	2005[1]
Denmark	1,728	4,818	2,584	582	-	-		-
France	1,844	74	7	5,316	13,676	-	2,161	3,540
Germany	3,268	3,197	3,760	3,645	2,249	4,908	72	4,776
Ireland	-	-	6,485	1,483	704	504	1,882	1,808
Netherlands	6,604	22,479	11,768	36,106	12,538	1,314	1,047	6,607
Russia	-	-	-	-	-	6,620		
Spain	23,599	24,190	24,154	23,531	22,110	24,598	16,245	16,624
UK (Engl. + Wales)	9	29	112	1,092	157	982	516	838
UK (Scotland)	-	-	249	-	-	-		-
Unallocated + discards	1,884	-8658	5,093	4,365	1,705	2,785	2,202	7,302
Total	38,936	46,129	54,212	76,120	54,560	41,711	24,125	41,495

[1]Preliminary.
[2]Included in Subarea VII.

9.4.4 Blue whiting combined stock (Subareas I–IX, XII, and XIV)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
full reproductive capacity	harvested unsustainably	Overexploited	Above target	

Based on the most recent estimates of fishing mortality and SSB, ICES classifies the stock as having full reproductive capacity, but being harvested unsustainably. SSB increased to a historical high in 2003 but has decreased since 2004. Although the estimates of SSB and fishing mortality are uncertain, the estimate of SSB appears to be well above $\mathbf{B}_{pa}$. The estimated fishing mortality is well above $\mathbf{F}_{pa}$, and is estimated to have reached $\mathbf{F}_{lim}$ in 2004. Recruitment in the last decade appears to be at a much higher level than earlier, but indices from surveys indicate that the 2005 year class is at the pre-1996 level.

Management objectives

In December 2005, the coastal states (EU, Norway, Iceland, and Faroe Islands) agreed on a sharing arrangement for the blue whiting stock. This arrangement provides for catches in 2006 of 2 million tonnes, allocated as follows: EU 30.5%, Faroe Islands 26.125%, Norway 25.745%, and Iceland 17.63%. Russia will be accommodated by transfers from some of the coastal states and additional catches in the NEAFC regulatory area. Details of the arrangement are specified in Annex I and Annex II below:

ANNEX I. MANAGEMENT OF THE BLUE WHITING STOCK IN THE NORTHEAST ATLANTIC

1. *A Delegation of the European Community, the Faroe Islands, Iceland and Norway met in Oslo on 15 and 16 December 2005 to consult on the management of the Blue Whiting stock in the North-East Atlantic.*
2. *The Delegations agreed to recommend to their respective authorities the arrangement for the regulation of the fisheries of Blue Whiting in 2006 and subsequent years set out in Annex I to this Agreed Record. They also agreed to recommend to their respective authorities the multi-annual management arrangement set out in Annex II.*
3. *The Delegations agreed to recommend that, in 2006, ICES be requested to evaluate, as soon as possible, whether the multi-annual management arrangement as set out in Annex II is in accordance with the precautionary approach and to make the results of this evaluation available to the Parties. The Delegations agreed to review the multi-annual management arrangement on the basis of evaluation by ICES.*
4. *This Agreed Record, including bilateral arrangements related to the implementation thereof, shall be applied provisionally from 1 January 2006 and enter into force when all Parties have notified each other of the completion of their necessary procedures.*
5. *For subsequent years, Delegations agreed to allocate allowable catches in the proportions that are set out in paragraph 1 of Annex I.*
6. *Unless one or more of the Parties notifies its withdrawal not later than by the end of June, the Agreed Record shall be renewed annually, including Annexes, in which years, maximum catch limit and quotas are updated.*
7. *The Delegations agreed to inform the NEAFC Secretariat about the regulatory measures they intend to take on the basis of this Agreed Record, for the fisheries of Blue Whiting in 2006 and in subsequent years.*

ANNEX II. ARRANGEMENT FOR THE MULTI-ANNUAL MANAGEMENT OF THE BLUE WHITING STOCK

7. *The Parties agree to implement a multi-annual management arrangement for the fisheries on the Blue Whiting stock which is consistent with the precautionary approach, aiming at constraining harvest within safe biological limits, protecting juveniles, and designed to provide for sustainable fisheries and a greater potential yield, in accordance with advice from ICES.*
8. *The management targets are to maintain the Spawning Stock Biomass (SSB) of the Blue Whiting stock at levels above 1.5 million tonnes (Blim) and the fishing mortality rates at levels of no more than 0.32 (Fpa) for appropriate age groups as defined by ICES.*
9. *For 2006, the Parties agree to limit their fisheries of Blue Whiting to a total allowable catch of no more than 2 million tonnes.*
10. *The Parties recognise that a total outtake by the Parties of 2 million tonnes in 2006 will result in a fishing mortality rate above the target level as defined in paragraph 2. Until the fishing mortality has reached a level*

of no more than 0.32, the Parties agree to reduce their total allowable catch of Blue Whiting by at least 100,000 tonnes annually.

11. *When the target fishing mortality rate has been reached, the Parties shall limit their allowable catches to levels consistent with a fishing mortality rate of no more than 0.32 for appropriate age groups as defined by ICES.*
12. *Should the SSB fall below a reference point of 2.25 million tonnes (Bpa), either the fishing mortality rate referred to in paragraph 5 or the tonnage referred to in paragraph 4 shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2.25 million tonnes.*
13. *This multi-annual management arrangement shall be reviewed by the Parties on the basis of ICES advice.*

ICES welcomes the development of an agreed management plan for blue whiting. ICES evaluated through simulations the current formulation of the harvest rule inferred by the management plan and a description of the results is provided in the answer to the Special Request (see Section 9.3.2.4). ICES concludes that the management plan is not precautionary in its current form. In Section 9.3.2.4 some guidelines are provided on how it could be improved. ICES encourages the Parties to continue their efforts in developing and refining a management plan consistent with the precautionary approach.

Reference points

(established in 1998)

	ICES considers that:	**ICES proposed that:**
Limit reference points	$\mathbf{B}_{lim}$ is 1.5 million t.	$\mathbf{B}_{pa}$ be set at 2.25 million t.
	$\mathbf{F}_{lim}$ is 0.51.	$\mathbf{F}_{pa}$ be set at 0.32.
Target reference points		$\mathbf{F}_{y}$ is not identified.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3-7	Yield/R	SSB/R
Average last 3 years	0.48	0.06	0.15
F0.1	0.20	0.05	0.27
Fmed	0.41	0.05	0.17

Fmax is not well-defined

Technical basis:

$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$: $\mathbf{B}_{lim}$ exp(1.645*σ), with σ = 0.25.
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$	$\mathbf{F}_{pa}$: $\mathbf{F}_{med}$ (1998).
	$\mathbf{F}_{y}$:

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

The maximum catch in 2007 corresponding to the existing management plan is 1.9 million tonnes, which is expected to leave the spawning stock biomass at 2.86 million t, i.e. above $\mathbf{B}_{pa}$ in 2008, but will lead to an F above $\mathbf{F}_{lim}$ in 2007.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality, estimated at 0.48, is above the fishing mortalities that are expected to lead to high long-term yields and low risk of depletion of production potential ($\mathbf{F}_{0.1}$ = 0.20). This indicates that long-term yield is expected to increase at fishing mortalities well below the historic values. Fishing at such a lower mortality is expected to lead to higher SSB and would therefore lower the risk of the stock being outside precautionary limits.

Exploitation boundaries in relation to precautionary limits

Fishing at $\mathbf{F}_{pa}$ implies catches of less than 980 thousand t in 2007. This will result in a spawning stock biomass in 2008 well above $\mathbf{B}_{pa}$.

Conclusion on exploitation boundaries

The proposed management plan is not considered in accordance with the precautionary approach. ICES concludes that the exploitation boundaries for this stock should be based on the precautionary limits.

Short-term implications

Outlook for 2007

Basis: Catch(2006) = 2.10 Mt (Catch constraint, best estimate); F(2006) = 0.61; SSB(2006) = 4.8 Mt.

Rationale	Catch (2007)[1]	Basis	F (2007)	SSB (2007)	SSB (2008)	%SSB change
Zero catch	0	F=0	0	3.7	4.6	24
Status quo	1.67	$\mathbf{F}_{sq}$	0.61	3.7	3.1	-16
Management Plan	1.90	100 000 t reduction from TAC for 2006	0.73	3.7	2.9	-22
Management Plan	2.00	100 000 t reduction from TAC for 2006 and Russian catches of 100 000t	0.77	3.7	2.8	-24
Precautionary limits	0.10	$\mathbf{F}_{pa}$ * 0.1	0.03	3.7	4.5	18
	0.26	$\mathbf{F}_{pa}$ * 0.25	0.08	3.7	4.4	14
	0.52	$\mathbf{F}_{pa}$ * 0.50	0.16	3.7	4.2	10
	0.77	$\mathbf{F}_{pa}$ * 0.75	0.24	3.7	3.9	5
	0.90	$\mathbf{F}_{pa}$ * 0.90	0.29	3.7	3.8	3
	0.98	$\mathbf{F}_{pa}$	0.32	3.7	3.7	0
	1.06	$\mathbf{F}_{pa}$ * 1.1	0.35	3.7	3.6	-3
	1.18	$\mathbf{F}_{pa}$ * 1.25	0.4	3.7	3.5	-5

[1] Weights in million tonnes.
Shaded scenarios are not considered consistent with the precautionary approach.
The fishing mortality applied according to the agreed management plan (F(management plan)) is 0.32, which is $\mathbf{F}_{pa}$.

Management considerations

The evaluation of the management plan by ICES indicates that TACs set at 100 000 tonnes below the TAC of the previous year (as implied by the management plan) have a high probability of SSB falling below $\mathbf{B}_{pa}$ in the short term when smaller year classes come in. The management plan does not include the additional quota set for the NEAFC regulatory areas.

Total landings in 2005 were 2.0 million t. Recent large landings are supported by the current high recruitments, and are much higher than in earlier years. Most of the catches are taken in the spawning and post-spawning areas along the continental edge, and in the Norwegian Sea. In the latter, the share of the total catch has increased from 5% in the mid-nineties to about 40% in 2003 and 2004. A larger proportion of the catch there consists of young fish. In 2005, the fishery in the Norwegian Sea was reduced to about half of the 2004 fishery (Figure 9.4.4.3).

The fishing effort is much above what the stock can sustain. At present, only a few year classes support the fishery and the spawning biomass, which makes the stock vulnerable to overexploitation. In this respect, there is an urgent need for a reduction in fishing mortality. The spawning biomass is decreasing and is expected to decrease further under the existing management plan.

Factors affecting the fisheries and the stock

In 2002 to 2005, and in the absence of agreements on TACs and their allocation, the EU, Faroe Islands, Iceland, Norway, and the Russian Federation implemented unilateral measures to limit blue whiting catches. In December 2005 the EU, Faroe Islands, Iceland, Norway agreed to a management plan and sharing arrangement, and total catches of 2 million tonnes for 2006. Russia will be accommodated by transfers from some of the other countries and additional catches in the NEAFC area.

Changes in fishing technology and fishing patterns

As stated above, the fishery has moved further north in 2003 and 2004 and this has resulted in an increase of the proportion of the juveniles in the catch.

Scientific basis

Data and methods

Five assessment models were used to explore the data for blue whiting. All models utilized catch-at-age data from commercial catches from 1981 onwards. Several survey time-series were available (1990–2005), but only one of the surveys cover almost the entire distribution area of the stock. Observations from two survey fleets are used in the assessment, namely the Norwegian acoustic survey on the spawning grounds 1991–2006 and the Norwegian Sea International ecosystem survey 2000–2006.

The final assessment was done using a stochastic multi-species model (SMS). It showed the most consistency in retrospective pattern and compared to the other models regarding the results from last year.

Uncertainties in assessment and forecast

The various models applied gave similar trends but a large divergence in the estimation of SSB and fishing mortality for the most recent years. Various model formulations could lead to estimates of SSB in 2005 varying from approximately 4 to 7 million tonnes.

Limited information was available on discarding. However, discarding is considered to be minor and is not included in the assessment.

Comparison with previous assessment and advice

The assessments show marked upward revisions in SSB each year and downward revisions of fishing mortality. (Figure 9.4.4.4). The new assessment model used for this stock is expected to be less sensitive to retrospective bias because the assessment is largely consistent with exploratory assessments that were carried out last year with that same methodology.

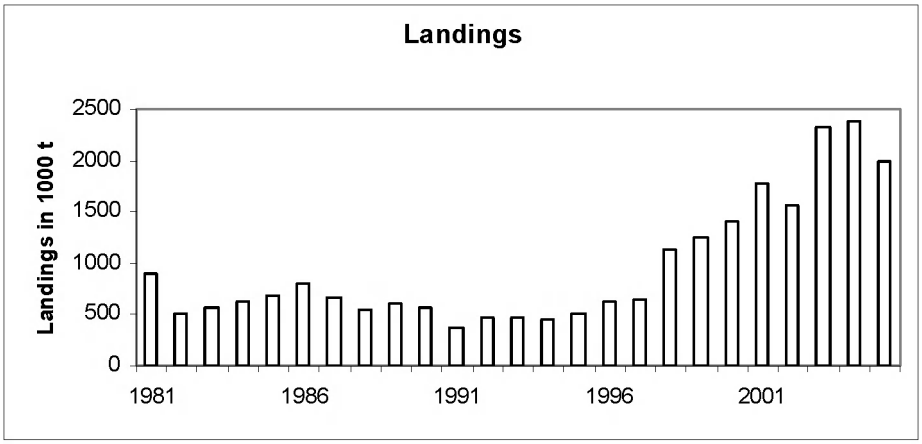
Last year the advice was to limit catches to 1.5 million tonnes in order to achieve a fishing mortality of less than $\mathbf{F}_{pa}$ = 0.32. This year the advice is on a similar basis and corresponds to predicted landings of 980 thousand tonnes. The decrease in predicted landings is due to a small year class entering the fishery, high fishing mortality, and a declining the stock biomass.

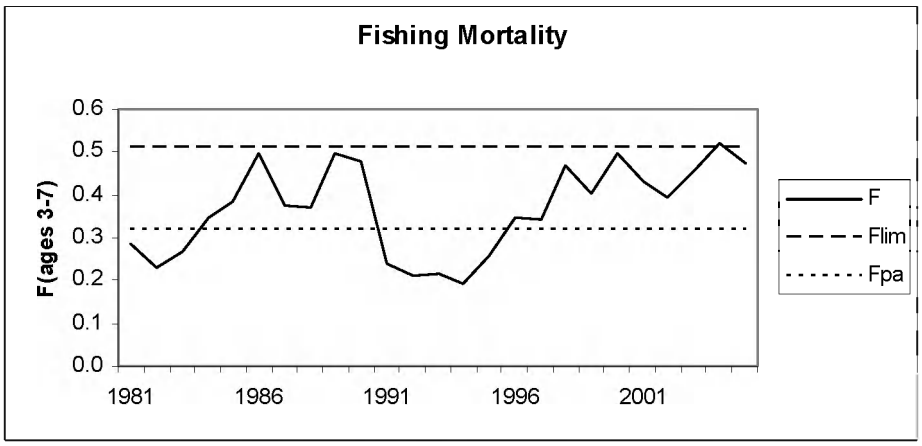
Source of information

Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 24–30 August 2006 (ICES CM 2006/ACFM:34).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC for northern areas; no advice for southern areas	950	-	665
1988	TAC for northern areas; no advice for southern areas	832	-	558
1989	TAC for northern areas; no advice for southern areas	630	-	627
1990	TAC for northern areas; no advice for southern areas	600	-	562
1991	TAC for northern areas; no advice for southern areas	670	-	370
1992	No advice	-	-	475
1993	Catch at *status quo* F (northern areas); no assessment for southern areas	490	-	481
1994	Precautionary TAC (northern areas); no assessment for southern areas	485	650[1]	459
1995	Precautionary TAC for combined stock	518	650[1]	579
1996	Precautionary TAC for combined stock	500	650[1]	646
1997	Precautionary TAC for combined stock	540		672
1998	Precautionary TAC for combined stock	650		1125
1999	Catches above 650 000 t may not be sustainable in the long run	650		1256
2000	F should not exceed the proposed $\mathbf{F}_{pa}$	800		1412
2001	F should not exceed the proposed $\mathbf{F}_{pa}$	628		1780
2002	Rebuilding plan	0		1556
2003	F should be less than the proposed $\mathbf{F}_{pa}$	600		2321
2004	Achieve 50% probability that F will be less than $\mathbf{F}_{pa}$	925		2378
2005	Achieve 50% probability that F will be less than $\mathbf{F}_{pa}$	1075		2027
2006	F old management plan	1500	2100[2]	
2007	F should be less than the proposed $\mathbf{F}_{pa}$	980		

Weights in '000 t.
[1]NEAFC proposal for NEAFC regions 1 and 2.
[2] Agreed TAC from four coastal coastal states of 2 million tonnes, and an additional allocation to Russia in the international zone of 100 000 t.





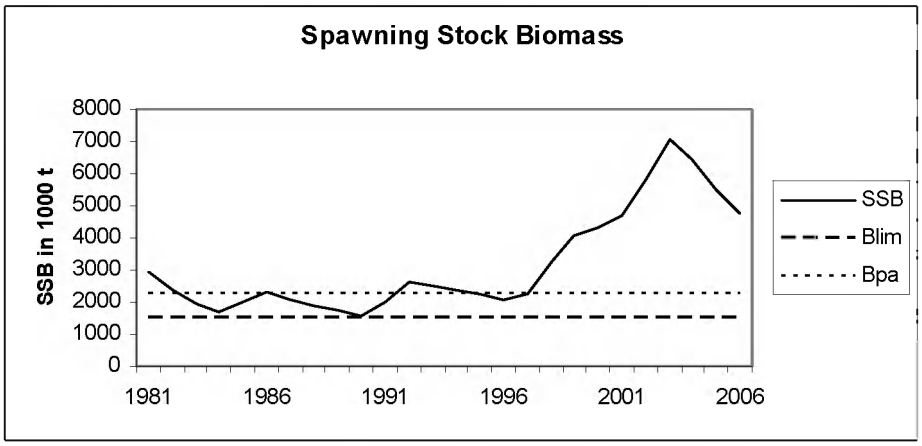
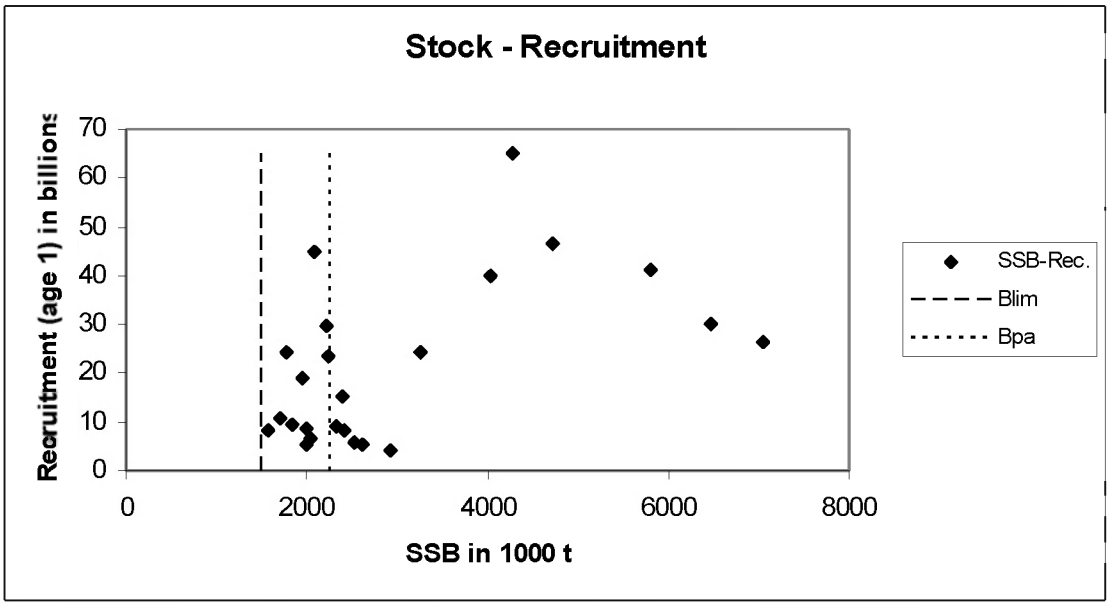
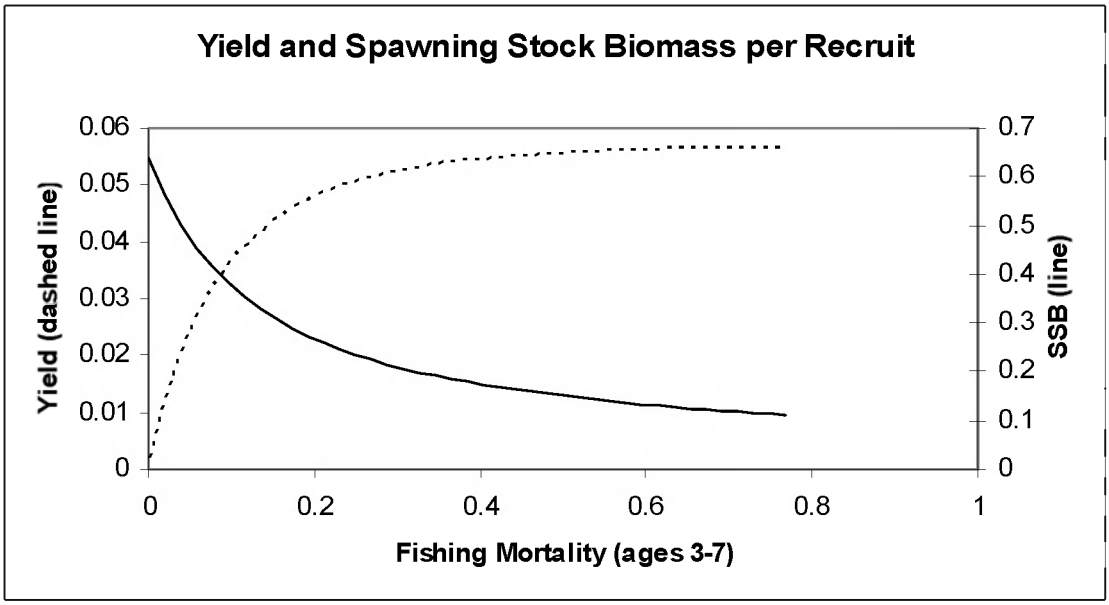


Figure 9.4.4.1 Blue whiting combined stock (Subareas I–IX, XII & XIV). Landings, fishing mortality, recruitment and SSB.





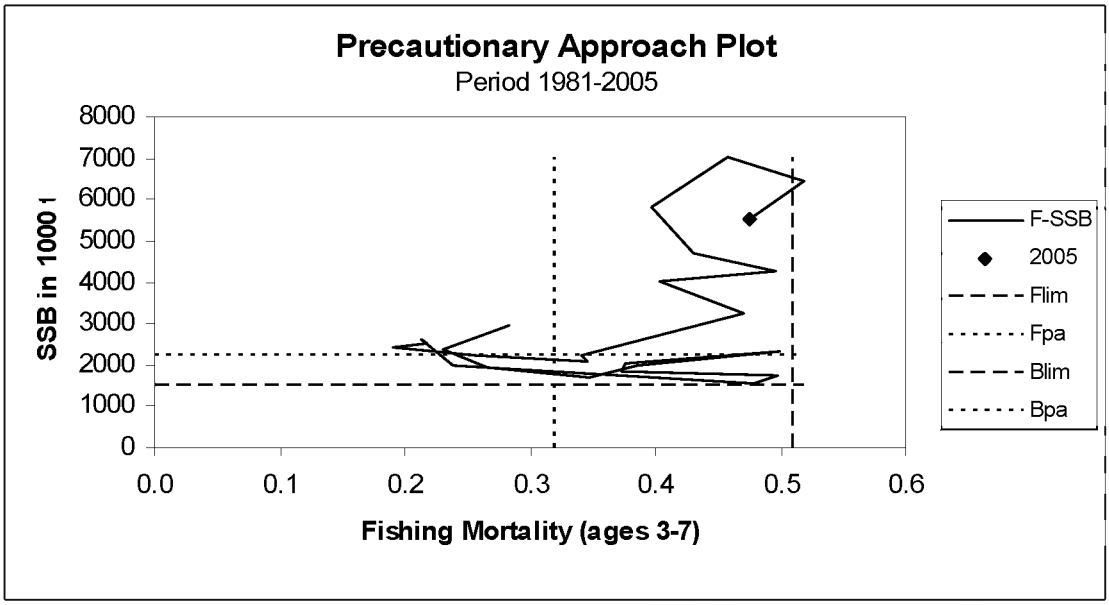


Figure 9.4.4.2 Blue whiting combined stock (Subareas I–IX, XII & XIV). Stock and recruitment; Yield and SSB per recruit.

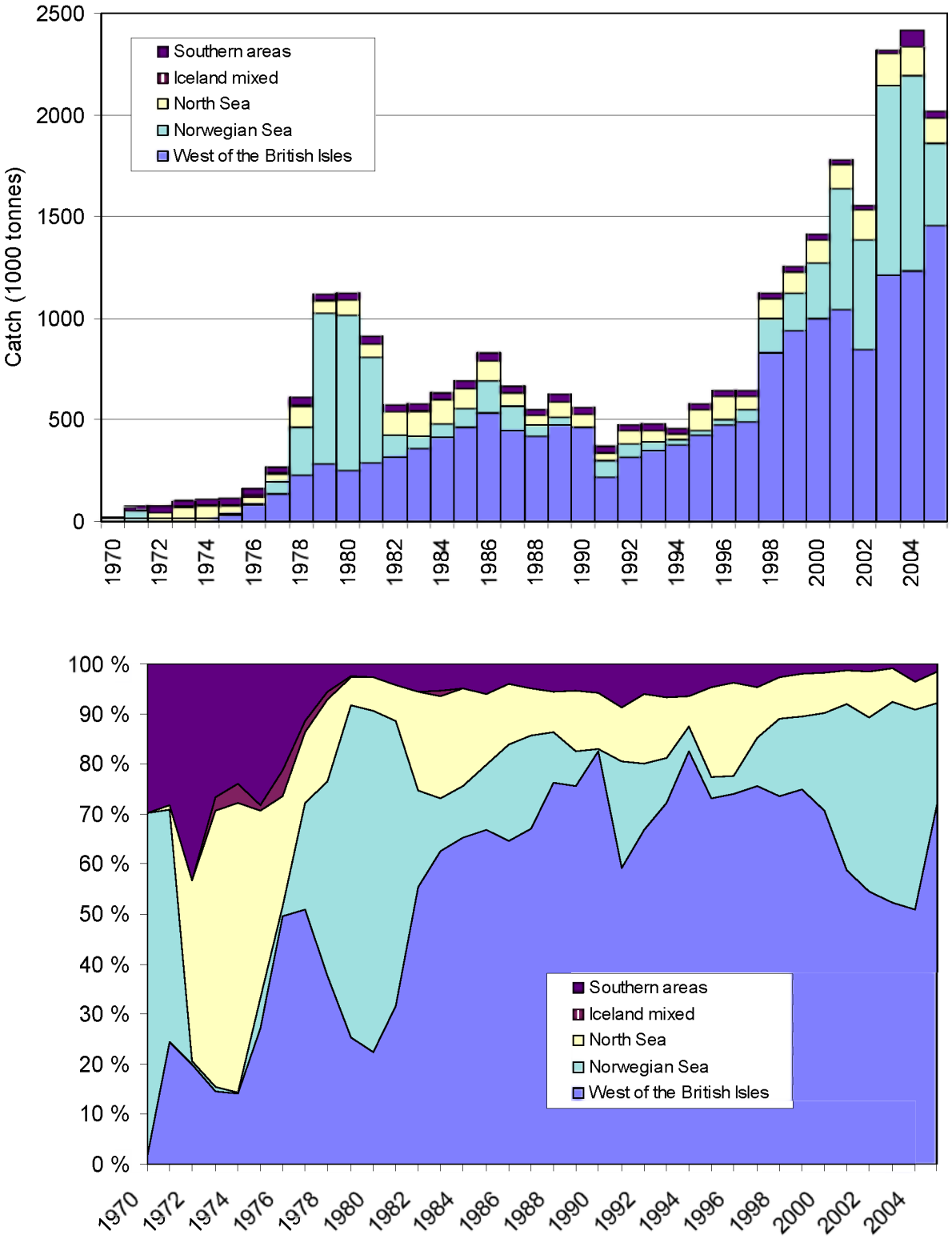


Figure 9.4.4.3. Development of blue whiting fisheries in different Subareas in terms of absolute (top) and relative catches (bottom).

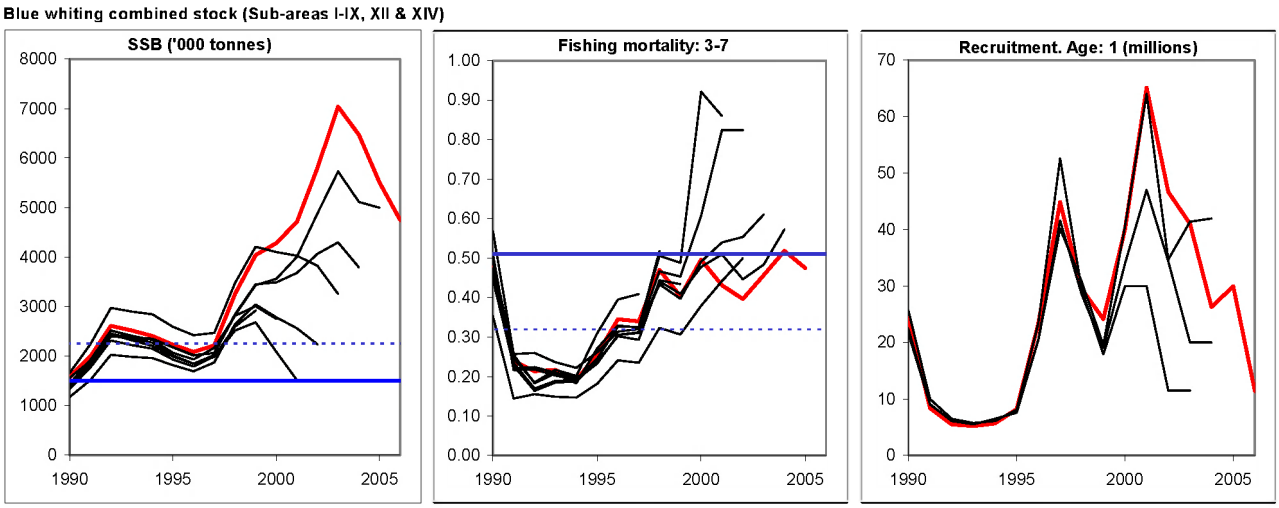


Figure 9.4.4.4 Blue whiting. Historical performance of the assessment. Note that for the recruitment plot, only the years have been included which used the same recruitment age.

Table 9.4.4.1 Landings (tonnes) of BLUE WHITING from the directed fisheries (Sub-areas I and II, Division Va, XIVa and XIVb) 1987–2005, as estimated by the Working Group.

Country	1987	1988	1989 [3]	1990	1991	1992	1993	1994 [2]	1995 [3]	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	15	7,721	5,723	13,608	38,226	23,437	365
Estonia	-	-	-	-	-	-	-	-	-	377	161	904	-	-	-	-	-		
Faroes	9,290	-	1,047	-	-	-	-	-	-	345	-	44,594	11,507	17,980	64,496	82,977	115,755	109,380	64,639
Germany	1,010	3	1,341	-	-	-	-	2	3	32	-	78	-	-	3117	1,072	813	488	569
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Iceland	-	-	4,977	-	-	-	-	-	369	302	10,464	68,681 [4]	96,295	155,024	245,814	195,483	312,334	279,811	145,640
Latvia	-	-	-	-	-	-	-	422	-	-	-	-	-	-	-	-			
Netherlands	-	-	-	-	-	-	-	-	72	25	-	63	435	-	5180	906	592	1,365	
Norway [5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64,581	100,922	215,075	302,166	9,778
Norway [6]	-	-	-	566	100	912	240	-	-	58	1,386	12,132	5,455	-	28,812	-	-	22167	6,793
Poland	56	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Scotland																		64	
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	57,206	15,794	785
USSR/ Russia [1]	112,686	55,816	35,250	1,540	78,603	61,400	43,000	22,250	23,289	22,308	50,559	51,042	65,932	103,941	173,860	145,649	191,507	166,677	177,008
Total	123,042	55,829	42,615	2,106	78,703	62,312	43,240	22,674	23,733	23,447	62,570	177,494	179,639	284,666	591,583	541,467	931,508	921,349	405,577

[1]) From 1992 only Russia

[2]) Includes Vb for Russia.

[3]) Icelandic mixed fishery in Va.

[4]) include mixed in Va and directed in Vb.

[5]) Directed fishery

[6]) By-catches of blue whiting in other fisheries.

Table 9.4.4.2 Landings (tonnes) of BLUE WHITING from directed fisheries (Division Vb,VIa,b, VIIa,b,c and Sub-area XII) 1987–2005, as estimated by the Working Group.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 [1)]	1999	2000	2001	2002	2003	2004	2005
Denmark	2.655	797	25	-	-	3.167	-	770	-	269	-	5051	19.625	11.856	18.110	2.141	17.813	44.992	24.731
Estonia	-	-	-	-	-	6.156	1.033	4.342	7754	10.605	5.517	5.416	-	-	-	-	-	[4)]	
Faroes	70.625	79.339	70.711	43.405	10.208	12.731	14.984	22.548	26.009	18.258	22.480	26.328	93.234	129.969	188.464	115.127	208.427	206.078	197.134
France	-	-	2.190	-	-	-	1.195	-	720	6.442	12.446	7.984	6.662	13.481	13.480	14.688	13.365	-	8.046
Germany	3.850	5.263	4.073	1.699	349	1.307	91	-	6.310	6.844	4.724	17.891	3.170	12.655	15.862	15.378	21.866	13.813	22.089
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	64.135	105.833	119.287	91.853	189.159	99.832	119.569
Ireland	3.706	4.646	2.014	-	-	781	-	3	222	1.709	25.785	45635	35.240	25.200	29.854	17.723	22.484	62.730	73.174
Japan	-	-	-	-	-	918	1.742	2.574	-	-	-	-	-	-	-	-	-	-	
Latvia	-	-	-	-	-	10.742	10.626	2.160	-	-	-	-	-	-	-	-	-	-	
Lithauen	-	-	-	-	-	-	2.046	-	-	-	-	-	-	-	-	-	-	-	
Netherlands[2)]	5.627	800	2.078	7.280	17.359	11.034	18.436	21.076	26.703	17.644	23.676	27.884	35.408	46.128	68.415	33.365	45.239	82.520	143.470
Norway	191.012	208.416	258.386	281.036	114.866	148.733	198.916	226.235	261.272	337.434	318.531	519.622	475.004	460.274	399.932	385.495	502.320	486.843	622.981
UK (Scotland)	3.315	5.071	8.020	6.006	3.541	6.849	2.032	4.465	10.583	14.325	33.398	92.383	98.853	42.478	50.147	26.403	27.136	56.326	104.526
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	
USSR/ Russia [3)]	165.497	121.705	127.682	124.069	72.623	115.600	96.000	94.531	83.931	64.547	68.097	79.000	112.247	141.257	141.549	144.419	163.812	179.400	150.014
Total	446.287	426.037	475.179	463.495	218.946	318.018	347.101	378.704	423.504	478.077	514.654	827.194	943.578	989.131	1.045.100	846.602	1.211.621	1.232.534	1.465.735

[1)] Including some directed fishery also in Division IVa.

[2)] Revised for the years 1987, 1988, 1989, 1992, 1995,1996,1997

[3)] From 1992 only Russia

[4)] Reported to the EU but not to the ICES WGNPBW. (Landings of 19,467 tonnes)

Table 9.4.4.3 Landings (tonnes) of BLUE WHITING from directed fisheries and by-catches caught in other fisheries (Divisions IIIa, IV) 1987–2005, as estimated by the Working Group.

Country	1987	1988	1989	1990	1991	1992	1993 [3]	1994	1995	1996	1997	1998 [2]	1999	2000	2001	2002	2003	2004	2005
Denmark [4]	28.541	18.144	3.632	10.972	5.961	4.438	25.003	5.108	4.848	29.137	9.552	40.143	36.492	30.360	21.995				
Denmark [5]			22.973	16.080	9.577	26.751	16.050	14.578	7.591	22.695	16.718	16.329	8.521	7.749	7.505	35.530	26.896	21.071	16.354
Faroes [4] [6]	7.051	492	3.325	5.281	355	705	1.522	1.794	-	6.068	6.066	-	-	-	60	7.317	5.712	6.864	1.437
Faroes [5] [6]												296	265	42	6.741				3.589
Germany [1]	115	280	3	-	-	25	9	-	-	-	-			-	81	-	36	19	17
Iceland																			307
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4		4	9
Netherlands	-	-	-	20	-	2	46	-	-	-	793			-	-	50	0	0	0
Norway [4]	24.969	24.898	42.956	29.336	22.644	31.977	12.333	3.408	78.565	57.458	27.394	28.814	48.338	73.006	21.804	85.062	117.145	107.311	98.938
Norway [5]															58.182				
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69	-	-		5.204
Scotland																		35	3
Sweden	2.013	1.229	3.062	1.503	1.000	2.058	2.867	3.675	13.000	4.000	4.568	9.299	12.993	3.319	2.086	17.689	8.326	3.289	2.175
UK	-	100	7	-	335	18	252	-	-	1	-	-	-	-	-	-	65		
Total	62.689	45.143	75.958	63.192	39.872	65.974	58.082	28.563	104.004	119.359	65.091	94.881	106.609	114.476	118.523	145.652	158.180	138.593	128.033

[1]) Including directed fishery also in Division IVa.

[2]) Including mixed industrial fishery in the Norwegian Sea

[3]) Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by the mean of 1992 and 1994, i.e. 2,867 t, and used in the assessment.

[4]) Directed fishery

[5]) By-catches of blue whiting in other fisheries.

[6]) For the periode 1987-2000 landings figures also include landings from mixed fisheries in Division Vb.

Table 9.4.4.4 Landings (tonnes) of BLUE WHITING from the Southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId,e) 1987–2005, as estimated by the Working Group.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
France																			
Germany	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600 [2)]	88 [2)]	973	148
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98 [2)]	96 [2)]	12.659	305
Netherlands	-	-	-	450	10	-	-	-	-	-	-	10 [1)]	-	-	-	3208 [2)]	2471,8 [2)]	11.426	4.313
Norway	4	-	-	-	-	-	-	-	-	-	-			-	-	-	-	39197	
Portugal	9.148	5.979	3.557	2.864	2.813	4.928	1.236	1.350	2.285	3.561	2.439	1.900	2.625	2.032	1.746	1.659	2.651	3.937	5.190
Russia																		685	
Scotland																		603	10
Spain	23.644	24.847	30.108	29.490	29.180	23.794	31.020	28.118	25.379	21.538	27.683	27.490	23.777	22.622	23.218	17.506	13.825	15.612	17.643
UK	23	12	29	13	-	-	-	5	-	-	-	-	-	-	-	-	181		
France	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	784		
Total	32.819	30.838	33.695	32.817	32.003	28.722	32.256	29.473	27.664	25.099	30.122	29.400	26.402	24.654	24.964	23.071	20.097	85.093	27.608

[1)] Directed fisheries in VIIIa

[2)] Landings reported as Directed fisheries and included in the Catch-at-Age calculations of that fisheries

Table 9.4.4.5 Total landings of blue whiting by country and area for 2005 in tonnes.

Area	Denmark	Faroe Islands	France	Germany	Iceland	Ireland	Norway	Portugal	Russia	Scotland	Spain	Sweden	Netherlands	Grand Total
IIa	365	41.161		246	97.571		16.571		155.173			785		311.872
IIb		435		324	34		0		21.835					22.628
IIIa	282	0					300					1.244		1.826
IVa	16.068	5.026		17	307	9	98.638		5.204	3		916		126.187
IVb	4	0					0					16		20
IXa		0					0	5.190						5.190
Va		23.042			48.035		0							71.077
Vb	8.674	97.197		3.319	109.320	560	28.597		83.945	2.805			11.812	346.230
VIa	4.757	11.935		11.561	4.455	42.512	84.524			50.258			75.175	285.176
VIb		25.645			5.794	1.898	276.426		46.680	7.264			383	364.089
VIIb	2.334	0		90		6.489	0			2.374			212	11.499
VIIc	8.966	41.996	8.046	7.083		21.716	227.969		2.918	41.825			55.888	416.407
VIIg		0				191	0							191
VIIIa		0					0						383	383
VIIIc+IXa		0					0				17.643			17.643
VIIj		0		148		114	0			10			2.066	2.337
VIIk		0					0						1.864	1.864
XII		20.361		36			5.465		16.471					42.333
Grand Total	41.450	266.799	8.046	22.823	265.516	73.488	738.490	5.190	332.226	104.539	17.643	2.960	147.783	2.026.953

Table 9.4.4.6 Blue whiting combined stock (Subareas I–IX, XII & XIV).

Year	Recruitment Age 1 Thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1981	3307001	2934624	907732	0.284
1982	4165174	2387669	513203	0.230
1983	15350509	1941540	561332	0.266
1984	18855076	1708205	626592	0.347
1985	10787485	1992076	676812	0.385
1986	8649177	2317482	801786	0.499
1987	9019770	2032276	656588	0.376
1988	6776130	1847167	552020	0.372
1989	9481372	1767045	598147	0.498
1990	24343811	1575252	558788	0.478
1991	8364120	1990041	363724	0.239
1992	5461825	2612481	473789	0.213
1993	5185755	2517503	475143	0.217
1994	5653690	2404827	458028	0.191
1995	8233816	2228112	505938	0.256
1996	23351823	2086005	629286	0.345
1997	44850292	2219566	640089	0.340
1998	29478471	3258054	1123732	0.470
1999	24142508	4041300	1251463	0.403
2000	40003049	4281525	1409143	0.496
2001	65081694	4710379	1775305	0.431
2002	46670179	5803770	1556955	0.396
2003	41036186	7037433	2321407	0.457
2004	26288523	6466520	2377568	0.518
2005	29955346	5508420	1996530	0.475
2006	11400000	4751276		
Average	20226645	3170021	952444	0.367

9.4.5 Norwegian spring-spawning herring

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to agreed target F	Fishing mortality in relation to highest yield	Comment
Full reproductive capacity	Harvested sustainably	near target	Unknown	

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. The estimate of the spawning stock biomass, although uncertain, is around 10.3 million t in 2006. Several good year classes contribute to the present spawning biomass: the spawning stock is now dominated by the strong 2002 year class, as well as by the 1998 and 1999 year classes and surveys indicate that recruitment from the 2003 year class is moderate, while the 2004 year class is also strong (comparable to the 1998 year class).

Management objectives

The EU, Faroe Islands, Iceland, Norway, and Russia agreed on a long-term management plan. This plan consists of the following elements:

1. *Every effort shall be made to maintain a level of Spawning Stock Biomass (SSB) greater than the critical level (B_{lim}) of 2 500 000 t.*
2. *For the year 2001 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of less than 0.125 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of this fishing mortality rate.*
3. *Should the SSB fall below a reference point of 5 000 000 t (B_{pa}), the fishing mortality rate referred to under paragraph 2, shall be adapted in the light of scientific estimates of the conditions to ensure a safe and rapid recovery of the SSB to a level in excess of 5 000 000 t. The basis for such an adaptation should be at least a linear reduction in the fishing mortality rate from 0.125 at B_{pa} (5 000 000 t) to 0.05 at B_{lim} (2 500 000 t).*
4. *The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.*

ICES considers that this agreement is consistent with the precautionary approach.

Reference points

	ICES considers that:	**ICES proposed that:**
Precautionary Approach reference points	B_{lim} is 2.5 million t	B_{pa} be set at 5.0 million t
	F_{lim} is not considered relevant for this stock	F_{pa} be set at F = 0.15

Management has defined a maximum fishing mortality at 0.125.

Technical basis (Source: ICES 1998):

B_{lim}: MBAL	B_{pa}: =B_{lim} * exp(0.4*1.645).
F_{lim}: -	F_{pa}: see reference

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

The management plan implies maximum catches of 1 280 000 t in 2007, which is expected to leave a spawning stock of 10.2 million tonnes in 2008.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The target defined in the management plan is consistent with high long-term yield and has a low risk of depleting the production potential.

Exploitation boundaries in relation to precautionary limits

The current long-term management plan is considered to be consistent with the precautionary approach.

Short-term implications

Outlook for 2007

i) Basis: Landings (2006) = 967[1)]; $\mathbf{F}_w$(2006)[2)] = 0.096; SSB(2006) = 10.3 million t.
ii) The fishing mortality applied according to the agreed management plan (F(management plan)) is 0.125.

Rationale	**Landings (2007)**	**Basis**	**F(2007)**	**SSB(2007)**	**SSB(2008)**
Zero catch	0	F=0	0	10.7	11.4
Status quo	1154	F(2005)	0.112	10.6	10.3
Agreed management plan	141	F(management plan)*0.1	0.013	10.7	11.3
	333	F(management plan)*0.25	0.031	10.7	11.1
	666	F(management plan)*0.50	0.063	10.6	10.8
	977	F(management plan)*0.75	0.094	10.6	10.5
	1164	F(management plan)*0.90	0.113	10.6	10.3
	1280	F(management plan)	0.125	10.6	10.2
	1403	F(management plan)*1.1	0.138	10.5	10.1
	1572	F(management plan)*1.25	0.156	10.5	10.0
Precautionary limits	1514	$\mathbf{F}_{pa}$	0.15	10.5	10.0

Landings weights in '000 t, stock biomass weights in millions t.
[1)] There was no agreement on the allocations of the TAC in 2006. The sum of autonomous allocations from the individual Parties amounts to 967 thousand t.
[2)] $\mathbf{F}_w$ = Fishing mortality weighted by population numbers (age groups 5-14).
Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

This stock has shown a large dependency on the occasional appearance of very strong year classes. In recent years, the stock has tended to produce strong year classes more regularly.

In recent years, the migration behaviour of the stock has changed significantly, particularly in geographical locations of the overwintering and feeding areas. These, in turn, affect the distribution of the fisheries.

There has been no international agreement on quota allocations in the past four years and quotas were set unilaterally or through bilateral agreements.

Ecosystem considerations

Juveniles and adults of this stock form an important part of the ecosystems in the Barents Sea, the Norwegian Sea, and the Norwegian coast. The herring has an important role as food resource to higher trophic levels (e.g. cod, seabirds, and marine mammals). Recent changes in the herring migration have led to an increased proportion of the population feeding in Faroese and Icelandic waters in the southwestern Norwegian Sea. The growth of these herring is faster than those feeding further east and north.

Factors affecting the fisheries and the stock

The effects of regulations

In the rebuilding phase of the stock in the 1980s and beginning of 1990s (SSB < MBAL = 2.5 million t), the objective was to keep the fishing mortality below 0.05. With the exception of a few years, this objective was achieved. A minimum landing size regulation of 25 cm has been in place since 1977. This has prevented the exploitation of young herring. These regulations have contributed to a rebuilding of the stock to levels well above precautionary limits. When the fishery expanded in the mid-1990s, a long-term management plan was agreed; this plan is cited above.

For 2006, the Parties exploiting the resources (European Union, Faroe Islands, Iceland, Norway, and Russia) did not reach agreement regarding the allocation of the quota and no TAC was agreed. However, the fishing mortality resulting from the sum of the coastal states quotas has not exceeded F_{pa}.

Changes in fishing technology and fishing patterns

The main catches in 2005 were taken by Norway (580 000 t), Russia (132 000 t), Iceland (156 000 t), EU (67 000 t), and Faroe Islands (65 000 t). The fishery in general follows the migration of the stock closely as it moves from the wintering and spawning grounds along the Norwegian coast to the summer feeding grounds in the Faroese, Icelandic, Jan Mayen, Svalbard, and international areas. Due to limitations by some countries to enter the EEZs of other countries in 2005, the fisheries do not necessarily depict the distribution of herring in the Norwegian Sea and the preferred fishing pattern of the fleets given free access to any zone. A special feature of the summer fishery in 2005 was the prolonged fishery in the Faroese and Icelandic zone during summer, where the oldest age groups were present. The usual pattern has been that the fishery moved gradually northwards towards the Jan Mayen zone in June.

A large increase in fishing effort, new technology, and environmental changes contributed to the collapse of this stock around 1970. Recruitment failed in the second half of the 1960s when the SSB was reduced below 2.5 million t. Starting in 1989 a succession of above-average to very strong year classes were produced, promoting full recovery of the SSB and allowing an expansion of the fishery. Since 1992 the coastal fishery has increased sharply. Until 1994, the fishery was almost entirely confined to Norwegian coastal waters. During the summer of 1994 there were also catches in the offshore areas of the Norwegian Sea for the first time in 26 years. The geographical extent of this fishery increased in 1995, with nine nations participating and the total catch exceeding 900 000 t. The fishery expanded further in 1996 and the annual level of the fishery was in the order of 1.2–1.5 million t in the period 1996–2000. After 2000 the fishery has dropped to a level between 700–1000 thousand tonnes.

The environment

The Norwegian spring-spawning herring carries out extensive migrations in the NE Atlantic, and has often been linked to changes in ocean climate and in zooplankton distribution. ICES has shown that there is a weak relationship between zooplankton biomass in May and herring condition in the autumn during the years 1995–2005. The March–April NAO index for 2004 and 2005 has been shown to predict the herring condition index in the winters of 2005 and 2006. Based on a link between SST in the first quarter in the Norwegian Sea and herring larval abundance with subsequent recruitment, recruitment is predicted to increase during the period from 2005 to 2007.

Scientific basis

Data and methods

The advice is based on an analytical assessment, which takes into consideration catch data and eight surveys (acoustic surveys of adults and juveniles, and larval surveys).

ICES investigated the use of a number of different models. When appropriately formulated, they all gave the same perception of the trajectory for stock size and fishing mortalities. On this basis, the SeaStar model was used, as in previous years.

Uncertainties in assessment and forecast

The choice of the assessment model had a minor impact on the results, apart from the estimation of recruitment of the most recent year classes. The assessment appears to be more sensitive to the choice of the data used than to the choice of the model.

There is an apparent shift in wintering areas for this stock. These distributional changes have affected the representativity of winter surveys because the surveys did not cover the whole distribution area of the stock anymore.

The winter surveys show a strong negative trend in the development of the 1998 and 1999 year classes since 2003. The decrease of these year classes is not observed in other surveys that are carried out later in the year on the feeding grounds. Because of the large change in wintering patterns of the herring, the results of the winter surveys from 2002–2006 were not used in the assessment. The design of the surveys will be adjusted to ensure that they cover the whole stock and will then be reintroduced in the assessment.

Tagging information has not been included because of the low recoveries from recent tagging programmes. The low recoveries were a result of tag screening effort which in 2005 was very low. Only a few tag detectors were operational and only part of the time. Problems with tagging information have also been detected in previous years and the results of these years have been omitted in previous assessments.

Comparison with previous assessment and advice

Compared to last year, the SSB for 2004 is estimated to be about 20% higher and fishing mortality in 2004 is estimated to be about 30% lower (see Figure 9.4.5.1). The changes in the present assessment compared to last year are partly the result of the exclusion of the tagging information and the last 4 years in the winter surveys. In comparison to the forecast of the 2006 SSB last year, the SSB estimate from the present assessment for 2006 is 60% higher. This is due in part to the upward revision of the SSB for recent years, as stated above, as well as to an upward revision of the maturity of the strong 2002 year class which now appears to be 90% mature at age 4. The 2002 year class also has a higher growth rate than usually seen in large year classes. This can in part be credited to some of the juveniles having had the Norwegian Sea as their juvenile area, favouring quicker growth than in the Barents Sea.

Source of information

Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 24–30 August 2006 (ICES CM 2006/ACFM:34).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	150	115	127
1988	TAC	120–150	120	135
1989	TAC	100	100	104
1990	TAC	80	80	86
1991	No fishing from a biological point of view	0	76	85
1992	No fishing from a biological point of view	0	98	104
1993	No increase in F	119	200	232
1994	Gradual increase in F towards $\mathbf{F}_{0.1}$; TAC suggested	334	450	479
1995	No increase in F	513	None[1]	906
1996	Keep SSB above 2.5 million t	-	None[2]	1 217
1997	Keep SSB above 2.5 million t	-	1 500	1 420
1998	Do not exceed the harvest control rule	-	1 300	1 223
1999	Do not exceed the harvest control rule	1 263	1 300	1 235
2000	Do not exceed the harvest control rule	Max 1 500	1 250	1 207
2001	Do not exceed the harvest control rule	753	850	770
2002	Do not exceed the harvest control rule	853	850	809
2003	Do not exceed the harvest control rule	710	711[3]	773
2004	Do not exceed the harvest control rule	825	825[3]	794
2005	Do not exceed the harvest control rule	890	1.000[3]	1003
2006	Do not exceed the harvest control rule	732	967[3]	
2007	Do not exceed the harvest control rule	1 280		

Weights in '000 t.
[1]Autonomous TACs totaling 900 000 t.
[2]Autonomous TACs totaling 1 425 000 t were set by April 1996.
[3]There was no agreement on the TAC, the number is the sum of autonomous quotas from the individual Parties.

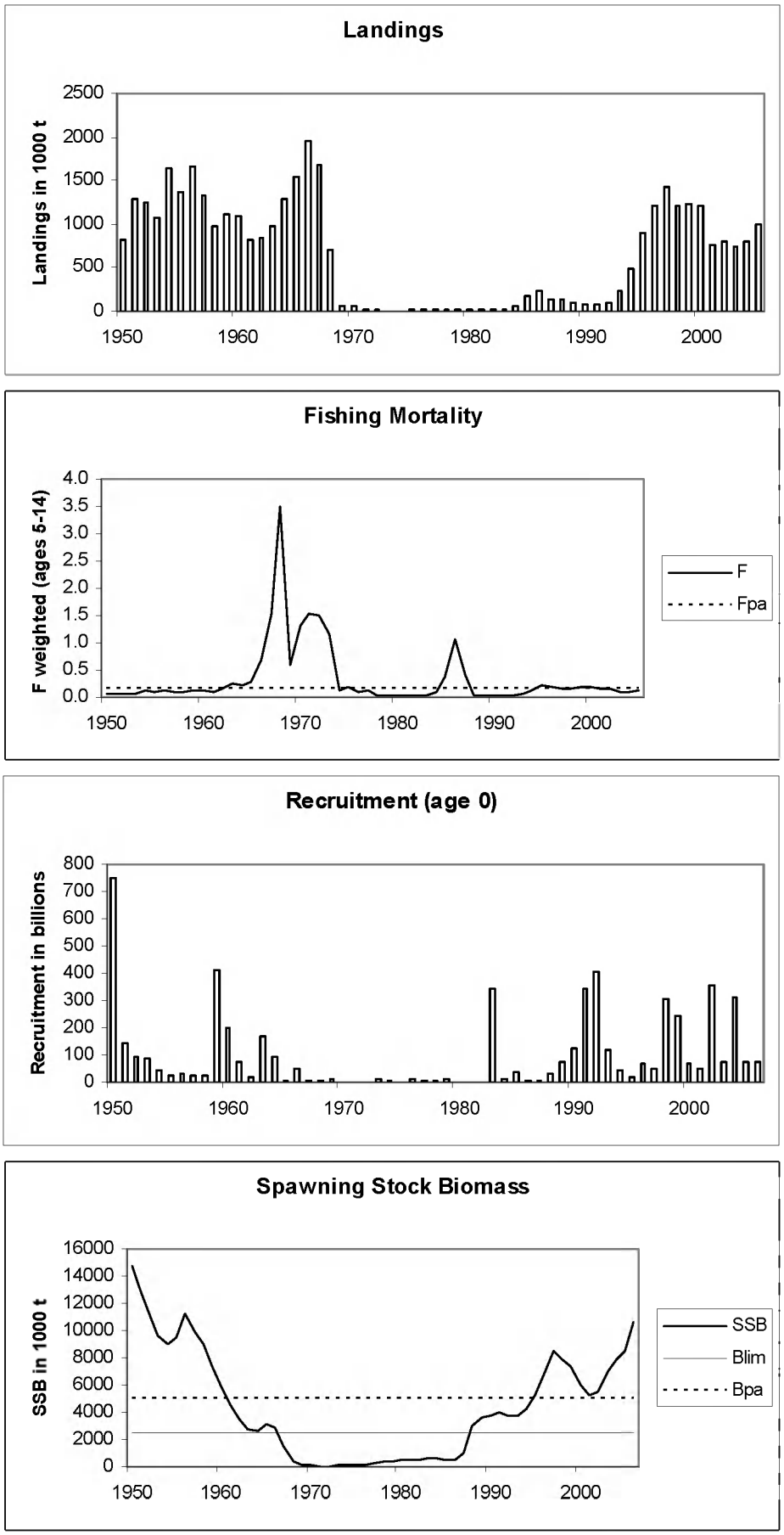
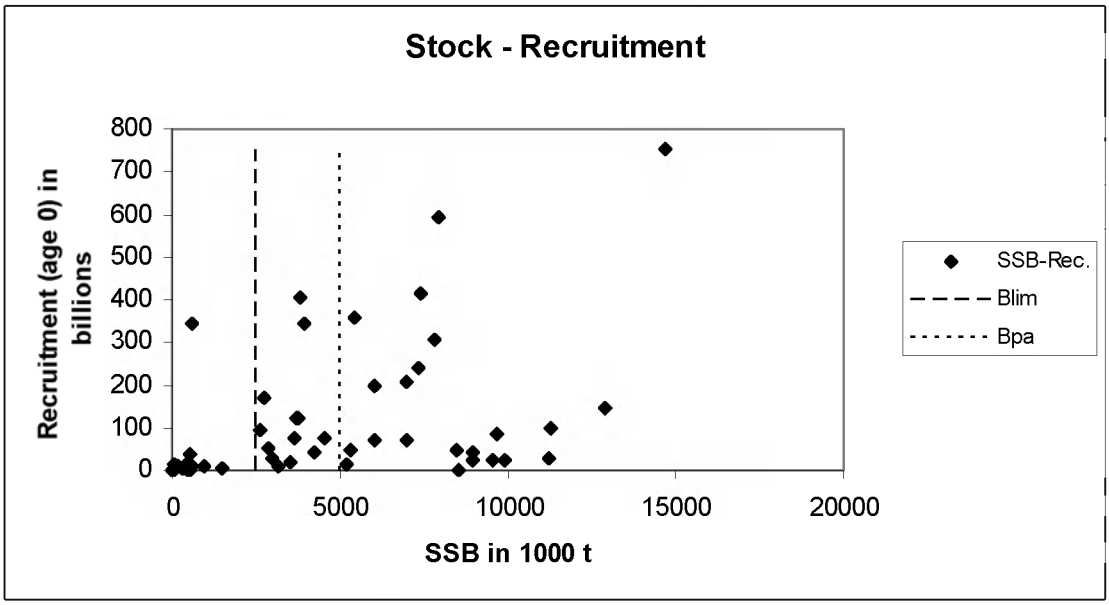


Figure 9.4.5.1 Norwegian spring-spawning herring. Landings, fishing mortality, recruitment and SSB.



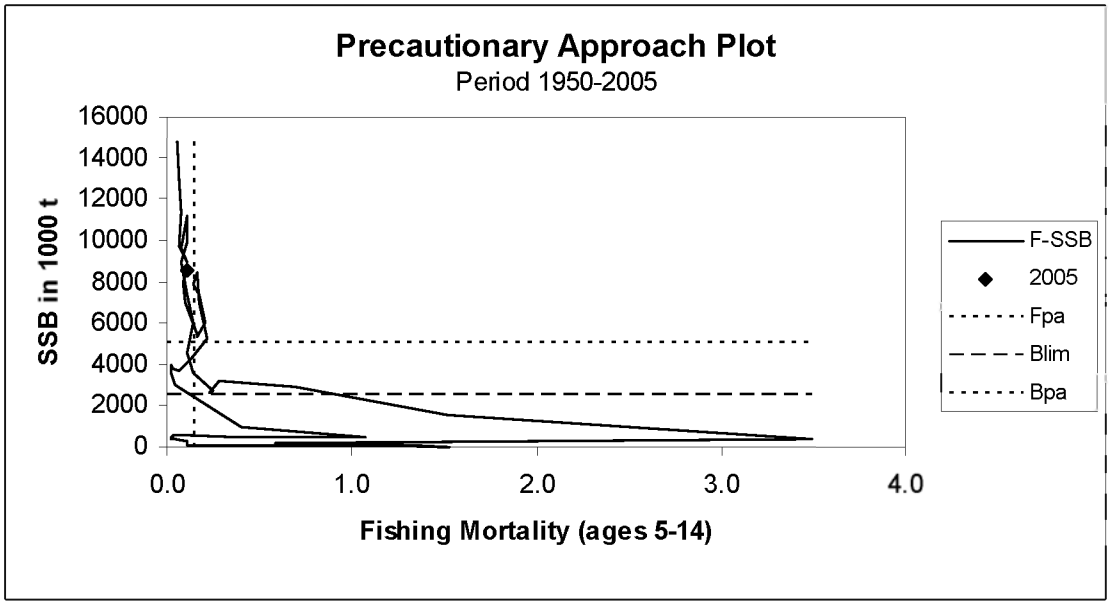


Figure 9.4.5.2 Norwegian spring-spawning herring. Stock and recruitment; and Yield

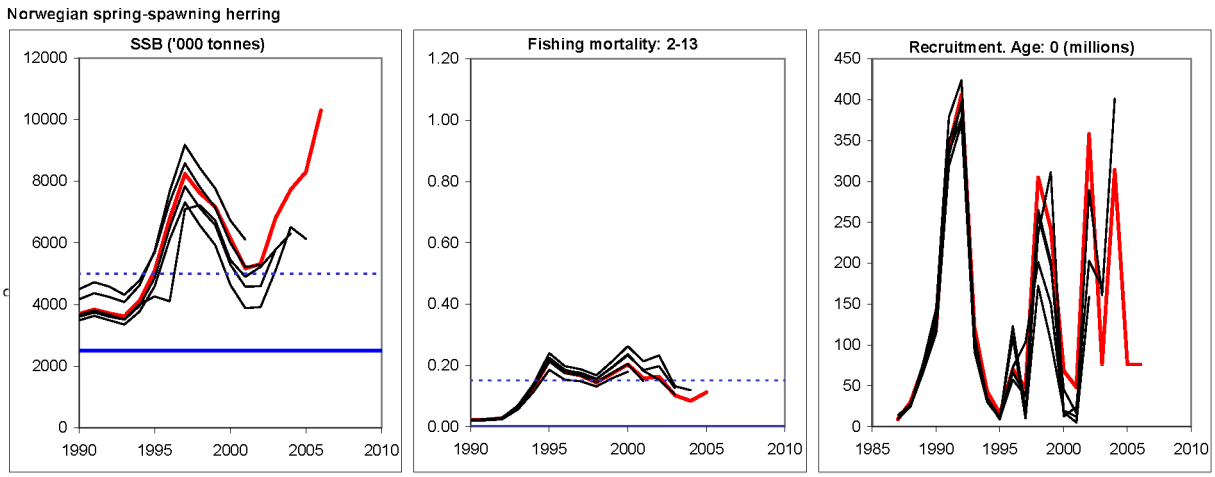


Figure 9.4.5.3 Norwegian Spring spawning Herring. Historical performance of the assessment (SSB, Fishing mortality and recruitment)

Table 9.4.5.1 Total catch of Norwegian spring-spawning herring (tonnes) since 1972. Data provided by Working Group members.

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireand	Netherlands	Greenland	UK (Scotland)	Germany	France	Poland	Sweden	Total
1972	13,161	-	-	-	-	-	-	-	-	-	-	-	-	13,161
1973	7,017	-	-	-	-	-	-	-	-	-	-	-	-	7,017
1974	7,619	-	-	-	-	-	-	-	-	-	-	-	-	7,619
1975	13,713	-	-	-	-	-	-	-	-	-	-	-	-	13,713
1976	10,436	-	-	-	-	-	-	-	-	-	-	-	-	10,436
1977	22,706	-	-	-	-	-	-	-	-	-	-	-	-	22,706
1978	19,824	-	-	-	-	-	-	-	-	-	-	-	-	19,824
1979	12,864	-	-	-	-	-	-	-	-	-	-	-	-	12,864
1980	18,577	-	-	-	-	-	-	-	-	-	-	-	-	18,577
1981	13,736	-	-	-	-	-	-	-	-	-	-	-	-	13,736
1982	16,655	-	-	-	-	-	-	-	-	-	-	-	-	16,655
1983	23,054	-	-	-	-	-	-	-	-	-	-	-	-	23,054
1984	53,532	-	-	-	-	-	-	-	-	-	-	-	-	53,532
1985	167,272	2,600	-	-	-	-	-	-	-	-	-	-	-	169,872
1986	199,256	26,000	-	-	-	-	-	-	-	-	-	-	-	225,256
1987	108,417	18,889	-	-	-	-	-	-	-	-	-	-	-	127,306
1988	115,076	20,225	-	-	-	-	-	-	-	-	-	-	-	135,301
1989	88,707	15,123	-	-	-	-	-	-	-	-	-	-	-	103,830
1990	74,604	11,807	-	-	-	-	-	-	-	-	-	-	-	86,411
1991	73,683	11,000	-	-	-	-	-	-	-	-	-	-	-	84,683
1992	91,111	13,337	-	-	-	-	-	-	-	-	-	-	-	104,448
1993	199,771	32,645	-	-	-	-	-	-	-	-	-	-	-	232,457
1994	380,771	74,400	-	2,911	21,146	-	-	-	-	-	-	-	-	479,228
1995	529,838	101,987	30,577	57,084	174,109	-	7,969	2,500	881	556	-	-	-	905,501
1996	699,161	119,290	60,681	52,788	164,957	19,541	19,664	-	46,131	11,978	-	-	22,424	1,220,283
1997	860,963	168,900	44,292	59,987	220,154	11,179	8,694	-	25,149	6,190	1,500	-	19,499	1,426,507
1998	743,925	124,049	35,519	68,136	197,789	2,437	12,827	-	15,971	7,003	605	-	14,863	1,223,131
1999	740,640	157,328	37,010	55,527	203,381	2,412	5,871	-	19,207	-	-	-	14,057	1,235,433
2000	713,500	163,261	34,968	68,625	186,035	8,939	-	-	14,096	3,298	-	-	14,749	1,207,201
2001	495,036	109,054	24,038	34,170	77,693	6,070	6,439	-	12,230	1,588	-	-	9,818	766,136
2002	487,233	113,763	18,998	32,302	127,197	1,699	9,392	-	3,482	3,017	-	1,226	9,486	807,795
2003*	477,573	122,846	14,144	27,943	117,910	1,400	8,678	-	9,214	3,371	-	-	6,431	789,510
2004	477,076	115,876	23,111	42,771	102,787	11	17,369	-	1,869	4,810	400	-	7,986	794,066
2005**	580,804	132,099	28,368	65,071	156,467	-	21,517	-	-	17,676	0	561	680	1,003,243

*In 2003 the Norwegian catches were raised of 39433 to account for changes in percentages of water content.

**Preliminary, as provided by Working Group members.

Table 9.4.5.2 Norwegian spring-spawning herring.

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	F weighted Ages 5-14
1950	751000000	14200000	826000	0.0584
1951	146000000	12500000	1280000	0.0697
1952	96600000	10900000	1250000	0.0728
1953	86100000	9350000	1070000	0.0663
1954	42100000	8660000	1640000	0.1130
1955	25000000	9270000	1360000	0.0783
1956	29900000	10900000	1660000	0.1100
1957	25400000	9650000	1320000	0.1030
1958	23100000	8690000	986000	0.0787
1959	412000000	7180000	1110000	0.1130
1960	198000000	5850000	1100000	0.1360
1961	76100000	4390000	830000	0.1040
1962	19000000	3440000	849000	0.1460
1963	169000000	2670000	985000	0.2530
1964	93900000	2530000	1280000	0.2260
1965	8490000	3060000	1550000	0.2780
1966	51400000	2800000	1960000	0.6960
1967	3950000	1470000	1680000	1.5200
1968	5190000	344000	712000	3.4900
1969	9780000	145000	67800	0.5900
1970	661000	71000	62300	1.3200
1971	236000	32000	21100	1.5300
1972	957000	16000	13200	1.5000
1973	12900000	85000	7020	1.1700
1974	8630000	91000	7620	0.1140
1975	2970000	79000	13700	0.1900
1976	10100000	138000	10400	0.1060
1977	5100000	286000	22700	0.1110
1978	6200000	358000	19800	0.0434
1979	12500000	388000	12900	0.0238
1980	1470000	471000	18600	0.0341
1981	1100000	504000	13700	0.0215
1982	2340000	503000	16700	0.0200
1983	343000000	575000	23100	0.0291
1984	11500000	602000	53500	0.0903
1985	36600000	515000	170000	0.3790
1986	6040000	437000	225000	1.0700
1987	9090000	926000	127000	0.4040
1988	30200000	2907000	135000	0.0421
1989	74300000	3537000	104000	0.0267
1990	122000000	3692000	86400	0.0210
1991	342000000	3845000	84700	0.0233
1992	406000000	3718000	104000	0.0273
1993	121000000	3615000	232000	0.0621
1994	42900000	4130000	479000	0.1260
1995	15700000	5086000	906000	0.2160
1996	70200000	6788000	1220000	0.1770
1997	47300000	8237000	1430000	0.1670
1998	305000000	7618000	1220000	0.1440
1999	242000000	7174000	1240000	0.1730
2000	68400000	6147000	1210000	0.2030
2001	47900000	5168000	766000	0.1580
2002	358000000	5319000	808000	0.1630
2003[1)]	76000000	6807000	750000	0.1020
2004[2)]	314000000	7725000	794000	0.0839
2005[1)]	76000000	8299000	1000000	0.1120
2006[1)]	76000000	10300000		
Average	97864982	4284000	659344	0.3301

[1)] Recruitment as GM 1986–2002. [2)] Recruitment predicted to be similar to the 1998 year class.

9.4.6 Northeast Atlantic spurdog

State of the stock

The stock is depleted. All experimental assessments indicate that the stock is at a record low level. The frequency of the occurrence of spurdog in trawl surveys has declined and, although large shoals are still caught, the frequency of these has also declined. Survey CPUE also indicates a declining trend. The absolute level of exploitation is unknown but the trends in fishing mortality and the continuous decline in landings indicates that exploitation has been, and continues to be well above sustainable levels.

Single stock exploitation boundaries

The stock is depleted and may be in danger of collapse. Targeted fisheries should not be permitted to continue, and bycatch in mixed fisheries should be reduced to the lowest possible level. The TAC should cover all areas where spurdog are caught in the northeast Atlantic and should be set at zero for 2007.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Spurdog are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality. Population productivity is low, with low fecundity and a protracted gestation period. In the light of this, the risk of depletion of reproduction potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for stock status and future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

Management considerations

A long-term management strategy for fisheries on this species would consist of an initial low fishery after the stock has recovered. This initial low fishery level should aim to identify harvest rates that are sustainable in the long term. A gradual expansion of the fishery from the initial low level should only be allowed if harvest rates that are sustainable in the long term are clearly identified and a management strategy has been identified and decided upon. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries.

Based on tagging results spurdog in the ICES area is considered to be a single stock, ranging from the Barents Sea (ICES Subarea I) to Subarea IX in the south. The TAC area should be extended to cover the full stock distribution.

A large proportion of spurdog are taken as bycatch in mixed demersal trawl fisheries. TACs only regulate the landings. A low TAC on bycatch species could induce more discards. Discard survival is unknown. Because spurdog is caught as a bycatch in demersal fisheries, they would benefit from a reduction in overall demersal fishing effort.

Spurdog forms size- and sex-specific schools and these are subject to directed fisheries specifically targeting large females. Additional management measures which would deter the targeting of mature females could include, for example, a minimum landing length.

Ecosystem considerations

Spurdog is an important component of the pelagic and demersal ecosystems, preying on a variety of pelagic fishes, such as herring.

Factors affecting the fisheries and the stock

Regulations and their effects

There is no international agreement on a TAC that covers the full distribution of northeast Atlantic spurdog.

A TAC has been introduced for the EU waters of Subarea IV and Division IIa in 1999. This TAC has been reduced from 8870 tonnes in 2001 to 1051 tonnes in 2006.

Norway has a 70-cm minimum landing size, but it is not known if this is effective in reducing the exploitation of mature females.

Changes in fishing technology and fishing patterns

Landings increased to more than 60 000 tonnes in the early 1960s, when target fisheries took place in Scotland and Norway. Landings in the Norwegian directed longline fishery decreased during the 1970s. In the 1980s, international landings increased slightly due to directed fisheries by UK (longline) and Irish (gillnet) vessels. Landings declined from the late 1980s again. There has been a reduction in target fisheries, though they still exist in certain areas and at certain times as schools appear, with an increasing proportion of spurdog being taken as a bycatch in mixed demersal trawl fisheries.

The environment

Studies in the Northwest Atlantic indicate that males tend to occupy deeper, more saline water than females, and that spurdog tends to prefer waters of 7–15°C.

Scientific basis

Data and methods

Survey and landings data are available. A number of different methods have been explored making use of the long time-series of landings data, including surplus production models, separable age-based assessments and length-structured approaches. Survey data have also been analysed in terms of trends in CPUE and frequency of occurrence in survey hauls. All analyses indicate similar stock trends.

Uncertainties in assessment and forecast

Particular problems identified with the data include:

- uncertainties in the historical level of catches due to landings being reported by generic 'dogfish' categories;
- limited catch composition information from countries other than UK;
- the aggregating behaviour of spurdog means that trawl survey catch rates are highly variable, with many zero catches and occasional high catches making CPUE difficult to interpret;
- survey data have not been provided for the whole stock area.

Information from the fishing industry

Those spurdog that are landed are mostly from a mixed demersal fishery. The fishing industry provided anecdotal information that catches recorded as "spurdog and others" mostly consist of spurdog only. Bycatches of spurdog in other fisheries (e.g. pelagic trawl) are likely, but these are generally not landed.

Comparison with previous assessment and advice

In 2005, the advice from ACFM was for a zero TAC for this stock. This was the first year that ACFM had provided advice for this stock. The advice for 2007 is consistent with that for 2006.

Source of information

Report of the Working Group on Elasmobranch Fishes, 2006 (ICES CM 2006/ACFM:31).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresponding to advice	Predicted catch corresponding to single-stock exploitation boundaries	Agreed TAC[1]	ACFM Landings[2]
1991	None					29.4
1992	None					28.8
1993	None					23.2
1994	None					21
1995	None					20.2
1996	None					16.7
1997	None					15
1998	None					14.1
1999	None				8.9	11.2
2000	None				8.9	15.5*
2001	None				8.9	16.0*
2002	None				7.1	9.3
2003	None				5.6	10.4
2004	None				4.5	6.0
2005	None				1.1	5.6
2006	TAC	F=0	0		1.05	
2007	TAC	F=0	0			

Weights in '000 t.
* May include some misreported deep-sea sharks or other species.
[1)] Landings for total stock area: Subareas I–IX.
[2)] TAC for ICES Subarea IV and Division IIa (EC).

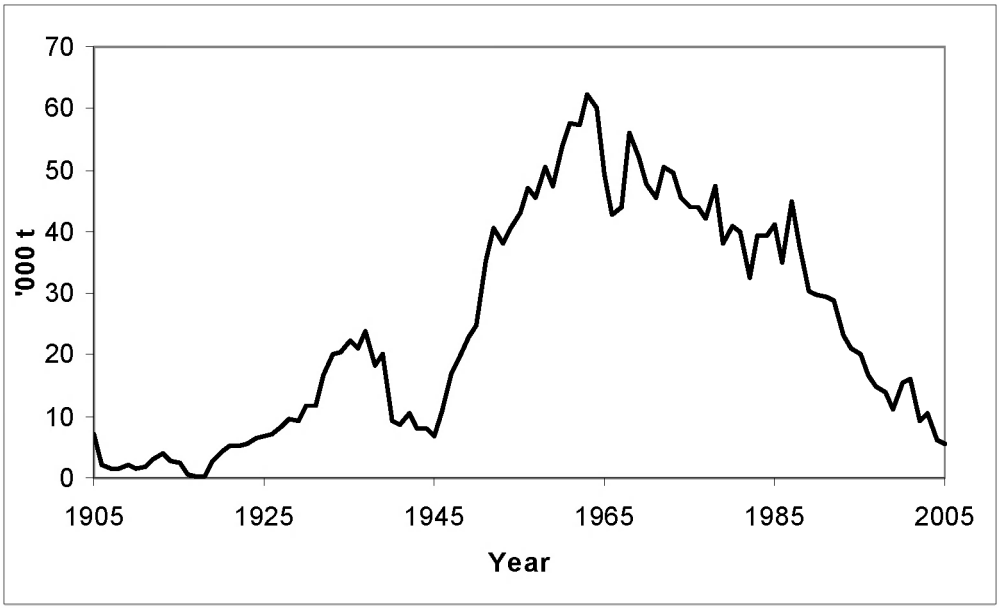


Figure 9.4.6.1 Northeast Atlantic spurdog. WG estimate of landings in the Northeast Atlantic (Subareas I–IX).

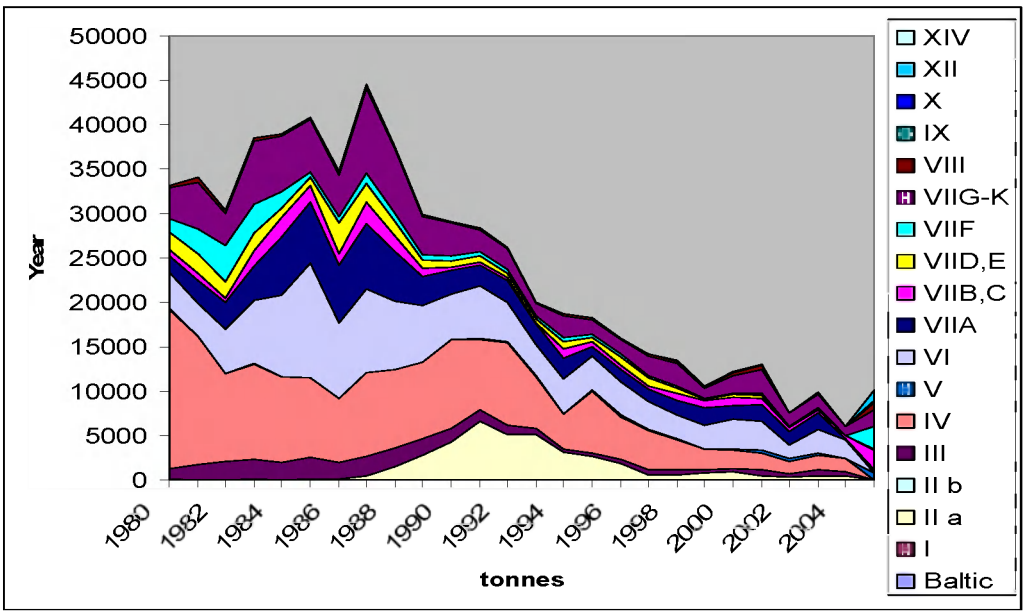


Figure 9.4.6.2 Northeast Atlantic spurdog. Recent landings by area.

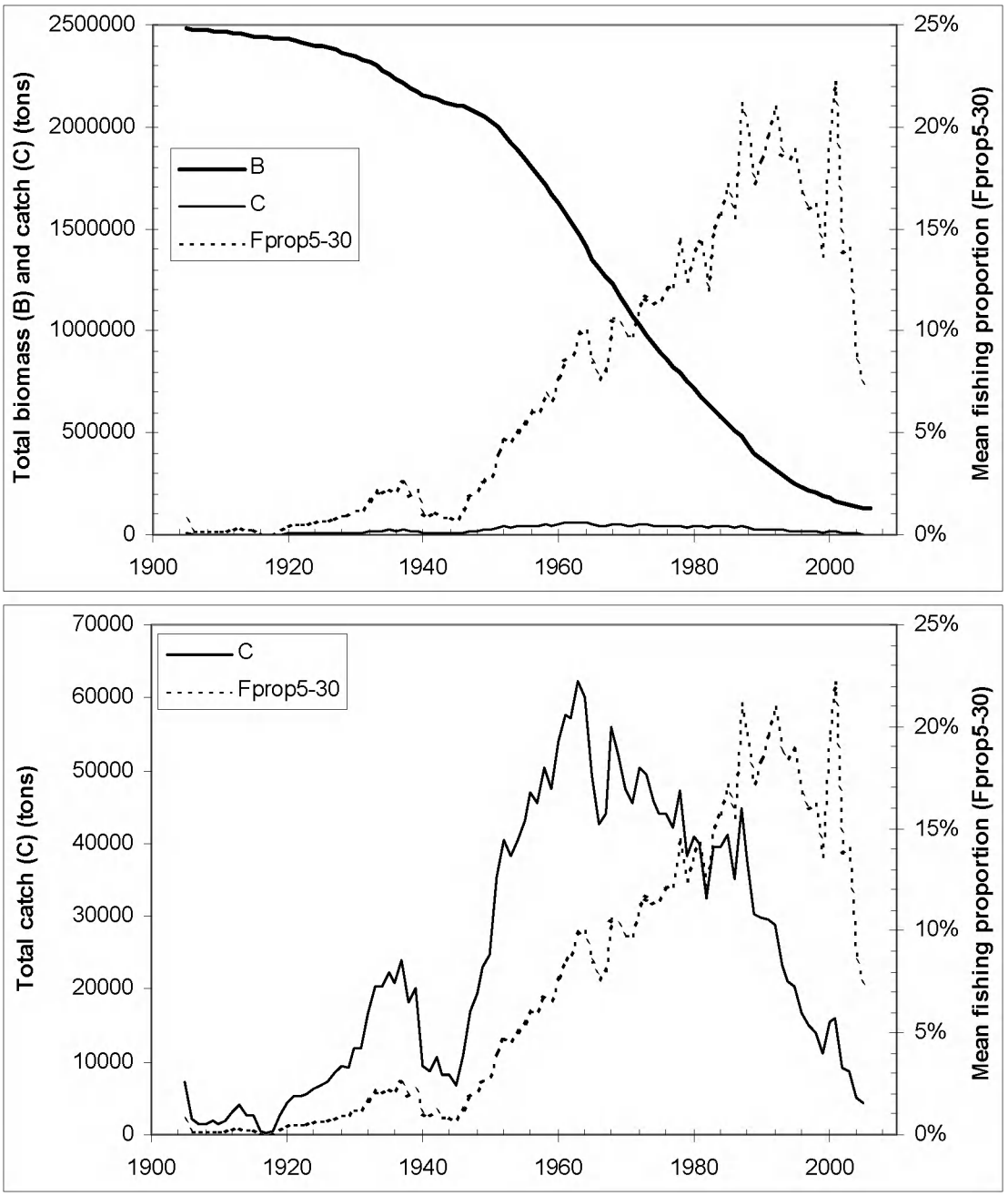


Figure 9.4.6.3 Northeast Atlantic spurdog. Base-case model estimates of total biomass (B) and mean fishing proportion ($F_{prop5\text{-}30}$) are shown in the top panel together with observed total annual catch (C), with the bottom panel repeating the information, but without the total biomass to show more detail in C.

9.4.7 Northeast Atlantic porbeagle

State of the stock

Available information from Norwegian and Faroese fisheries shows that landings declined strongly and these fisheries ceased in the ICES area. These fisheries have not resumed, implying that the stock has not recovered, at least in the areas where those fisheries took place.

The available information from the French fishery suggests that CPUE reached a peak in 1994 and afterwards has declined. The CPUE has been stable at a much lower level since 1999, despite a relatively constant number of vessels involved.

Single-stock exploitation boundaries

No targeted fishing for porbeagle should be permitted on the basis of their life history and vulnerability to fishing. In addition, measures should be taken to prevent bycatch of porbeagle in fisheries targeting other species, particularly in the depleted northern areas.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Porbeagles are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality. Population productivity is low, with low fecundity and a protracted gestation period. In the light of this, risk of depletion of reproduction potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for stock status and future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

Management considerations

A long-term management strategy for fisheries on this species would consist of an initial low scientific fishery. This initial low fishery level should aim at identifying harvest rates that are sustainable in the long term. A gradual expansion of the fishery from the initial low level should only be allowed if harvest rates that are sustainable in the long term are clearly identified and a management strategy has been identified and decided upon. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries.

Information from surface longline fishing shows that porbeagles are usually captured alive. Therefore, a mitigation policy might be implemented by releasing porbeagle.

Porbeagle is a highly migratory and schooling species. Sporadic targeted fisheries develop on these schools and such fisheries are highly profitable.

Porbeagle is highly vulnerable to longline fisheries.

Factors affecting the fisheries and the stock
Regulations and their effects
EC Regulation No. 1185/2003 prohibits the removal of shark fins of this species, and the subsequent discarding of the body. This regulation is binding on EC vessels in all waters and non-EC vessels in Community waters. For further details see Section 1.4.8 on basking shark.

Scientific basis

Data and methods

Countries fishing for porbeagle need to provide better data. All fisheries-dependent data should be provided by EU member states that have fisheries for this stock as well as other countries longlining in the ICES area. Landings data for porbeagle may be reported as "porbeagle", as "various sharks nei", or as "Sharks, rays, skates, etc. nei" in the official statistics. This means that the reported landings of porbeagle are likely an underestimation of the total landing of the species from the NE Atlantic.

There is no fishery-independent information on this stock.

Comparison with previous assessment and advice

ICES has not provided advice on this species in the past.

Source of information

Report of the Working Group on Elasmobranch Fishes, 2006 (ICES CM 2006/ACFM:31).

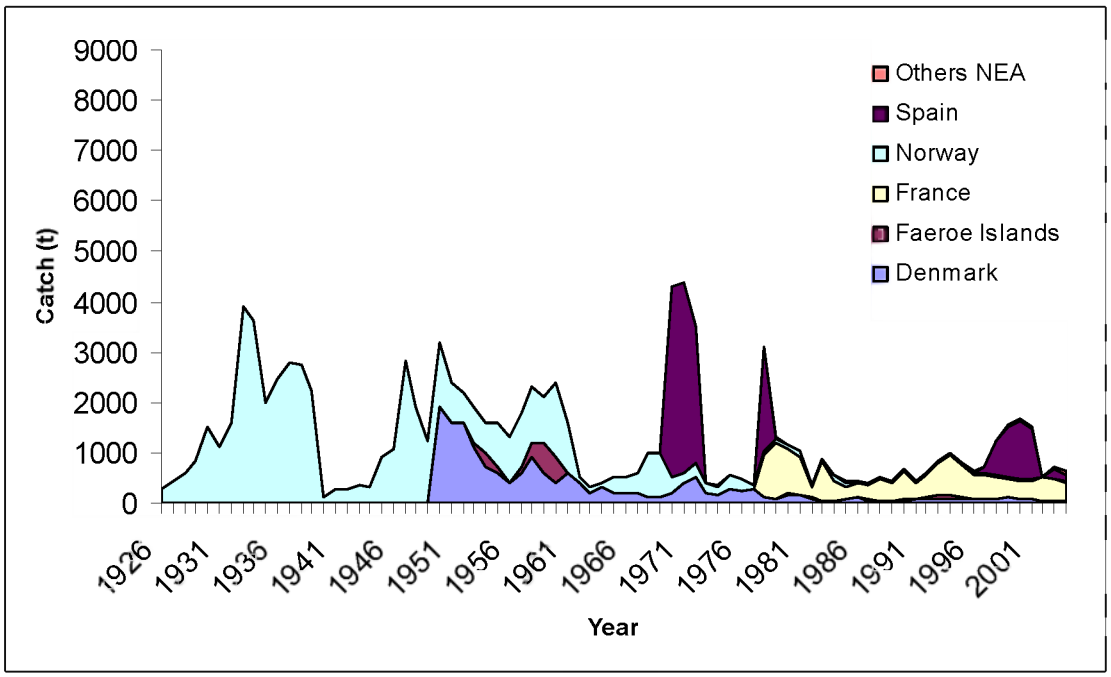


Figure 9.4.7.1 Porbeagle in the NE Atlantic. Working Group estimate of landings 1926–2005.

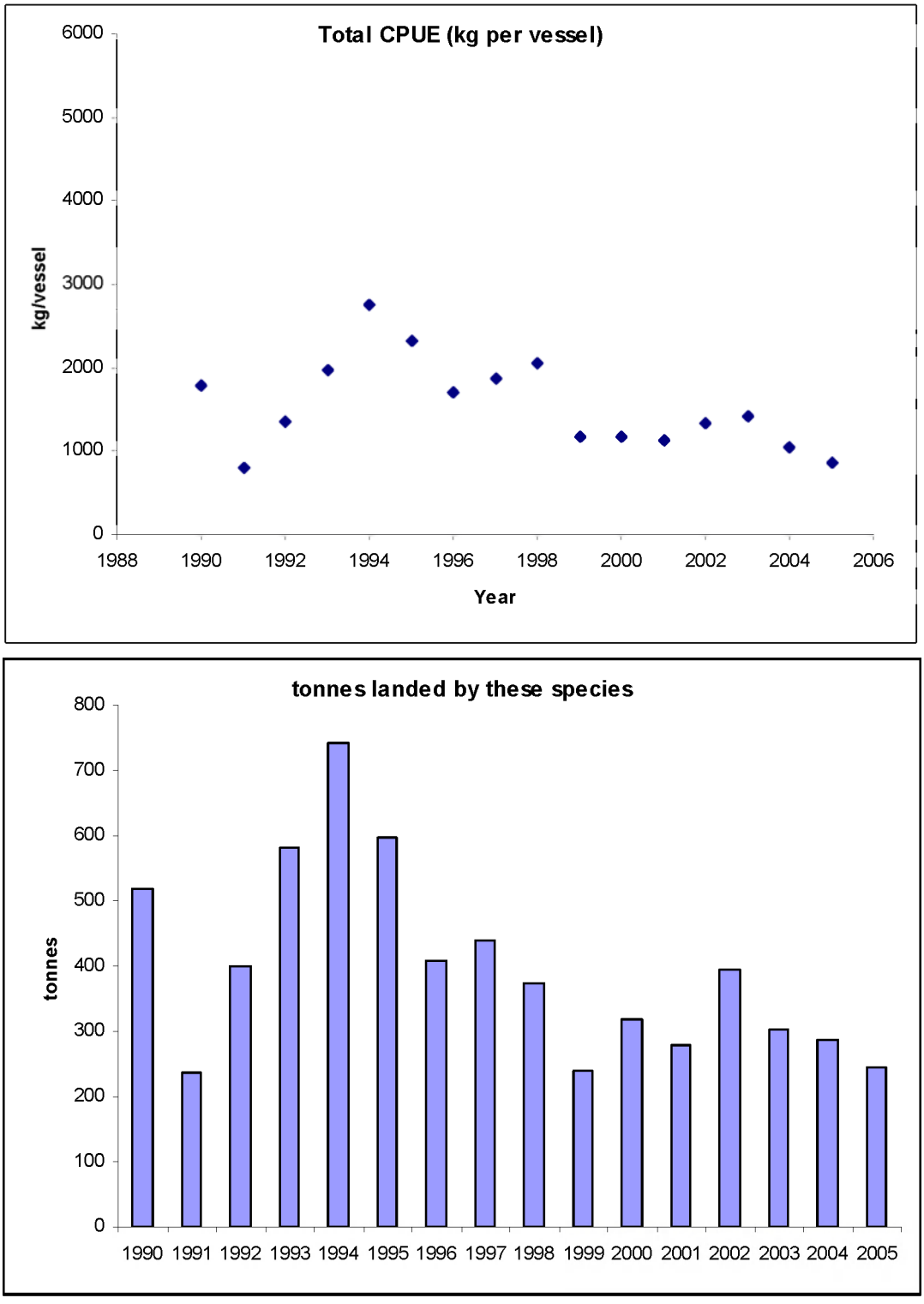


Figure 9.4.7.2 Porbeagle in the NE Atlantic. CPUE from French directed fishery (upper panel) and landings from these vessels (lower panel).

Table 9.4.7.1 Available landing data for porbeagle in the ICES area. From Eurostat/ICES database. Figures as reported here should be considered an underestimate.

ICES area / Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
I & II	6	10	7	14	8	11	9	0	6	16	10
III & IV	439	171	170	165	133	87	91	2	23	37	5
Va	6	5	3	4	2	2	3	2	1	0	0
Vb	36	9	9	7	11	13	8	10	14	0	0
VI	10	1	1	+	1	52	11	+	+	+	2
VII	96	115	78	70	92	163	118	216	166	186	130
VIII	465	172	282	189	427	242	188	158	127	95	92
IX	1	7	49	354	723	1086	408	0	0	1	0
X	.	.	30	284	8	376	454	0	65	0	0
XII	.	.	16	0	0	4	1	0	1	0	0
XIV	.	.	1	.	.	.	.	.	.	.	.
Total	1059	490	646	1087	1405	2036	1292	387	404	336	240

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Denmark	87	72	69	86	109	74	76	0	21	20	3
Faeroe Islands	372	82	96	66	10	0	8	10	14	0	0
France	565	267	331	219	237	319	237	353	258	251	221
Germany	0	0	0	2	0	16	0	3	5	6	5
Iceland	6	5	3	4	2	2	3	2	1	0	0
Ireland	0	0	0	0	3	2	6	0	11	18	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0
Norway	28	31	19	28	34	23	17	0	5	24	11
Portugal	1	1	1	1	0	1	0	0	0	1	0
Spain	0	31	125	681	1002	1507	932	16	89	10	0
Sweden	0	1	1	0	0	0	1	0	0	5	0
UK (Eng.Wal. Nl.+)	0	0	0	1	8	11	11	6	0	0	0
UK (Scot)	0	0	0	0	0	0	1	0	0	0	0
TOTAL	1059	490	645	1088	1405	1955	1292	390	404	336	240

9.4.8 Basking shark in the northeast Atlantic (ICES Areas I–XIV)

State of the stock

Available landings and anecdotal information suggest that the stock is severely depleted.

Management objectives

There are no explicit management objectives for this stock.

Single-stock exploitation boundaries

No targeted fishing for basking shark should be permitted and additional measures should be taken to prevent bycatch of basking shark in fisheries targeting other species. A TAC should cover all areas where basking sharks are caught in the northeast Atlantic. This TAC should be set at zero for 2007.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Basking sharks are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality. Population productivity is low, with low fecundity and a protracted gestation period. In the light of this, the risk of depletion in reproduction potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

Management considerations

At present there is no directed fishery for this species. ICES considers that no targeted fishery should be permitted unless a reliable estimate of a sustainable exploitation rate is available and that such a fishery can be monitored and managed reliably. Any future fishery would need to be in keeping with both nature conservation policy (e.g. taking into account CITES status, any legal protection), fisheries policy (e.g. having sustainable exploitation rates), have conservative management measures from the outset, and be monitored closely

The TAC area should correspond to the entire stock distribution (all ICES Areas). The present TAC only covers Areas IV, VI & VII, although most of the recorded landings are in Areas I & II.

Proper quantification of the impact of bycatch, discarding, and ship strikes on this species in the ICES area is required.

Where national legislation prohibits landing of bycaught basking sharks, measures should be put in place to ensure that incidental catches are recorded and carcasses made available for research.

Factors affecting the fisheries and the stock

Changes in fishing technology and fishing patterns

Most of the reported historical catch was taken by Norway. There is in 2006 no targeted fishery for basking sharks in Norway, UK, and Ireland.

Regulations and their effects

EC Regulation No. 1185/2003 prohibits the removal of shark fins of this species, and subsequent discarding of the body. This regulation is binding on EC vessels in all waters and non-EC vessels in Community waters.

The justification of this regulation was that finning may lead to excessive mortality of sharks. Given that the price of fins of this species is increasing, the compliance to the regulation should be monitored more strictly.

The CITES, Appendix II listing of this species means that the exporting nation must document that the catch of basking shark is not detrimental to the stock.

This species was recently listed on the Convention on the Conservation of Migratory Species of Wild Animals (CMS). This Convention aims to promote the collaborative management of migratory stocks and strict protection of threatened species. It has not yet been implemented in the ICES area.

In 2006 Norway banned all direct fishery for basking shark based on the ICES advice. Live specimens caught as by-catch must be released, while dead or dying specimens can be landed and sold as before. This regulation is only valid for 2006. The possibility of landing dead or dying specimens allows circumvention of the regulation.

The current TAC for EU member states in EU waters of ICES Subareas IV, VI and VII is zero (Annex ID of Council Regulation No. 2555/2001). This has been in effect since 2002. In the past, Norway had a quota in EU waters for livers. The EU no longer provides this entitlement.

The basking shark has been protected from killing, taking, disturbance, possession and sale in UK territorial (12 mile) waters since 1998. They are also protected in two UK Crown Dependencies: Isle of Man and Guernsey. In Sweden it is forbidden to fish for or to land basking shark.

The environment

Distribution and local abundance will be influenced by oceanographic conditions (e.g. frontal systems).

Other factors

This species is vulnerable to mortality due to shipping.

Scientific basis

Data and methods

There is no assessment of this stock. The evaluation is based on landings data and anecdotal information.

Comparison with previous assessment and advice

ICES also advised a zero TAC in 2005.

Source of information

Report of the Working Group on Elasmobranch Fishes 2006 (ICES CM 2006/ACFM:31).

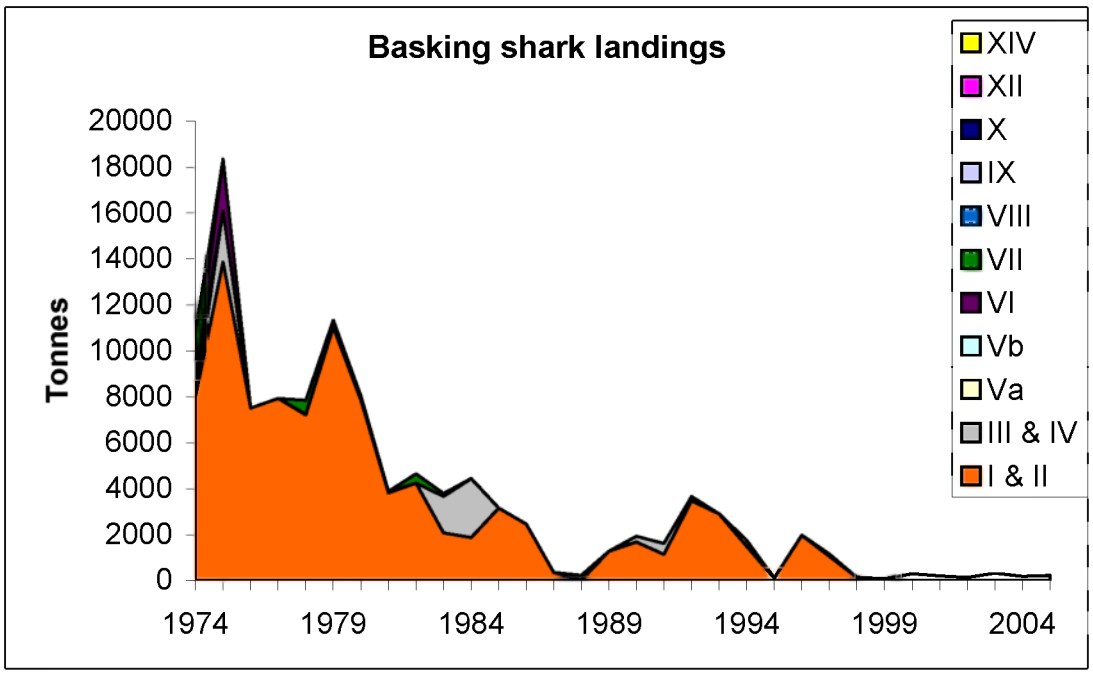


Figure 9.4.8.1 Basking sharks in the Northeast Atlantic. Total landings (tonnes) of basking sharks, 1973 to 2005.

Table 9.4.8.1 Landings data for Northeast Atlantic basking shark.

Year	catch	TAC
1973	10.9	
1974	10.7	
1975	18.4	
1976	7.5	
1977	7.9	
1978	7.8	
1979	11.3	
1980	8.0	
1981	3.9	
1982	4.6	
1983	3.8	
1984	4.4	
1985	3.2	
1986	2.5	
1987	0.4	
1988	0.2	
1989	1.3	
1990	1.9	
1991	1.6	
1992	3.7	
1993	2.9	
1994	1.8	
1995	0.1	
1996	2.0	
1997	1.2	
1998	0.1	
1999	0.1	
2000	0.3	
2001	0.2	
2002	0.1	0
2003	0.3	0
2004	0.2	0
2005	0.2	0

9.4.9 European eel

State of the stock

In the absence of defined reference points, the state of the stock cannot be fully evaluated. An analytical assessment of the state of the European eel stock is not available and reference points for the stock have not been defined. Nevertheless, all available information indicates that the stock is at a historical minimum in most of the distribution area and continues to decline. Fishing mortality is thought to be high both on juvenile (glass eel) and older eel (yellow and silver eel). Recruitment is at a historically low level (1–5% of the pre-1980 level) and most recent observations do not indicate recovery (Figures 9.4.9.1 and 9.4.9.2).

Estimated total yield has declined to about half that of the mid-1960s (Figure 9.4.9.3).

Management objectives

The European Commission has presented a proposal for the recovery of the European eel stock (COM(2005) 472 final). The objective of this Eel Recovery plan is "to achieve a recovery of the stock of European eel to previous historic levels of adult abundance and the recruitment of glass eel." More specifically: "the principal element of the Regulation is the establishment of national eel management plans, by means of which each Member State will achieve the objective of a 40% escapement of adult silver eel from each river basin (measured with respect to undisturbed conditions)."

The proposal by the European Commission has not yet been accepted by the Council of Ministers.

Reference points

Precautionary reference points have not been agreed for eel. The EC proposal for an Eel recovery plan (COM(2005) 472) is based on target reference points of a 40% escapement of adult silver eel from each river basin.

Exploitation that leaves 30% of the virgin spawning stock biomass is generally considered to be a reasonable target for escapement. Due to the large uncertainties in eel management and biology (one single stock, spawning only once in their lifetime), ICES has proposed an escapement target of 50% (ICES, 2003).

An intermediate rebuilding target could be the pre-1980s average SSB level which has generated normal recruitments in the past.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

The recruitment of glass eels to Europe has showed a sharp decline in the last 25 years. The historically low recruitment levels in recent years are an indication that the reproduction is seriously impaired and that the stock is likely to be severely depleted.

In order to restore the spawning stock, protective measures have to be implemented. ICES repeats its recommendation that a recovery plan for the whole stock should be implemented urgently. An important element of such a recovery plan should be a ban on all exploitation (including eel harvesting for aquaculture) until clear signs of recovery can be established. Other anthropogenic impacts should be reduced to a level as close to zero as possible.

Management considerations

The eel stock is scattered over a multitude of inland and coastal waters with divergent characteristics. Anthropogenic impacts, such as barriers in migration ways (including intakes and turbines), pollution, habitat loss, etc. will be different for different River Basin Districts (RBD) and could affect the eel stock as much as the effects of fishing.

Current monitoring is based on national programmes. Several of the long time-series may be stopped in the near future because of the decreased turnover of the local eel fisheries. However, in light of the poor state of the stock and the high anthropogenic impacts, it is of utmost importance that time-series of recruitment continue to be monitored and are preferably supplemented. If any fishery continues effort and yield will need to be monitored.

The European Commission initiated a Workshop on Data Collection for European Eel, from 6 to 8 September 2005 which concluded that the registration of fishing capacity, fishing effort, and landings should be continued and harmonized, that catch composition sampling should be enhanced, and that recruitment surveys require harmonization.

The recruitment level since 1990 is estimated to be less than 20% of the level observed not more than three generations ago. The European eel qualifies for the IUCN Red List of endangered species.

Evaluation of proposed management plans

Summary of the Commission proposal for a Recovery Plan on eel (COM(2005) 472 final)

The objective of the Recovery Plan is the escapement to the sea of at least 40% of the biomass of adult eel relative to the best estimate of the potential escapement from the river basin in the absence of human activities affecting the fishing area or stock.

The key measures of the proposal are a 50% reduction in eel fishing effort and the establishment of Eel Management Plans for each 'eel river basin' (see: EC 2000). Member states should communicate such plan(s) by 31 December 2006, to be implemented by 1 July 2007.

About the objective

The objective is related to the adult eel stock, but as females grow bigger than males (>50 cm against <45 cm) and sexual differentiation is density dependent, there is a risk that for some river basins the objective is reached with only male escapement due to directed harvesting of large fish. ICES recommends that the objective should be defined in terms of both sexes separately.

Due to the large uncertainties in eel management and biology (one single stock, spawning only once in their lifetime), ICES has proposed an escapement target of 50% which is higher than the target in the management plan.

The proposed reference state of the habitat, "in the absence of human activities affecting the fishing area or the stock", corresponds more or less to a pristine state. When an assessment is available for a river basin, the reference state can be modelled, otherwise reviewed historical data on eel abundance and glass eel recruitment should be used to obtain the reference level. In river basins where such data do not exist, data from adjacent or similar basins should be used.

About the temporary closure measure

ICES cannot evaluate the impact of the temporary closures on the state of the stock.

Other comments

ICES supports the approach taken in the proposal to develop management plans based on Eel River Basin Districts.

The eel stock is widely scattered over different countries and continents. The current proposal for the recovery of eel is restricted to the European part of the eel stock. A coordinated recovery plan over all countries and continents would therefore be beneficial for eel recovery.

An analysis of the stock dynamics under different management regimes indicates that the recovery time for eel could be at least 20 years, depending on the implemented fisheries restrictions and the model assumptions.

Restocking of eel has been practised by some countries for decades (Tables 9.4.9.2 and 9.4.9.3, Figure 9.4.9.4), but this has generally been to maintain fisheries rather than to improve the stock or recruitment. Since artificial reproduction is currently not possible for eel, all aquaculture and restocking is based on the capture of wild glass eels. It is an essential precondition that a surplus in local glass-eel exists for the restocking. There is no firm evidence that restocking is functional in improving the SSB or recruitment. The possibility exists that subsequent mortality of restocked eels may significantly reduce any benefits.

Ecosystem considerations

Movement and restocking of eel may involve a risk of decreased genetic variability. Although there is a general consensus that the European eel stock is one panmictic homogeneous stock, there are some dissenters from this view.

Movement and restocking could disrupt the migration behaviour and could lead to spreading of diseases and parasites. Productivity and survival of restocked individuals are sensitive to changes in habitats.

Factors affecting the fisheries and the stock

Seasonality of the fisheries

Glass eel fisheries all around Europe show a temporal distribution from October till May. Yellow eel fisheries mostly start in April, with an increase in catches to June/July and then a decrease until October when the season ends. The fishing pattern for the silver eel is similar to that for yellow eel, but the peak in the catches is in August–October.

Aquaculture of eel has increased rapidly since the early 1980s. By the year 2000 aquaculture was at the same level as the total yield (Figure 9.4.9.3). This means that an increasing part of the glass eel catches are devoted to aquaculture.

Regulations and their effects

Season closures have been applied locally in several areas. The effects of such closures to restrict fishing have not been evaluated. Season closure has been advised as a management measure to restrict the impact of fishing. In some countries there are license systems that control the glass eel fisheries.

The environment

Recent research indicated that the quality of spawners escaping from the continent might be seriously impaired by pollution, diseases, and parasites. The quality of spawners also varies with biological characteristics such as size and fat content. None of these quality parameters is currently included in the assessment of the status of the stock or in setting management targets. Implementation of basic field sampling programmes and further analysis will be required.

Scientific basis

Data and methods

There is no agreed assessment method for European eel. This is due to both methodological issues and lack of data. An assessment method for eel was proposed by Dekker (2000). Research in this area is currently ongoing (SLIME) with the aim to provide analytical tools to set reference levels and to evaluate the stock status and the impact of management measures for eel.

For some years there have been major inconsistencies between the official statistics on eel landings and ICES estimates. ICES finds that a major revision of the databases is required and has started this work. This report therefore only includes a catch table which is updated up to 2000.

Comparison with previous assessment and advice

There is no change in the perception of the status of the stock. The advice remains that urgent actions are needed to avoid the depletion of the eel stock.

Sources of information

Report from the ICES/EIFAC Working Group on Eels, Rome 23–27 January 2006. ICES CM 2006/ACFM:16.
Dekker, W. (2000). "A Procrustean assessment of the European eel stock." ICES Journal of Marine Science 57(4): 938.
EC (2000) Water Framework Directive, 2000/60/EC.
EC (2005) Proposal for the recovery of the European eel stock, COM(2005) 472.
ICES (2003). Report of the ICES Advisory Committee on Fishery Management 2002. ICES Cooperative Research Report no. 255.

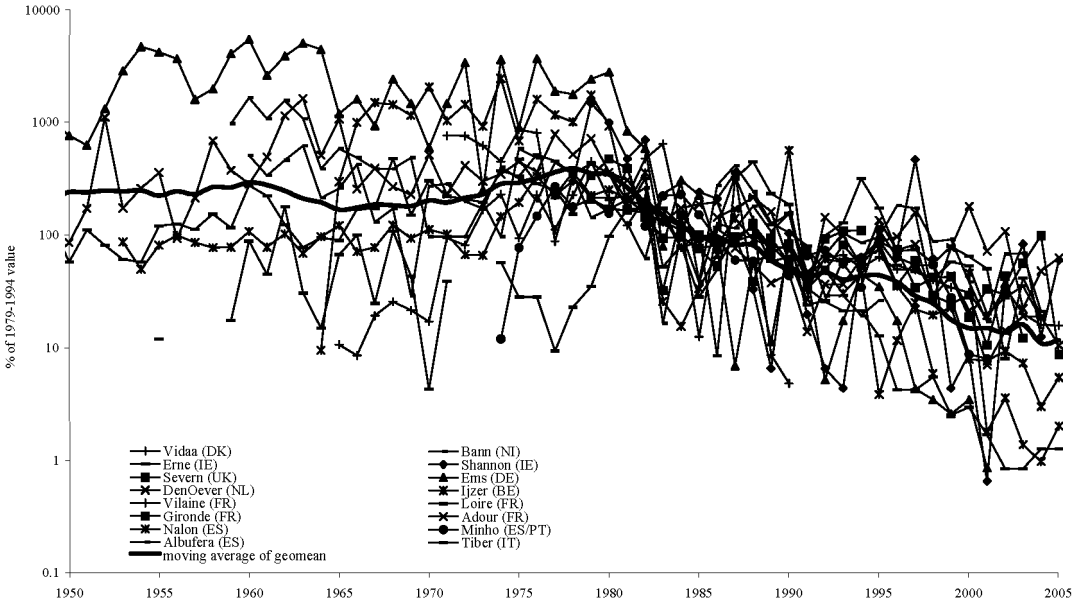


Figure 9.4.9.1 Time-series of **glass eel** monitoring in Europe. Each series has been scaled to the 1979–1994 average. The heavy line indicates the geometric mean of the series from Loire (F), Ems (D), Göta Älv (S), and DenOever (NL), which are the longest and most consistent time-series.

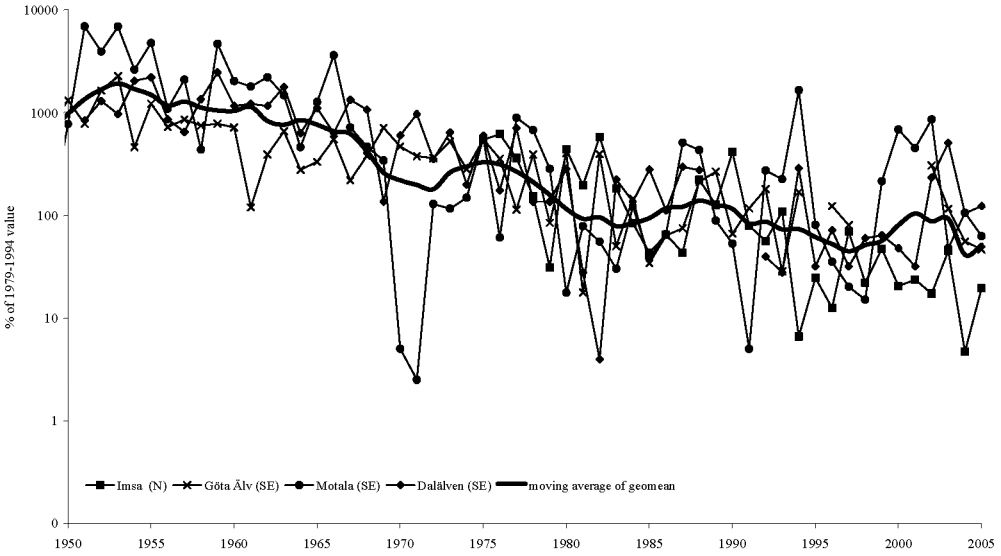


Figure 9.4.9.2 Time-series of **yellow eel** recruitment. Each series has been scaled to the 1979–1994 average. The heavy line indicates the geometric mean of all time-series.

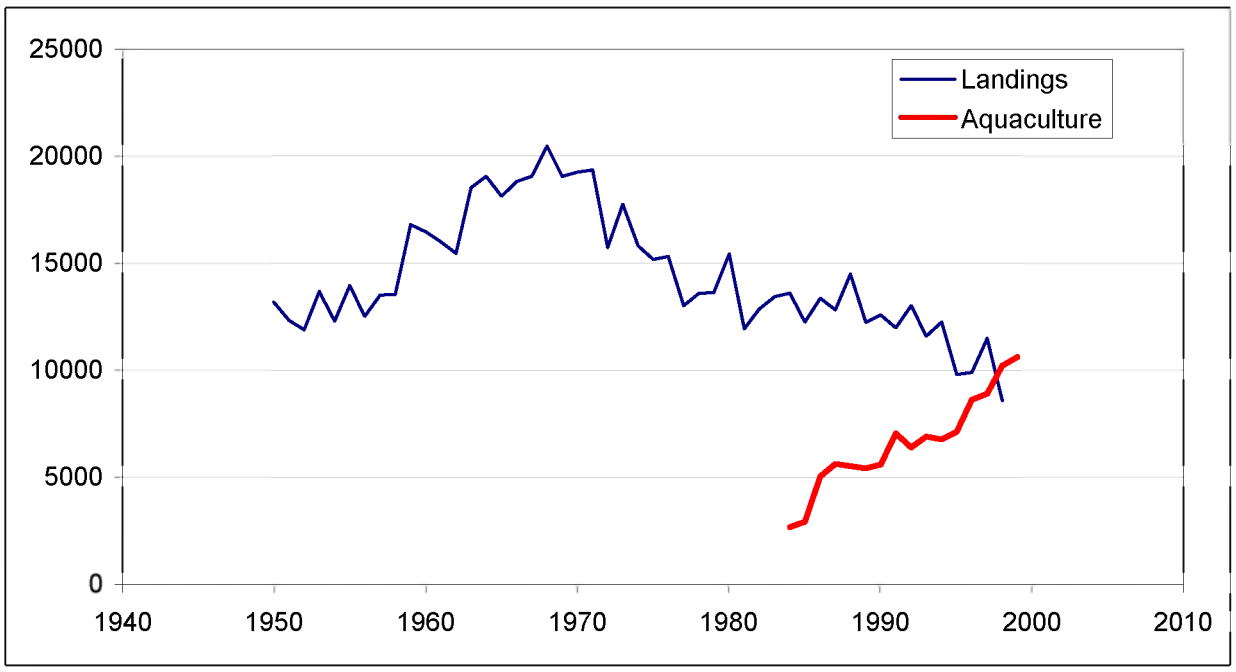


Figure 9.4.9.3 Landing statistics of the European eel (FAO data, with minor corrections) and trends in aquaculture production (in the EU) of the European eel. Unit: tonnes.

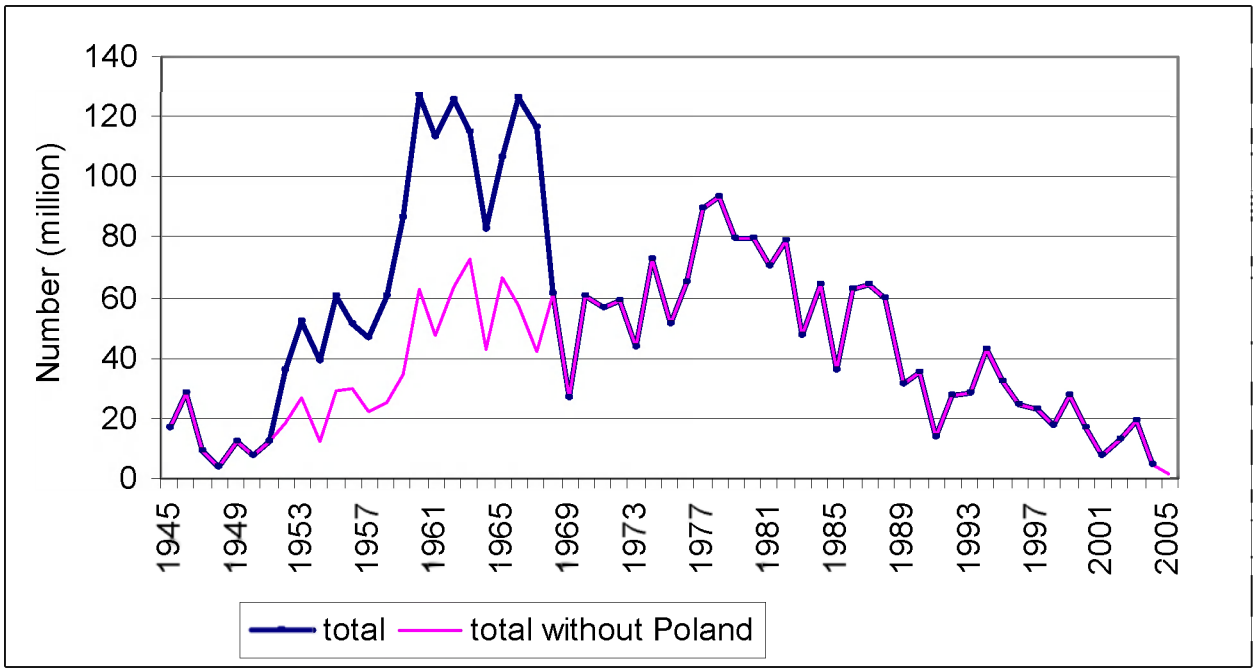


Figure 9.4.9.4 Stocking of European eel (**glass eel** and **yellow eel** combined) in East Germany, Netherlands, Sweden, Poland, Northern Ireland, and Belgium. Unit: millions. The data series of Polish restocking was discontinued in 1968, while the restocking continued.

Table 9.4.9.1 Recruitment data series (in the units in which they were reported)

year	NO	Sweden				DK	DE	N.Irl.	Ireland		UK	NL	BE	France					ES	PT/ES	IT	Geomean
	Imsa	Göta Älv	Viskan	Motala	Dalälven	Vidaa	Ems	Bann	Erne	Shannon	Severn	DenOever	IJzer	Vilaine	Loire	Gironde (CPUE)	Gironde (Yield)	Adour	Nalon	Minho	Tiber	
1950		2947		305			875					7.2			86							240
1951		1744		2713	210		719					14.1			166							239
1952		3662		1544	324		1516					91.0			121							247
1953		5071		2698	242		3275					14.8			91				14529			243
1954		1031		1030	509		5369					22.1			86				8318			248
1955		2732		1871	550		4795		167			30.4			181				13576			223
1956		1622		429	215		4194					8.0			187				16649			244
1957		1915		826	162		1829					18.2			168				14351			230
1958		1675		172	337		2263					58.1			230				12911			265
1959		1745		1837	613		4654		244			32.0			174				13071			264
1960		1605		799	289		6215	7409	1229			24.2			411				17975			292
1961		269		706	303		2995	4939	625			42.1			334				13060			278
1962		873		870	289		4430	6740	2469			97.0			185				17177			246
1963		1469		581	445		5746	9077	426			138.4			116				11507			210
1964		622		182	158		5054	3137	208			43.2	4		142				16139			194
1965		746		500	276		1363	3801	932			90.4	115	5	134				20364			168
1966		1232		1423	158		1840	6183	1394			21.7	385	4	253				11974			175
1967		493		283	332		1071	1899	345			33.3	575	9	258				12977			187
1968		849		184	266		2760	2525	1512			22.9	554	12	712				20556			183
1969		1595		135	34		1687	422	600			19.4	445	10	225				15628			180
1970		1046		2	150		683	3992	60			43.8	795	8	453				18753			203
1971		842	12	1	242	787	1684	4157	540			19.5	399	44	330				17032			194
1972		810	88	51	88	780	3894	2905				35.0	557	38	311				11219			214
1973		1179	177	46	160	641	289	2524				26.0	356	78	292				11056			230
1974		631	13	59	50	464	4129	5859	794			29.6	946	107	557				24481	1.6		285
1975	42945	1230	99	224	149	888	1031	4637	392			38.1	264	44	497				32611	10.6	11.00	290
1976	48615	798	500	24	44	828	4205	2920	394			31.0	618	106	770				55514	20.0	6.70	318
1977	28518	256	850	353	176	91	2172	6443	131	1.02		67.3	450	52	677				37661	36.6	5.90	360
1978	12181	873	533	266	34	335	2024	5034	320	1.37		44.0	388	106	526				59918	24.3	3.60	388
1979	2457	190	505	112	34	220	2774	2089	488	6.69	40	60.9	675	209	642	19.7	286		37468	28.4	8.40	352
1980	34776	906	72	7	71	220	3195	2486	1352	4.50	33	30.5	358	95	526	25.9	405		42110	21.3	8.20	343
1981	15477	40	513	31	7	226	962	3023	2346	2.15	32	26.0	74	57	303	20.0	332		34645	54.2	4.00	263
1982	45750	882	380	22	1	490	674	3854	4385	3.16	30	16.4	138	98	274	15.0	123		26295	16.4	4.00	187
1983	14500	113	308	12	56	662	92	242	728	0.60	6	11.0	10	69	260	13.6	80		21837	30.4	4.00	148
1984	6640	325	21	48	34	123	352	1534	1121	0.50	29	14.8	6	36	183	19.2	82		22541	31.4	1.80	121
1985	3412	77	200	15	70	13	260	557	394	1.09	19	15.3	13	41	154	9.6	65		12839	20.7	2.50	97
1986	5145	143	151	26	28	123	89	1848	684	0.95	16	16.1	26	53	123	10.6	45	8.0	13544	12.6	0.20	96
1987	3434	168	146	201	74	341	8	1683	2322	1.61	18	6.3	33	41	145	14.0	82	9.5	23536	8.2	7.40	83
1988	17500	475	92	170	69	141	67	2647	3033	0.15	23	4.7	48	47	177	10.9	33	12.0	15211	8.0	10.50	81
1989	10000	598	32	35		9	13	1568	1718	0.03	14	3.2	30	37	87	7.2	80	9.0	13574	9.0	5.50	59
1990	32500	149	42	21		5	99	2293	2152	0.47	16	3.9	218	36	96	5.6	48	3.2	9216	6.0	4.40	49
1991	6250	264	1	2			52	677	482	0.09	8	1.2	13	15	36	7.7	64	1.5	7117	9.0	0.80	42
1992	4450	404	70	108	10		6	978	1371	0.03	18	3.1	19	30	39	3.7	42	8.0	10259	10.0	0.60	47
1993	8625	64	43	89	7		20	1525	1785	0.02	21	3.1	12	31	91	8.2	69	5.5	9673	7.6	0.50	40
1994	525	377	76	650	72		52	1249	4400	0.29	21	5.0	18	24	95	8.7	46	3.0	9900	4.7	0.50	43
1995	1950		6	32	8		40	1403	2400	0.40		7.1	2	30	133	8.2	73	7.5	12500	15.2	0.30	44
1996	1000	277	1	14	18		20	2667	1000	0.33	14	8.0	5	23	81	4.8	31	4.1	5900	8.7	0.10	38
1997	5500	180	8	8	8		5	2533	1038	2.12	7	13.0	10	23	71	6.5	51	4.6	3656	7.4	0.10	29
1998	1750		5	6	15		4	1283	782	0.28	8	2.3	2	19	61	4.3	25	1.5	3273	7.4	0.13	25
1999	3750		2	85	16		3	1345	1246	0.02	8	3.6		16	87	7.5	44	4.3	3815	3.8	0.06	18
2000	1625		14	270	12		4	563	1074	0.04	4	1.8	18	14	80	6.6	25	10.0	1330	1.2	0.07	15
2001	1875		2	178	8		1	250	699	0.00	6	0.6	1	8	30	1.9	9	4.0	1285	1.1	0.04	15
2002	1375	685	26	339	59		-	1000	112	0.18	6	1.2	1	16	42	4.9	37	6.0	1569		0.02	14
2003	3775	261	44	19	127		-	1010	580	0.38	11	1.6	1	9	53	2.7	10	1.2	1231		0.02	16
2004	375	125	5	42	26		-	308	269	0.06	19	1.6	0	7	27			2.7	506		0.03	11
2005	1550	105	26	25	31				836	0.04		0.9	1	7				3.5	914		0.03	12

Table 9.4.9.2 Re-stocking of **glass eel** (in millions) in (eastern) Germany (D east), the Netherlands (NL), Sweden (S), Poland (PO), Northern Ireland (N.Irl.), Belgium (BE), Estonia (EE), and Finland (FI).

Year	D east	NL	SE	PL	N.Irl.	BE	EE	FI
1945					17.0			
1946		7.3			21.0			
1947		7.6						
1948		1.9						
1949		10.5						
1950	0	5.1						
1951	0	10.2						
1952	0	16.9		18				
1953	2	21.9		26				
1954	0	10.5		27				
1955	10	16.5		31	0.5			
1956	5	23.1		21			0.2	
1957	1	19.0		25				
1958	6	16.9		35				
1959	11	20.1		53	0.7			
1960	14	21.1		64	25.9		0.6	
1961	8	21.0		65	16.7		0.0	
1962	14	19.8		62	27.6		0.9	
1963	20	23.2		42	28.5		0.0	
1964	12	20.0		39	10.0		0.2	
1965	28	22.5		40	14.2		0.7	
1966	22	8.9		69	22.7		0.0	1.1
1967	23	6.9		74	6.7		0.0	3.9
1968	25	17.0		data	12.1		1.4	2.8
1969	19	2.7		series	3.1		0.0	
1970	28	19.0		discontinue d	12.2		1.0	
1971	24	17.0		restocking	14.1		0.0	
1972	32	16.1		continued.	8.7		0.1	
1973	19	13.6			7.6		0.0	
1974	24	24.4			20.0		1.8	
1975	19	14.4			15.1		0.0	
1976	32	18.0			9.9		2.6	
1977	38	25.8			19.7		2.1	
1978	39	27.7			16.1		2.7	3.7
1979	39	30.6			7.7		0.0	
1980	40	24.8			11.5		1.3	
1981	26	22.3			16.1		2.7	
1982	31	17.2			24.7		3.0	
1983	25	14.1			2.9		2.5	
1984	32	16.6			12.0		1.8	
1985	6	11.8			13.8		2.4	
1986	24	10.5			25.4		2.5	
1987	26	7.9			25.8		2.5	
1988	27	8.4			23.4		0.0	
1989	14	6.8			9.9		0.0	0.00
1990	11	6.1	0.7		13.3		0.0	0.06
1991	2	1.9	0.3		3.5		2.0	0.10
1992	6	3.5	0.3		9.4		2.5	0.10
1993	8	3.8	0.6		9.9	0.8	0.0	0.10
1994	8	6.2	1.7		16.4	0.5	1.9	0.10
1995	1	4.8	1.5		13.5	0.5	0.0	0.20
1996	0	1.8	2.4		11.1	0.5	1.4	0.07
1997	0	2.3	2.5		10.9	0.4	0.9	0.08
1998	0	2.5	2.1		6.2	0.0	0.5	0.08
1999	0	2.9	2.3		12.0	0.8	2.3	0.06
2000	0	2.8	1.3		5.4	0.0	1.1	0.06
2001		0.9	0.8		3.0	0.2		0.05
2002		1.6	1.4		6.6	0.0		0.06
2003		1.6	0.6		9.2	4.5		0.00
2004		0.3	0.8		3.0	0.0		0.06
2005			0.7					0.06

Table 9.4.9.3 Re-stocking of **yellow eel** (in millions) in (eastern) Germany (D east), the Netherlands (NL), Sweden (S), Denmark (DK), and Belgium (BE), Estonia (EE), and Finland (FI).

Year	D east	NL	SE	DK	BE	EE	FI
1945							
1946							
1947		1.6					
1948		2.0					
1949		1.4					
1950	0.9	1.6					
1951	0.9	1.3					
1952	0.6	1.2					
1953	1.5	0.8					
1954	1.1	0.7					
1955	1.2	0.9					
1956	1.3	0.7					
1957	1.3	0.8					
1958	1.9	0.8					
1959	1.9	0.7					
1960	0.8	0.4					
1961	1.8	0.6					0.05
1962	0.8	0.4					0.14
1963	0.7	0.1					0.00
1964	0.8	0.3					0.08
1965	1.0	0.5					0.11
1966	1.3	1.1					0.05
1967	0.9	1.2					0.00
1968	1.4	1.0					0.00
1969	1.4	0.0					0.04
1970	0.7	0.2					0.03
1971	0.6	0.3					
1972	1.9	0.4					
1973	2.7	0.5					
1974	2.4	0.5					
1975	2.9	0.5					0.04
1976	2.4	0.5					0.02
1977	2.7	0.6					0.03
1978	3.3	0.8					0.01
1979	1.5	0.8					0.08
1980	1.0	1.0					
1981	2.7	0.7					
1982	2.3	0.7					
1983	2.3	0.7					
1984	1.7	0.7					
1985	1.1	0.8					
1986	0.0	0.7					
1987	0.0	0.4		1.6			
1988	0.0	0.3		0.8		0.2	
1989	0.0	0.1		0.4			
1990	0.1	0.0	0.8	3.5			
1991	0.1	0.0	0.9	3.1			
1992	0.1	0.0	1.1	3.9			
1993	0.2	0.2	1.0	4.0	0.2		
1994	0.2	0.0	1.0	7.4	0.1		
1995	0.7	0.0	0.9	8.4	0.1	0.2	
1996	0.9	0.2	1.1	4.6	0.1		
1997	1.5	0.4	1.1	2.5	0.1		
1998	1.2	0.6	0.9	3.0	0.1		
1999	1.1	1.2	1.0	4.1	0.1		
2000	1.0	1.0	0.7	3.8	0.0		
2001		0.1	0.4	1.7	0.0	0.4	
2002	0.4	0.1	0.3	2.4		0.4	
2003		0.1	0.3	2.2		0.5	
2004		0.1	0.1			0.4	
2005						0.4	

Table 9.4.9.4 Statistics of eel landings, reported in the FAO database of fishing yields. These data include landings of 'river eels' in Atlantic waters, the Mediterranean and Inland waters. Data for several countries have been corrected, e.g. for erroneous inclusion of aquaculture.

year	Norway	Sweden	Denmark	Germany	Ireland	UK	Netherlands	France	Spain	Portugal	Italy	Remaining Europe	Northern Africa	Total
1950	300	2188	4500	400			4200	500	100		1000			13188
1951	300	1929	4400	400			3700	500	100		1000			12329
1952	200	1598	3900	400			4000	700	100		1000			11898
1953	400	2378	4300	500		400	3100	600	100		1000	900		13678
1954	300	2106	3800	300		500	2100	500	900		1000	800		12306
1955	500	2651	4800	500		700	1700	500	600		1000	1000		13951
1956	300	1533	3700	400		600	1800	500	800		2000	900		12533
1957	400	2225	3600	400		600	2500	500	500		2000	800		13525
1958	400	1751	3300	400	100	600	2700	500	500		2100	1200		13551
1959	400	2789	4000	500	100	500	3400	900	500		3000	700		16789
1960	400	1646	4723	400	0	800	3000	1300	500		2700	1000		16469
1961	500	2066	3875	500	100	800	2660	1300	400		2600	900	300	16001
1962	400	1908	3907	400	100	700	1543	1300	800		3100	1000	300	15458
1963	500	2071	3928	2100	100	700	1818	1400	1100		3500	1000	300	18517
1964	400	2288	3282	1900	100	600	2368	1400	1700		3500	1100	400	19038
1965	500	1802	3197	1500	200	800	2509	1700	1300		3200	900	500	18108
1966	500	1969	3690	1700	100	1000	2739	1300	1300		3100	1000	400	18798
1967	500	1617	3436	1900	100	600	2884	2000	1400		3100	1100	400	19037
1968	600	1808	4218	1800	100	600	2622	2700	1300		3200	1100	400	20448
1969	500	1675	3624	1600	100	600	2741	1900	1400		3400	1100	400	19040
1970	400	1309	3309	1600	200	800	1512	4200	1100		3300	1400	100	19230
1971	400	1391	3195	1300	100	800	1153	4900	1100		3400	1500	100	19339
1972	400	1204	3229	1300	100	700	1057	2600	1000		2900	1138	100	15728
1973	400	1212	3455	1300	100	800	1023	3900	700		2900	1150	800	17740
1974	383	1034	2814	1285	67	817	994	2493	1300	42	2697	1528	352	15806
1975	411	1399	3225	1398	79	833	1173	1590	570	44	2973	1400	85	15180
1976	386	935	2876	1322	150	694	1306	2959	675	38	2677	1254	47	15319
1977	352	989	2323	1317	108	742	929	1538	666	52	2462	1384	159	13021
1978	347	1076	2335	1162	76	877	862	2455	655	44	2237	1357	112	13595
1979	374	956	1826	1164	110	879	687	3144	394	25	2422	1518	134	13633
1980	387	1112	2141	1051	75	1053	828	4503	300	32	2264	1242	448	15436
1981	369	887	2087	1033	94	858	876	1425	250	33	2340	1192	497	11941
1982	385	1161	2378	1027	144	1032	1097	1469	200	14	2087	1419	455	12868
1983	324	1173	2003	1029	117	1113	1230	1856	150	11	2076	1782	575	13439
1984	309	1073	1745	911	88	957	681	2336	150	80	2361	2445	477	13613
1985	352	1140	1519	866	87	781	666	2288	200	76	1907	2123	258	12263
1986	271	943	1552	887	87	997	729	2924	200	633	1928	1867	356	13374
1987	282	897	1189	731	221	939	512	2378	259	566	2076	2479	306	12835
1988	513	1162	1759	746	215	715	590	2879	205	501	2165	2790	256	14496
1989	312	952	1582	678	400	1075	645	2482	83	6	1301	2365	368	12249
1990	336	942	1568	976	256	1039	657	2484	75	295	1199	2209	560	12596
1991	323	1084	1366	1010	245	822	707	2260	65	314	1106	2337	358	11997
1992	373	1180	1342	1026	234	782	621	1964	60	674	1662	2749	358	13025
1993	340	1210	1023	1027	260	752	320	1674	55	505	1307	2509	613	11595
1994	472	1553	1140	585	300	873	369	1417	50	979	986	2797	732	12253
1995	454	1205	840	585	400	808	279	500	106	10	886	2572	1176	9821
1996	352	1134	718	696	550	895	336	563	97	21	883	2676	984	9905
1997	497	1382	758	746	550	807	315	1942	113	16	1010	2034	1327	11497
1998	353	645	557	717	670	741	346	491	160	13	682	2159	1069	8603
1999	475	734	686	747	675	697	372	189	166	3		1532	1257	7533
2000	281	561	620	686	250	796	368	247	48	29		604	30	4520
2001		429			110	795	351							1685
2002														
2003														
2004														
2005														

Table 9.4.9.5 Aquaculture production of European eel in Europe and Japan. Compilation of production estimates (tonnes) derived from reports of previous WG meetings, FAO, FEAP and others. Data after 2001 probably incompletely reported.

Year	Norway	Sweden	Denmark	Germany	Ireland	UK	Netherlands	Belgium/Lux.	Spain	Portugal	Italy	Greece	Hungary	Czech. Rep.	Croatia	Yugoslavia	Macedonia	Morocco	Tunisia	Algeria	Total		Japan
1984		12	18						15	60	2600					44					2749		
1985		41	40						20	60	2800					52					3013		3000
1986		51	200						25	590	4200	6				48					5120		
1987		90	240			20	100		37	566	4600	4				49					5706		
1988		203	195			30	300	30	32	501	4250	10	90			19				72	5732		
1989		166	430			0	200	30	57	6	4500	54	39			10				53	5545		
1990		157	586			0	600	125	98	270	3700	94	73			5		35	150	22	5915		
1991		141	866				900	125	105	622	4185	132	33		7	1		41	151	1	7310		
1992		171	748				1100	125	175	505	3265	337		2	5	8	1	68	250	0	6760		
1993	120	169	782	100			1300	125	134	979	3000	341	50	4	5	2	0	85	260	22	7358		
1994	200	160	1034	100		25	1450	150	214	200	2800	659		4	7	9	70	55	108	20	7065		
1995	200	139	1324	100			1540	140	249	110	3000	550	50	3	6	5	83	55	158	17	7529		
1996	200	161	1568	150		25	2800	150	266	200	3000	312		3	7	5	60	56	147	17	8927		
1997	200	189	1913	150			2450	150	270	200	3100	500		3		5	72	42	108	17	9169		
1998		204	2483	150			3250	40	300	200	3100	500	19	1		6	60	27		22	10362		
1999		222	2718	150			3500	20	425	200	3100	300	19	1		6	50	28		15	10754		
2000		273	2674	300	100		3800	50	200		2750	600		1		5	32	60		18	10863		10000
2001		200	2000	160			4000	55	259		2500	735		1		4		28		20	9962		
2002		167	1880				4000				1900										7947		
2003		170	2050				4200														6420		
2004		158	1700			328	4500														6686		
2005							4500														4500		
Sum	920	3244	25449	1360	100	428	44490	1315	2881	5269	62350	5134	373	23	37	283	428	580	1332	316	155392		13000

9.4.10 Ling (*Molva molva*) in all areas

There is insufficient scientific information to establish the extent of putative stocks; however, ling may be sufficiently isolated at separate fishing grounds to be considered as individual management units. On this basis advice is presented for the following management units: Subdivisions I and II (Arctic); Va (Iceland); Vb (Faroes); and IIIa, IVa, VI, VII, VIII, IX, XII, and XIV (other areas). The latter grouping is a combination of isolated fishing grounds and these areas are grouped thus due to their mutual of lack of data.

Ling is primarily fished in the depth range 200–500 m, though it is also found an shallower depths. This species is not believed to have such extreme low productivity and high longevity as "typical" deepwater species, though specific data for many areas are lacking.

With the exception of Division Va, cpue indicators show stable or slightly increasing trends at a much lower level than earlier in the time-series. For Division Va, a survey index suggests that the stock is at the same high level as at the time when the survey series began in 1985.

The precautionary advice is to decrease catches compared to last year in areas where indicators show stable (and low) abundance, and to maintain stable catches in areas where indicators show increasing abundance.
There are no specific management objectives for ling in any of the units given below.

The previous advice was based on cpue trends and this continues to be the case. ICES advised on a 30% reduction in effort in 2004 compared to the 1998 level. Since then, cpue appears to have increased in some areas and landings have remained at the same level. This could indicate a reduction in effort. At least part of the cpue increase is considered to reflect a stock increase.

9.4.10.1 Ling in Divisions I and II

State of the stock

Commercial cpue indicates that the abundance which remained at a reduced level from the 1970s to the 1990s may have been increasing in recent years.

Reference points

Reference points that were previously suggested for ling were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max,}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$ (where U is an index of catch per unit effort). The catch history of ling extends well before the beginning of the available cpue series. The cpue in the early part of the series is very noisy and the available cpue for early and later periods are differently defined (see Figure 9.4.10.1.2), $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

The cpue shows an increasing trend while the catches have been stable. However, the cpue also suggests a lower current abundance than in the 1980s. Therefore, advice in a precautionary context is to maintain catches below the recent level of about 6000 t, which is assumed to permit an increase in abundance.

Management considerations

The cpue is used as an indicator of stock trend. However, it is unclear whether the increase in cpue is affected by an increase in efficiency of fishing.

Factors affecting the fisheries

The major fisheries are the Norwegian longline and gillnet fisheries, but there are also bycatches in other gears, i.e. trawls and handline. Of the Norwegian landings, around 50% are taken by longline and 45% by gillnet, partly in directed ling fisheries and partly as bycatch in fisheries for other groundfish. Other nations catch ling as a bycatch in trawl fisheries.

Scientific basis

Summaries of the total landings are given in Table 9.4.10.1.1 and Figure 9.4.10.1.1. Landings by Subarea and by nation are given in Table 9.4.10.1.2.

Landings were available for all relevant fleets. New discard data were not available. Length compositions/mean lengths are available from 1976 to the present, based on data from the Norwegian longliners, Catch and effort data for Norwegian longliners were available, both from the overall fleet and for a set of 4 vessels, "the reference fleet", with which there is a special agreement on reporting for scientific purposes. This series comprises the years 2000–2005. For the period 1971–1994, a series of standardised cpue estimates is available derived from skippers' logbooks. These two cpue series are shown in Figure 9.4.10.1.2.

Comparison with previous assessment and advice

The information base is similar to previous assessments. The previous advice was for a 30% reduction in fishing effort. compared to the 1998 level. The current advice is to continue the current catches (around 30% of 1998 catches).

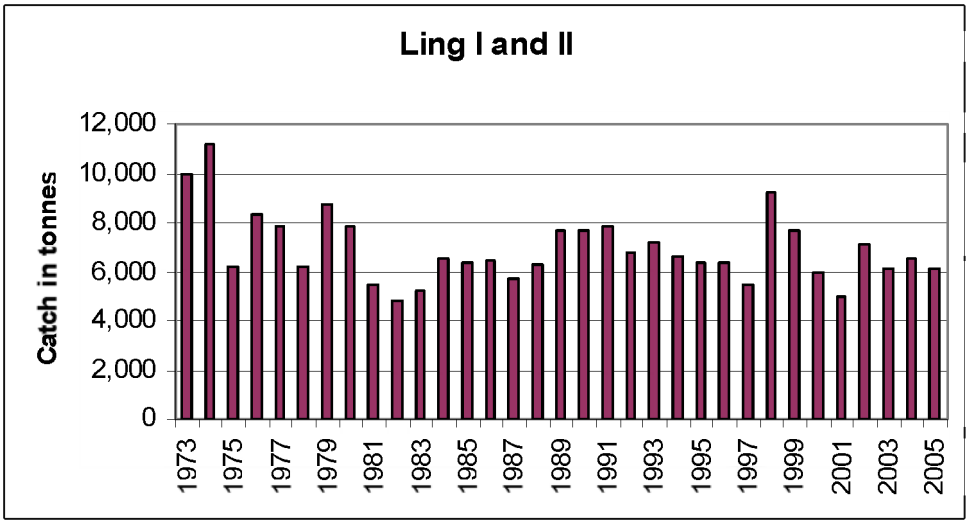


Figure 9.4.10.1.1 Ling in Divisions I and II. Catch by year.

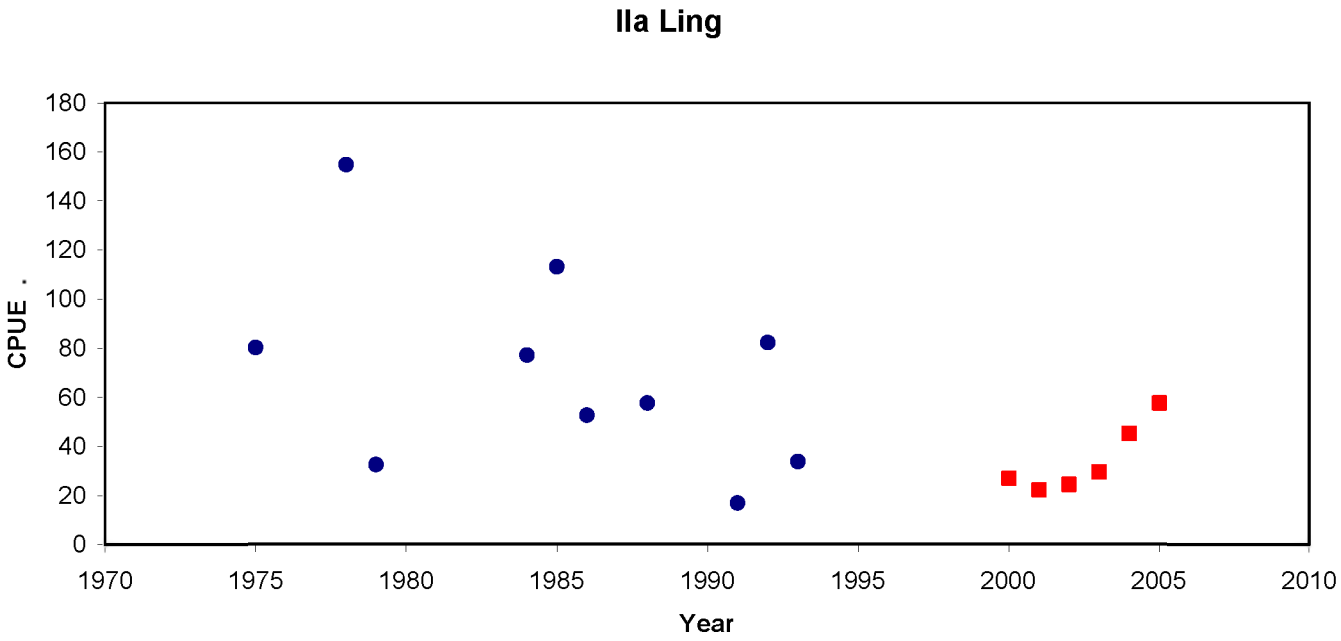


Figure 9.4.10.1.2 Ling in Division IIa. Estimates of Norwegian longline cpue (kg/1000 hooks) based on skippers' logbooks (pre-2000) and reports from a set of selected vessels "reference fleet".

Table 9.4.10.1.1. Ling in Divisions I and II. Catch.

Year	ACFM Catch
1988	6
1989	7
1990	8
1991	8
1992	7
1993	7
1994	6
1995	6
1996	6
1997	5
1998	9
1999	8
2000	6
2001	5
2002	7
2003	6
2004	7
2005	6

Weights in '000 t.

Table 9.4.10.1.2 Ling in Division I. WG estimates of landings.

Year	Norway	Iceland	Scotland	Faroes	Total
1996	136				136
1997	31				31
1998	123				123
1999	64				64
2000	68	1			69
2001	65	1			66
2002	182		24		206
2003	89				89
2004	323			22	345
2005*	114				114

*Preliminary

Ling in Division IIa. WG estimates of landings.

Year	Faroes	France	Germany	Norway	E & W	Scotland	Russia	Total
1988	3	29	10	6,070	4	3		6,119
1989	2	19	11	7,326	10	-		7,368
1990	14	20	17	7,549	25	3		7,628
1991	17	12	5	7,755	4	+		7,793
1992	3	9	6	6,495	8	+		6,521
1993	-	9	13	7,032	39	-		7,093
1994	101	n/a	9	6,169	30	-		6,309
1995	14	6	8	5,921	3	2		5,954
1996	0	2	17	6,059	2	3		6,083
1997	0	15	7	5,343	6	2		5,373
1998		13	6	9,049	3	1		9,072
1999		11	7	7,557	2	4		7,581
2000		9	39	5,836	5	2		5,891
2001	6	9	34	4805	1	3		4858
2002	1	4	21	6886	1	4		6917
2003	7	3	43	6001		8		6062
2004	15		3	6114		1	5	6138
2005*	4	4	6	6071	2		2	6089

*Preliminary.

9.4.10.2 Ling in Subdivision Va

State of the stock

A survey biomass index shows increasing abundance since 2000. The levels are currently at a similar high level as in the start of the series.

Reference points

Reference points that were previously suggested for ling were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$ (U is the survey index). Given that the catch history of ling extends well before the beginning of the available survey series, $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

The biomass index shows an increasing trend while the catches have been stable. Advice in a precautionary context is to maintain catches at the recent level (2001–2004) level of about 3800 t, at which level the stock has increased. This fishery should not expand until it is confirmed that the stock has recovered to the levels before 1990.

Management considerations

Ling is a bycatch in the Icelandic longline and trawl fisheries, which is mainly directed at cod.

Factors affecting the fisheries

The fishery is limited by a specific TAC for ling. Bycatches of ling in the cod fishery only occurs in some areas.

Scientific basis

The assessment is based on the Icelandic March groundfish survey. The trends are confirmed by the October survey.

Comparison with previous assessment and advice
The perception of the stock has changed since the last advice, from being stable at a very low level to being increasing. This change is due to increases detected in the biomass index. The advice in 2004 was for a 30% decrease in effort compared to 1998. This year the advice is to maintain catches at a recent average (low) level.

Year	ICES Advice	Predicted landings corresp. to (single-stock) exploitation boundaries/advice	Agreed TAC[1]	Official landings	ACFM landings
1988					5 846
1989					5 547
1990					5 556
1991					5 782
1992					5 106
1993					4 840
1994					4 604
1995					4 318
1996					4 277
1997					4 146
1998					4 316
1999					4 509
2000					3 696
2001			3000		3 222
2002			3000		3 256
2003			3000		4 162
2004			4000		4 470
2005			5000		5 065
2006					
2007	Maintain catches at 2001–2004 level	3800			

1. TACs set by Iceland

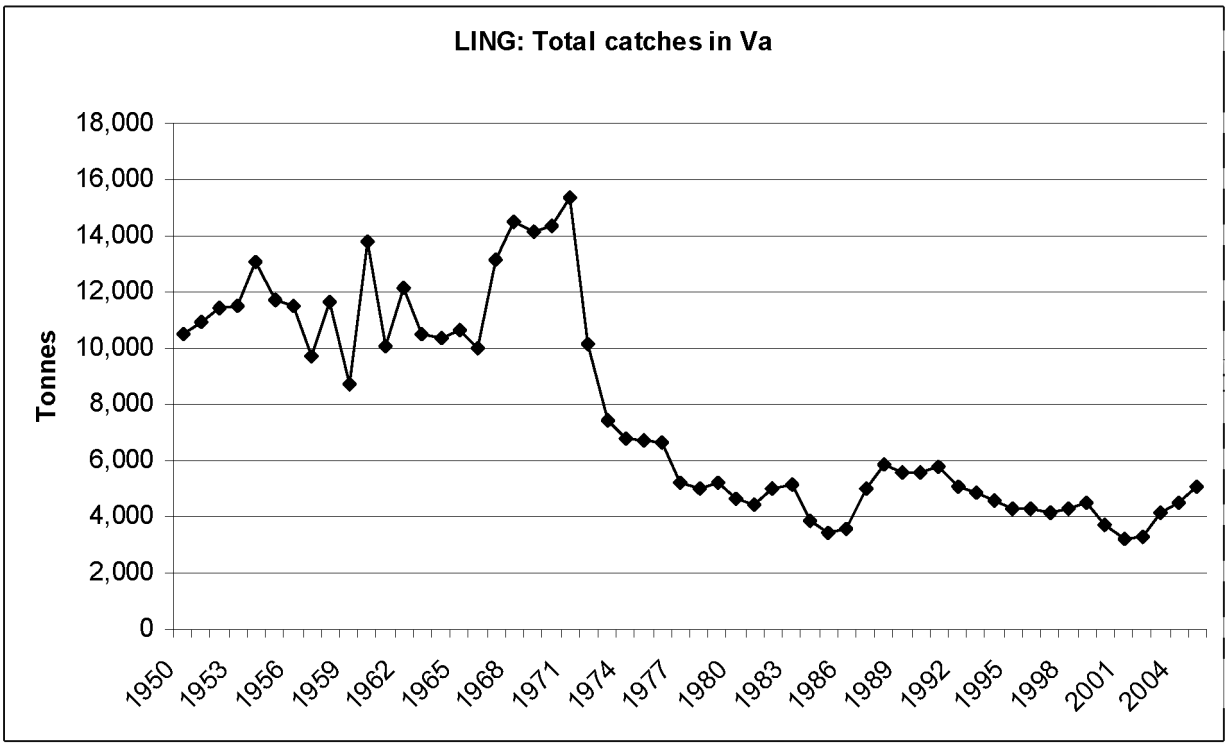


Figure 9.4.10.2.1 Ling. Landings in ICES Division Va since 1950.

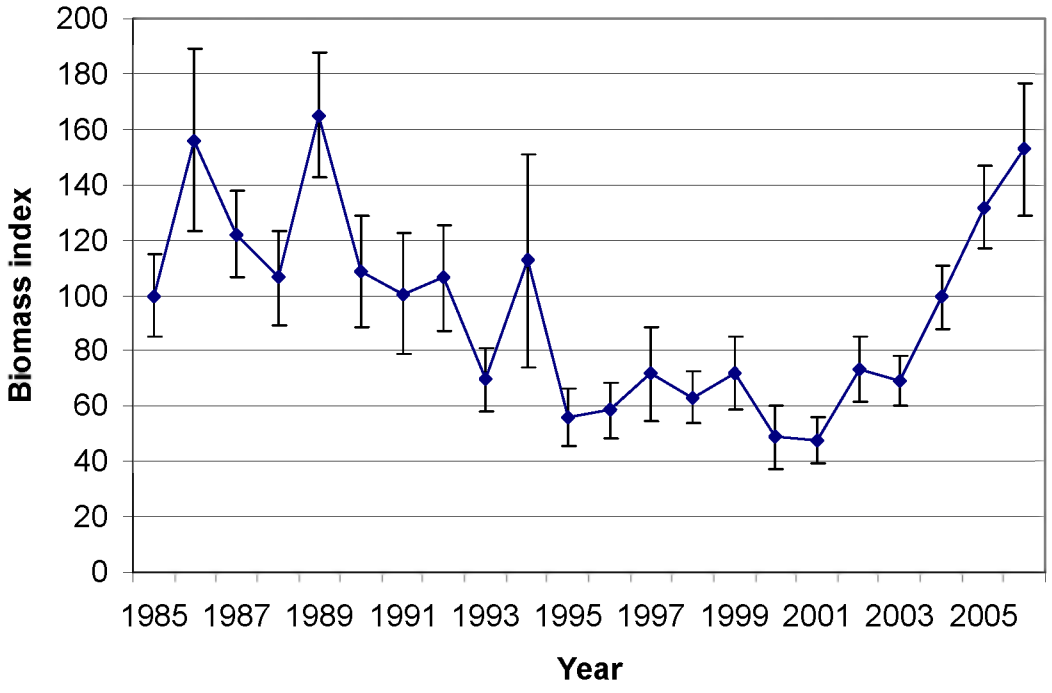


Figure 9.4.10.2.2 Ling. Index on fishable biomass (40 cm +), calculated from the Icelandic groundfish survey at the Icelandic shelf.

Table 9.4.10.2.1 Ling. Landings in ICES Division Va since 1950.

Year	Iceland	Other nations	Total
1950	3 551	6 947	10 497
1951	3 278	7 651	10 929
1952	4 420	7 034	11 454
1953	3 325	8 145	11 470
1954	3 442	9 653	13 095
1955	3 972	7 721	11 693
1956	3 823	7 702	11 525
1957	3 591	6 096	9 687
1958	4 195	7 468	11 663
1959	2 681	6 019	8 700
1960	6 774	6 996	13 770
1961	6 032	4 034	10 066
1962	7 073	5 044	12 117
1963	5 607	4 885	10 492
1964	4 976	5 398	10 374
1965	4 811	5 847	10 658
1966	4 559	5 473	10 032
1967	7 531	5 621	13 152
1968	8 697	5 829	14 526
1969	8 677	5 461	14 138
1970	8 345	6 017	14 362
1971	8 867	6 524	15 391
1972	6 085	4 092	10 177
1973	3 564	3 897	7 461
1974	3 868	2 907	6 775
1975	3 748	2 950	6 698
1976	4 538	2 103	6 641
1977	3 433	1 815	5 248
1978	3 439	1 559	4 998
1979	3 759	1 443	5 202
1980	3 149	1 475	4 624
1981	3 348	1 100	4 448
1982	3 733	1 252	4 985
1983	4 256	887	5 143
1984	3 304	574	3 878
1985	2 980	460	3 440
1986	2 948	648	3 596
1987	4 154	820	4 974
1988	5 083	763	5 846
1989	4 833	714	5 547
1990	5 115	441	5 556
1991	5 182	600	5 782
1992	4 546	560	5 106
1993	4 319	521	4 840
1994	4 053	551	4 604
1995	3 729	589	4 318
1996	3 670	607	4 277
1997	3 626	518	4 146
1998	3 603	713	4 316
1999	3 973	536	4 509
2000	3 221	475	3 696
2001	2 863	359	3 222
2002	2 830	426	3 256
2003	3 584	578	4 162
2004	3 726	744	4 470
2005[1)]	4 306	750	5 065

[1)] *Provisional figures.*

9.4.10.3 Ling in Subarea Vb

State of the stock

Based on data from Norwegian and Faroese longliners, cpue declined during the 1980s and has remained at about half the level that it was in the 1970s.

Reference points

Reference points previously suggested for ling are: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max.}$ Given that the catch history of ling extends well before the beginning of the available cpue series, $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

Based on the current perception of status and trends and as part of an adaptive management strategy, effort should not be allowed to increase.

Management considerations

There is no species-specific management of ling in Division Vb, only minimum landing size (60 cm). The exploitation is influenced by regulations aimed at other groundfish species, e.g. cod, haddock, and saithe.

Factors affecting the fisheries

The major fishery is the Faroese and Norwegian longline fisheries, but there are also bycatches by other gears, i.e. trawls, gillnet, and handline. Of the Faroese landings, around 60% are taken by longline partly in directed ling fisheries and 30% as bycatch by trawlers in fisheries for other groundfish. The Norwegian longliners catch about 40–50% of the total ling landings in Division Vb and other nations catch ling as a bycatch in trawl fisheries.

Scientific basis

cpue data from Faroese and Norwegian longliners are available from 1973 and 1986, respectively. cpue from Faroese pair trawlers are available from 1985. The longline cpue were considered as a reliable basis for providing advice. The Faroese pair trawl data are consistent with the longline data.

Comparison with previous assessment and advice

The advice in 2004 was 'not to allow the effort to increase'. The previous advice was based on cpue trends, which have not changed. Therefore there is no change in the advice.

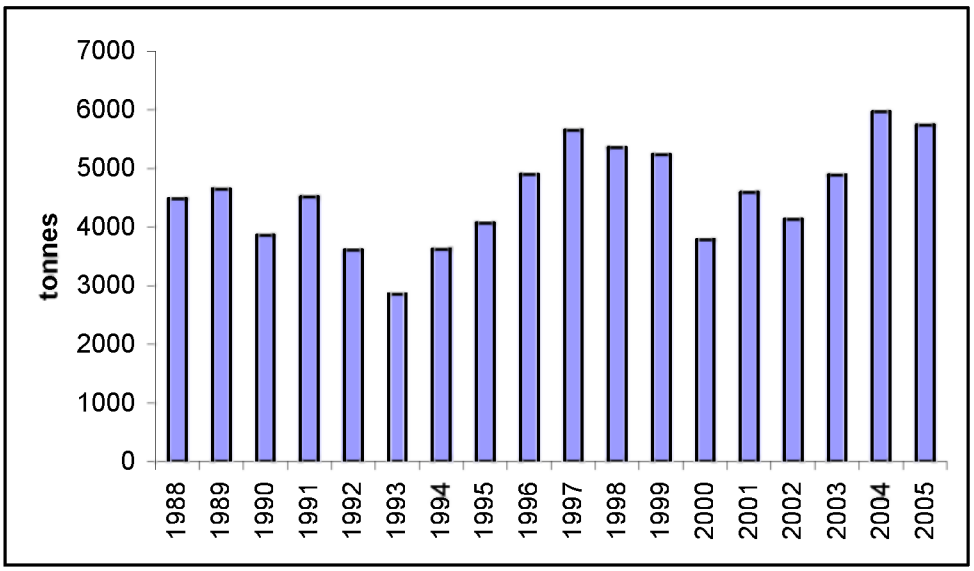


Figure 9.4.10.3.1 Ling in Division Vb. Landings (tonnes).

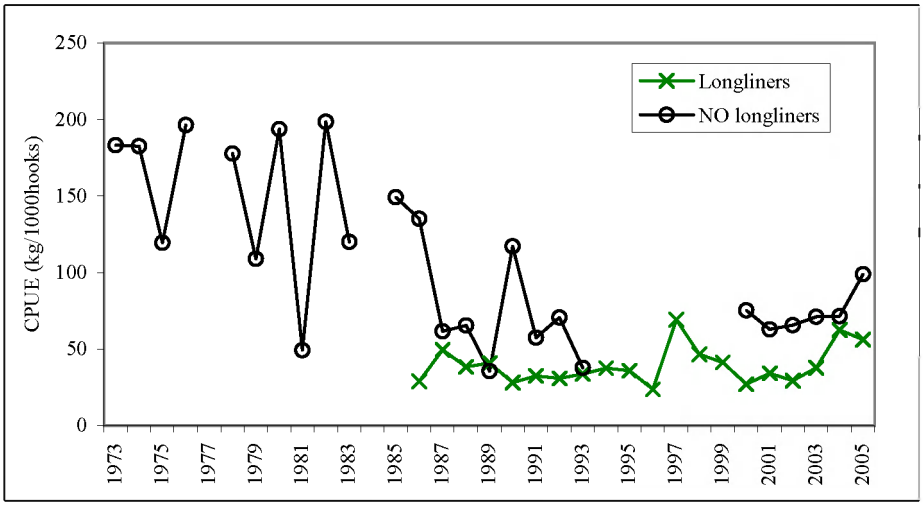


Figure 9.4.10.3.2 Ling in Division Vb. Cpue (kg/1000 hooks) from commercial Faroese longliners >100 GRT and Norwegian longliners (NO).

Table 9.4.10.3.1 Ling in Division Vb. Landings table (tonnes).

Year	Vb1	Vb2	All areas
1988	2372	2116	4488
1989	2962	1690	4652
1990	3062	795	3857
1991	3465	1047	4512
1992	2400	1214	3614
1993	2242	614	2856
1994	2657	965	3622
1995	3286	784	4070
1996	3996	900	4896
1997	4733	924	5657
1998	4029	1330	5359
1999	4576	662	5238
2000	3386	399	3785
2001	4091	497	4588
2002	3681	457	4138
2003	3966	927	4893
2004	5720	247	5967
2005*	5097	647	5744

*Preliminary.

9.4.10.4 Ling in Divisions IIIa and IVa, and in Subareas VI, VII, VIII, IX, XII, and XIV

State of the stocks

The cpue series of the main fleet in Divisions IVa, Via, and VIb suggest that the abundance has remained at a reduced level after the decline in the 1970s to 1990s (Figure 9.4.10.4.2).

Reference points

Reference points previously suggested for ling are: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$. ICES considers that the available cpue series are not suitable for defining $\mathbf{U}_{max}$ because the definition of effort may not be consistent between different periods.

Exploitation boundaries

Landings of ling have declined in recent years and the overall cpue on ling has remained at a reduced level. ICES recommends to reduce catches to 10 000 t (about 30%) and to monitor if the indicators show that stock sizes increase.

Management considerations

The major directed fishery for ling in Subdivision VI is by Norwegian longliners. Trawl fisheries in the United Kingdom (Scotland) and France primarily take ling as bycatch.

The fishery covers a wide area and to avoid local overexploitation disproportionate allocation of effort among areas should be avoided.

Factors affecting the fisheries

Since 2003 an annual unilateral TAC was introduced by the EC for all Subareas, and the regulation is valid for EU vessels fishing in the EU EEZ as well as in international waters. There is no species-specific regulation in the Norwegian EEZ. A TAC is negotiated for Norwegian vessels fishing in EU waters.

Changes in fishing technology and fishing patterns

The major directed fishery for ling in Divisions IVa and VI is by Norwegian longlining. The bulk of the landings from other countries are bycatches in trawl fisheries mainly for roundfish or deep-sea species. The landings from the central and southern North Sea (IVb, c) are bycatches in various other fisheries. In Subarea VII the main landings are generated by Norwegian and some Irish and Spanish longline fisheries. In Subareas VIII, IX, XII, and XIV all landings are bycatches in various fisheries.

Scientific basis

Total landings for ling by area are presented in Table 9.4.10.4.1. Landings were available for all relevant fleets. Discard data were not available.

Catch and effort data for Norwegian longliners are available, both from the overall fleet (1971–1994) and from a "reference fleet" of 4 vessels (2000–2005). The reference fleet is by special agreement tasked with reporting to science and supplies information on catch rates and biological measurements. The cpue series in the period 1971–1994 is derived from skippers' logbooks. The cpue series for 2000–2005 is based on catch and effort in number of hooks per day. The consistency between the two series needs to be further explored. The reference fleet may not cover the entire area.

Comparison with previous assessment and advice

The interpretation of the information on the stock has changed since the advice in 2004. The advice in 2004 was for a 30% decrease in effort compared to 1998. Landings have decreased substantially since 1998 but this reduction has not resulted in an increase in cpue. The advice for a 30% reduction in landings this year is an adaptive approach based on landings (and implicitly effort).

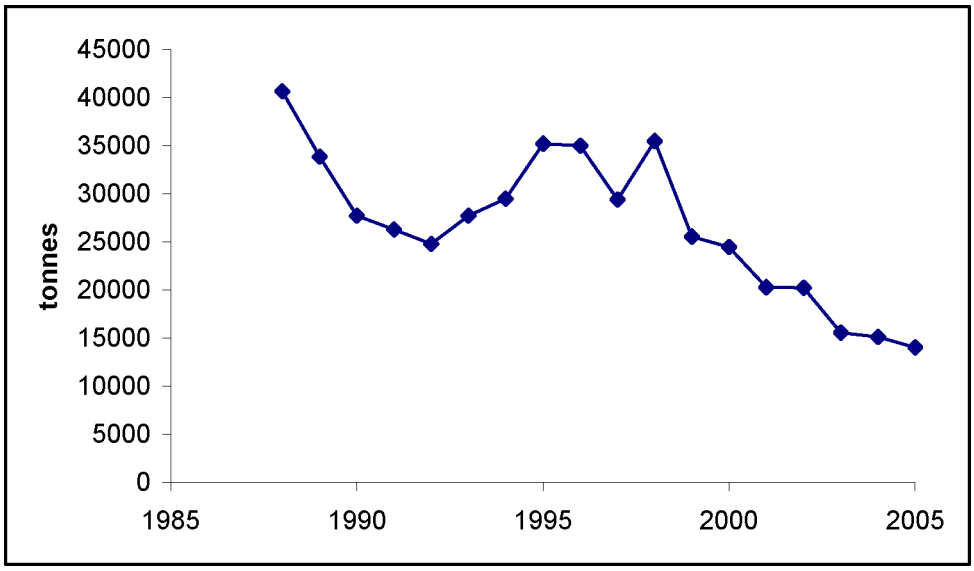


Figure 9.4.10.4.1 Landings of ling in Divisions and Subareas IIIa, IVa, VI, VII, VIII, IX, XII, and XIV, based on ICES estimates.

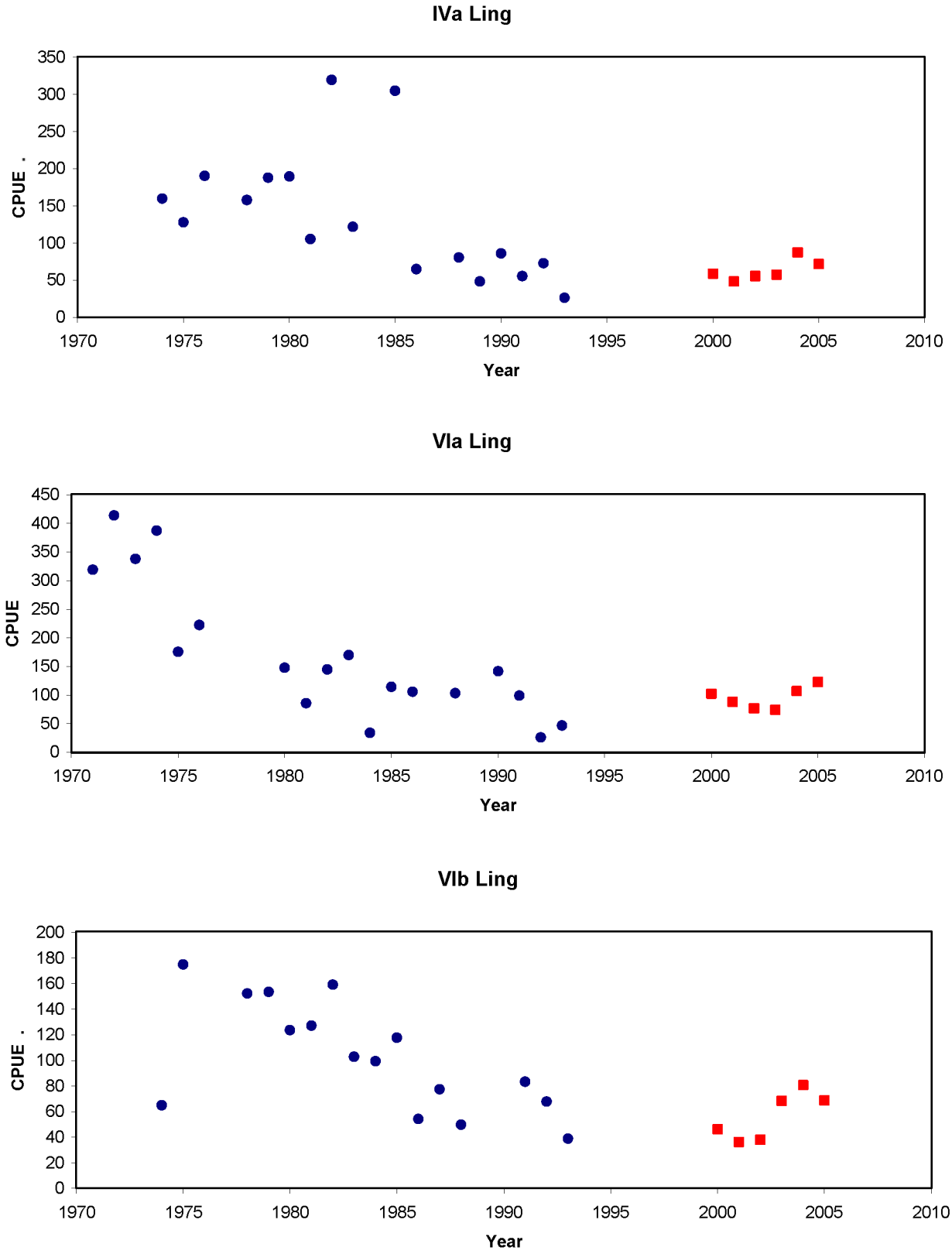


Figure 9.4.10.4.2 Norwegian longline cpue (kg/1000 hooks) of ling based on skippers' logbooks (before 1994, dots) and a "reference fleet" (after 2000, squares). Different cpue scale between areas.

Table 9.4.10.4.1 Ling. Landings by area (ACFM estimates).

Year	III	IVa	VIa	VIb	VII	VIIa	VIIb,c	VIId,e	VIIf	VIIg-k	VIII	IX	XII	XIV	All areas
1988	331	11223	14556	1765	5057	211	865	779	444	4415	1028		0	3	40677
1989	422	11677	8631	3743	5261	311	577	700	310	1012	1221		0	1	33866
1990	543	10027	6730	1505	4575	169	678	799	233	1077	1372		3	9	27720
1991	484	9969	4795	2662	3977	125	749	680	302	1394	1139		10	1	26287
1992	549	10763	4588	1891	2552	105	1286	519	137	1593	802		0	17	24802
1993	642	12810	5301	1522	2294	219	1434	436	223	2334	510		0	9	27734
1994	469	11496	6730	2540	2185	284	1595	451	400	3254	85		5	6	29500
1995	412	13041	8847	1638		305	1944	1389	602	6131	845		50	17	35221
1996	402	12705	8577	1124		210	2201	1477	399	6850	1041		2	0	34988
1997	311	11315	6746	814		264	1780	1472	547	5045	1034	0	9	61	29398
1998	214	13631	7362	1394		198	1034	1500	561	7814	1797	2	2	6	35515
1999	216	9810	6899	1175		84	1366	1057	312	4204	451	1	2	1	25578
2000	228	9246	6889	1879		73	1176	844	217	3535	331	1	7	26	24452
2001	262	7851	5097	788		87	1226	804	217	3309	577	0	59	35	20312
2002	263	9070	4076	533		118	955	857	445	3451	439	0	8	20	20235
2003	261	6433	3290	660		110	484	702	169	2906	450		19	83	15567
2004	232	6306	2807	1062		97	637	770	159	2517	527			10	15124
2005	210	5747	2708	1092		60	417	914	429	1963	487		1	0	14028

Weight in tonnes. 2005 is preliminary.

Table 9.4.10.4.2 Ling (*Molva molva*). Working Group estimates of landings (tonnes).

LING III

Year	Belgium	Denmark	Germany	Norway	Sweden	E & W	**Total**
1988	2	165	-	135	29	-	**331**
1989	1	246	-	140	35	-	**422**
1990	4	375	3	131	30	-	**543**
1991	1	278	-	161	44	-	**484**
1992	4	325	-	120	100	-	**549**
1993	3	343	-	150	131	15	**642**
1994	2	239	+	116	112	-	**469**
1995	4	212	-	113	83	-	**412**
1996		212	1	124	65	-	**402**
1997		159	+	105	47	-	**311**
1998		103	-	111	-	-	**214**
1999		101	-	115	-	-	**216**
2000		101	+	96	31		**228**
2001		125	+	102	35		**262**
2002		157	1	68	37		**263**
2003		156		73	32		**261**
2004		130	1	70	31		**232**
2005*		106	1	72	31		**210**

*Preliminary

LING IVa

Year	Belgium	Denmark	Faroes	France	Germany	Neth.	Norway	Sweden[1)]	E&W	N.I.	Scot.	**Total**
1988	3	408	13	1,143	262	4	6,473	5	55	1	2,856	**11,223**
1989	1	578	3	751	217	16	7,239	29	136	14	2,693	**11,677**
1990	1	610	9	655	241	-	6,290	13	213	-	1,995	**10,027**
1991	4	609	6	847	223	-	5,799	24	197	+	2,260	**9,969**
1992	9	623	2	414	200	-	5,945	28	330	4	3,208	**10,763**
1993	9	630	14	395	726	-	6522	13	363	-	4,138	**12,810**
1994	20	530	25	n/a	770	-	5355	3	148	+	4,645	**11,496**
1995	17	407	51	290	425	-	6,148	5	181		5,517	**13,041**
1996	8	514	25	241	448		6,622	4	193		4,650	**12,705**
1997	3	643	6	206	320		4,715	5	242		5,175	**11,315**
1998	8	558	19	175	176		7,069	-	125		5,501	**13,631**
1999	16	596	n.a.	293	141		5,077		240		3,447	**9,810**
2000	20	538	2	146	103		4,780	7	74		3,576	**9,246**
2001		702		125	54		3613	6	61		3290	**7851**
2002	6	578	24	115			4509		59		3779	**9070**
2003	4	779	6	121	62		3122	5	23		2311	**6433**
2004		575	11	64	34		3753	2	15		1852	**6306**
2005*		698	3	47	55		4067	4	12		861	**5747**

*Preliminary. [(1)] Includes IVb 1988-1993.

LING IVb,c

Year	Belgium	Denmark	France	Sweden	Norway	E & W	Scotland	Germany	Netherlands	**Total**
1988					100	173	106	-		**379**
1989					43	236	108	-		**387**
1990					59	268	128	-		**455**
1991					51	274	165	-		**490**
1992		261			56	392	133	-		**842**
1993		263			26	412	96	-		**797**
1994		177			42	40	64	-		**323**
1995		161			39	301	135	23		**659**
1996		986			100	187	106	45		**1424**
1997	33	166	1	9	57	215	170	48		**699**
1998	47	164	5		129	128	136	18		**627**
1999	35	138	-		51	106	106	10		**446**
2000	59	101	0	8	45	77	90	4		**384**
2001	46	81	0	3	23	62	60	6	2	**283**
2002	38	91		4	61	58	43	12	2	**309**
2003	28	0		3	83	40	65	14	1	**234**
2004	48	71		1	54	23	24	19	1	**241**
2005*	28	56		5	27	17	6	13		**152**

Table 9.4.10.4.2 (Cont'd)

LING Vb1

Year	Denmark	Faroes[4]	France [2]	Germany	Norway	E&W [1]	Scotland [1]	Russia	**Total**
1988	42	1,383	53	4	884	1	5		**2,372**
1989	-	1,498	44	2	1,415	-	3		**2,962**
1990	-	1,575	36	1	1,441	+	9		**3,062**
1991	-	1,828	37	2	1,594	-	4		**3,465**
1992	-	1,218	3	+	1,153	15	11		**2,400**
1993	-	1,242	5	1	921	62	11		**2,242**
1994	-	1,541	6	13	1047	30	20		**2,657**
1995		2,789	4	13	446	2	32		**3,286**
1996		2672			1,284	12	28		**3,996**
1997		3224	7		1,428	34	40		**4,733**
1998		2,422	6		1,452	4	145		**4,029**
1999		2,446	22	3	2,034	0	71		**4,576**
2000		2008	9	1	1305	2	61		**3386**
2001		2489	17	3	1496	5	99		**4109**
2002		1788	9	2	1640	3	239		**3681**
2003		2203	17	2	1526	3	215		**3966**
2004		3727	10	1	1799	3	178	2	**5720**
2005*		3461	10		1553	3	70		**5097**

*Preliminary. [1] Includes Vb_2. [2] Includes Vb_2 and Va. [3]Reported as Vb.(4) 2000-2003 Vb1 and Vb2 combined

LING Vb2

Year	Faroes	Norway	**Total**
1988	832	1,284	**2,116**
1989	362	1,328	**1,690**
1990	162	633	**795**
1991	492	555	**1,047**
1992	577	637	**1,214**
1993	282	332	**614**
1994	479	486	**965**
1995	281	503	**784**
1996	102	798	**900**
1997	526	398	**924**
1998	511	819	**1,330**
1999	164	498	**662**
2000		399	**399**
2001		497	**497**
2002		457	**457**
2003		927	**927**
2004		247	**247**
2005*		647	**647**

LING VIa

Year	Belgium	Denmark	Faroes	France [1]	Germany	Ireland	Norway	Spain[2]	E&W	IOM	N.I.	Scot.	**Total**
1988	4	+	-	5,381	6	196	3,392	3575	1,075	-	53	874	**14,556**
1989	6	1	6	3,417	11	138	3,858		307	+	6	881	**8,631**
1990	-	+	8	2,568	1	41	3,263		111	-	2	736	**6,730**
1991	3	+	3	1,777	2	57	2,029		260	-	10	654	**4,795**
1992	-	1	-	1,297	2	38	2,305		259	+	6	680	**4,588**
1993	+	+	-	1,513	92	171	1937		442	-	13	1,133	**5,301**
1994	1	1		1713	134	133	2034	1027	551	-	10	1,126	**6,730**
1995	-	2	0	1970	130	108	3,156	927	560	n/a		1994	**8,847**
1996			0	1762	370	106	2809	1064	269			2197	**8,577**
1997			0	1,631	135	113	2229	37	151			2,450	**6,746**
1998				1,531	9	72	2,910	292	154			2,394	**7,362**
1999				941	4	73	2,997	468	152			2,264	**6,899**
2000	+	+		717	3	75	2956	708	143			2287	**6889**
2001				728	3	70	1869	142	106			2179	**5097**
2002				351	1	44	973	190	65			2452	**4076**
2003				284	1	88	1477	75	108			1257	**3290**
2004				249	1	96	791	43	8			1619	**2807**
2005*				421		89	1389	61	1			747	**2708**

*Preliminary. [1] Includes VIb until 1996 [2] Includes minor landings from VIb.

Table 9.4.10.4.2 (Cont'd)

LING VIb

Year	Faroes	France [2]	Germany	Ireland	Norway	Spain [3]	E & W	N.I.	Scotland	Russia	**Total**
1988	196		-	-	1,253		93	-	223		**1,765**
1989	17		-	-	3,616		26	-	84		**3,743**
1990	3		-	26	1,315		10	+	151		**1,505**
1991	-		-	31	2,489		29	2	111		**2,662**
1992	35		+	23	1,713		28	2	90		**1,891**
1993	4		+	60	1179		43	4	232		**1,522**
1994	104		-	44	2116		52	4	220		**2,540**
1995	66		+	57	1,308		84		123		**1,638**
1996	0		124	70	679		150		101		**1,124**
1997	0		46	29	504		103		132		**814**
1998		1	10	44	944		71		324		**1,394**
1999		26	25	41	498		86		499		**1,175**
2000	+	18	31	19	1,172		157		475	7	**1,879**
2001	+	16	3	18	328		116		307		**788**
2002		2	2	2	289		65		173		**533**
2003		2	3	25	485		34		111		**660**
2004	+	7	3	6	717		6		141	182	**1062**
2005*		30	4	17	628		9		48	356	**1092**

*Preliminary. [1] Includes XII. [2] Until 1966 included in VIa. [3] Included in Ling VIa.

LING VII

Year	France	**Total**
1988	5,057	**5,057**
1989	5,261	**5,261**
1990	4,575	**4,575**
1991	3,977	**3,977**
1992	2,552	**2,552**
1993	2,294	**2,294**
1994	2,185	**2,185**
1995	-1	
1996	-1	
1997	-1	
1998	-1	
1999	-1	

LING VIIa

Year	Belgium	France	Ireland	E & W	IOM	N.I.	Scotland	**Total**
1988	14	-1	100	49	-	38	10	**211**
1989	10	-1	138	112	1	43	7	**311**
1990	11	-1	8	63	1	59	27	**169**
1991	4	-1	10	31	2	60	18	**125**
1992	4	-1	7	43	1	40	10	**105**
1993	10	-1	51	81	2	60	15	**219**
1994	8	-1	136	46	2	76	16	**284**
1995	12	9	143	106	1	-2	34	**305**
1996	11	6	147	29	-	-2	17	**210**
1997	8	6	179	59	2	-2	10	**264**
1998	7	7	89	69	1	-2	25	**198**
1999	7	3	32	29		-2	13	**84**
2000	3	2	18	25			25	**73**
2001	6	3	33	20			31	**87**
2002	7	5	91	15			7	**118**
2003	4	2	75	18			11	**110**
2004	3	2	47	11			34	**97**
2005*	4	2	28	12			14	**60**

*Preliminary. [1] French catches in VII not split into divisions, see Ling VII. [2] Included with UK (EW)

Table 9.4.10.4.2 (Cont'd)

LING Vb1

Year	Denmark	Faroes[4]	France [2]	Germany	Norway	E&W [1]	Scotland [1]	Russia	**Total**
1988	42	1,383	53	4	884	1	5		**2,372**
1989	-	1,498	44	2	1,415	-	3		**2,962**
1990	-	1,575	36	1	1,441	+	9		**3,062**
1991	-	1,828	37	2	1,594	-	4		**3,465**
1992	-	1,218	3	+	1,153	15	11		**2,400**
1993	-	1,242	5	1	921	62	11		**2,242**
1994	-	1,541	6	13	1047	30	20		**2,657**
1995		2,789	4	13	446	2	32		**3,286**
1996		2672			1,284	12	28		**3,996**
1997		3224	7		1,428	34	40		**4,733**
1998		2,422	6		1,452	4	145		**4,029**
1999		2,446	22	3	2,034	0	71		**4,576**
2000		2008	9	1	1305	2	61		**3386**
2001		2489	17	3	1496	5	99		**4109**
2002		1788	9	2	1640	3	239		**3681**
2003		2203	17	2	1526	3	215		**3966**
2004		3727	10	1	1799	3	178	2	**5720**
2005*		3461	10		1553	3	70		**5097**

*Preliminary. [1] Includes Vb_2. [2] Includes Vb_2 and Va. [3]Reported as Vb.(4) 2000-2003 Vb1 and Vb2 combined

LING Vb2

Year	Faroes	Norway	**Total**
1988	832	1,284	**2,116**
1989	362	1,328	**1,690**
1990	162	633	**795**
1991	492	555	**1,047**
1992	577	637	**1,214**
1993	282	332	**614**
1994	479	486	**965**
1995	281	503	**784**
1996	102	798	**900**
1997	526	398	**924**
1998	511	819	**1,330**
1999	164	498	**662**
2000		399	**399**
2001		497	**497**
2002		457	**457**
2003		927	**927**
2004		247	**247**
2005*		647	**647**

LING VIa

Year	Belgium	Denmark	Faroes	France [1]	Germany	Ireland	Norway	Spain[2]	E&W	IOM	N.I.	Scot.	**Total**
1988	4	+	-	5,381	6	196	3,392	3575	1,075	-	53	874	**14,556**
1989	6	1	6	3,417	11	138	3,858		307	+	6	881	**8,631**
1990	-	+	8	2,568	1	41	3,263		111	-	2	736	**6,730**
1991	3	+	3	1,777	2	57	2,029		260	-	10	654	**4,795**
1992	-	1	-	1,297	2	38	2,305		259	+	6	680	**4,588**
1993	+	+	-	1,513	92	171	1937		442	-	13	1,133	**5,301**
1994	1	1		1713	134	133	2034	1027	551	-	10	1,126	**6,730**
1995	-	2	0	1970	130	108	3,156	927	560	n/a		1994	**8,847**
1996			0	1762	370	106	2809	1064	269			2197	**8,577**
1997			0	1,631	135	113	2229	37	151			2,450	**6,746**
1998				1,531	9	72	2,910	292	154			2,394	**7,362**
1999				941	4	73	2,997	468	152			2,264	**6,899**
2000	+	+		717	3	75	2956	708	143			2287	**6889**
2001				728	3	70	1869	142	106			2179	**5097**
2002				351	1	44	973	190	65			2452	**4076**
2003				284	1	88	1477	75	108			1257	**3290**
2004				249	1	96	791	43	8			1619	**2807**
2005*				421		89	1389	61	1			747	**2708**

*Preliminary. [1] Includes VIb until 1996 [2] Includes minor landings from VIb.

Table 9.4.10.4.2 (Cont'd)

LING VIIb,c

Year	France (1)	Germany	Ireland	Norway	Spain (3)	E & W	N.I.	Scotland	**Total**
1988	-1	-	50	57		750	-	8	**865**
1989	-1	+	43	368		161	-	5	**577**
1990	-1	-	51	463		133	-	31	**678**
1991	-1	-	62	326		294	8	59	**749**
1992	-1	-	44	610		485	4	143	**1,286**
1993	-1	97	224	145		550	9	409	**1,434**
1994	-1	98	225	306		530	2	434	**1,595**
1995	78	161	465	295		630	-2	315	**1,944**
1996	57	234	283	168		1117	-2	342	**2,201**
1997	65	252	184	418		635	-2	226	**1,780**
1998	32	1	190	89		393		329	**1,034**
1999	50	4	377	288		488		159	**1,366**
2000	117	21	401	170		327		140	**1176**
2001	80	2	413	515		94		122	**1226**
2002	123	0	315	207		151		159	**955**
2003	88	0	270			74		52	**484**
2004	130	12	255	163		27		50	**637**
2005*	140	11	208			17		41	**417**

*Preliminary. (1) See Ling VII. (2) Included with UK (EW). (3) Included with VIIg-k.

LING VIId,e

Year	Belgium	Denmark	France (1)	Ireland	E & W	Scotland	Ch. Islands	**Total**
1988	36	+	-1	-	743	-		**779**
1989	52	-	-1	-	644	4		**700**
1990	31	-	-1	22	743	3		**799**
1991	7	-	-1	25	647	1		**680**
1992	10	+	-1	16	493	+		**519**
1993	15	-	-1	-	421	+		**436**
1994	14	+	-1	-	437	0		**451**
1995	10	-	885	2	492	0		**1,389**
1996	15		960		499	3		**1,477**
1997	12		1,049	1	372	1	37	**1,472**
1998	10		953		510	1	26	**1,500**
1999	7		542	-	507	1		**1057**
2000	5		452	1	372		14	**844**
2001	6		399		399			**804**
2002	7		464		386	0		**857**
2003	5		446	1	250	0		**702**
2004	13		542	1	214			**770**
2005*	11		667		236			**914**

LING VIIf

Year	Belgium	France (1)	Ireland	E & W	Scotland	**Total**
1988	77	-1	-	367	-	**444**
1989	42	-1	-	265	3	**310**
1990	23	-1	3	207	-	**233**
1991	34	-1	5	259	4	**302**
1992	9	-1	1	127	-	**137**
1993	8	-1	-	215	+	**223**
1994	21	-1	-	379	-	**400**
1995	36	110	-	456	0	**602**
1996	40	121	-	238	0	**399**
1997	30	204	-	313		**547**
1998	29	204	-	328		**561**
1999	16	108	-	188		**312**
2000	15	90	1	111		**217**
2001	14	111	-	92		**217**
2002	16	131	3	295		**445**
2003	15	72	1	81		**169**
2004	18	71	5	65		**159**
2005*	36	304	7	82		**429**

*Preliminary. (1) See Ling VII.

Table 9.4.10.4.2 (Cont'd)

LING VIIg-k

Year	Belgium	Denmark	France	Germany	Ireland	Norway	Spain [2]	E&W	IOM	N.I.	Scot.	**Total**
1988	35	1	[1]	-	286	-	2,652	1,439	-	-	2	**4,415**
1989	23	-	[1]	-	301	163		518	-	+	7	**1,012**
1990	20	+	[1]	-	356	260		434	+	-	7	**1,077**
1991	10	+	[1]	-	454	-		830	-	-	100	**1,394**
1992	10	-	[1]	-	323	-		1,130	-	+	130	**1,593**
1993	9	+	[1]	35	374			1,551	-	1	364	**2,334**
1994	19	-	[1]	10	620		184	2,143	-	1	277	**3,254**
1995	33	-	1597	40	766	-	195	3046		[3]	454	**6,131**
1996	45	-	1626	169	771		583	3209			447	**6,850**
1997	37	-	1,574	156	674		33	2112			459	**5,045**
1998	18	-	1,362	88	877		1669	3,465			335	**7,814**
1999	-	-	1235	49	554		455	1619			292	**4204**
2000	17		1019	12	624		639	921			303	**3535**
2001	16		1103	4	727	24	559	591			285	**3309**
2002	16		950	2	951		568	862			102	**3451**
2003	12		1054	5	808		607	382			38	**2906**
2004	14		947		686		530	335			5	**2517**
2005*	15		598	12	539		484	313			2	**1963**

*Preliminary. [1] See Ling VII. [2] Includes VIIb,c. [3] Included in UK (EW).

LING VIII

Year	Belgium	France	Germany	Spain	E & W	Scot.	**Total**
1988		1,018			10		**1,028**
1989		1,214			7		**1,221**
1990		1,371			1		**1,372**
1991		1,127			12		**1,139**
1992		801			1		**802**
1993		508			2		**510**
1994		n/a		77	8		**85**
1995		693		106	46		**845**
1996		825	23	170	23		**1,041**
1997	1	705	+	290	38		**1,034**
1998	5	1,220	-	543	29		**1,797**
1999	22	233	-	188	8		**451**
2000	1	219		106	5		**331**
2001		228		341	6	2	**577**
2002		288		141	10	0	**439**
2003		267		147	36		**450**
2004		362		112	53		**527**
2005*		327		141	19		**487**

*Preliminary

LING IX

Year	Spain	**Total**
1997	0	**0**
1998	2	**2**
1999	1	**1**
2000	1	**1**
2001	0	**0**
2002	0	**0**
2003*	0	**0**

*Preliminary

Table 9.4.10.4.2 (Cont'd)

LING XII

Year	Faroes	France	Norway	E & W	Scotland	Germany	Ireland	**Total**
1988				-				**0**
1989				-				**0**
1990				3				**3**
1991				10				**10**
1992				-				**0**
1993				-				**0**
1994				5				**5**
1995	5			45				**50**
1996	-		2					**2**
1997	-		+	9				**9**
1998	-	1	-	1				**2**
1999	-	0	-	-	+	2		**2**
2000		1	-		6			**7**
2001		0	29	2	24		4	**59**
2002		0	4	4	0			**8**
2003			17	2	0			**19**
2004								
2005*				1				**1**

*Preliminary

LING XIV

Year	Faroes	Germany	Iceland	Norway	E & W	Scotland	**Total**
1988		3	-	-	-	-	**3**
1989		1	-	-	-	-	**1**
1990		1	-	2	6	-	**9**
1991		+	-	+	1	-	**1**
1992		9	-	7	1	-	**17**
1993		-	+	1	8	-	**9**
1994		+	-	4	1	1	**6**
1995	-	-		14	3	0	**17**
1996	-			0			**0**
1997	1			60			**61**
1998	-			6			**6**
1999	-			1			**1**
2000			26	-			**26**
2001	1			35			**36**
2002	3			20			**23**
2003				83			**83**
2004				10			**10**
2005*							

*Preliminary.

9.4.11 Blue ling (*Molva dypterygia*) in all areas

There is insufficient scientific information to establish the extent of putative stocks; however, blue ling may be sufficiently isolated at separate fishing grounds to be considered as individual management units. On this basis advice is presented for the following management units:

- Subdivisions Va and XIV (Iceland and Reykjanes ridge);
- Subdivisions Vb,VI, and VII (Faroes Rockall and Celtic shelf); and
- Subdivisions I, II, IIIa, IVa, VIII, IX, and XII. The latter grouping is a combination of isolated fishing grounds and these areas are grouped thus due to lack of data.

Blue ling is more vulnerable to over-exploitation than ling due to a slower growth rate and higher age at first maturity. It is particularily susceptible to rapid local depletion due to its highly aggregating behaviour during spawning.

Ageing is a problem in this species, and thus age-structured analytical assessments are unlikely in the short term.

Trends in abundance from all areas indicate declines of varying gravity. In Iceland the decline appears to have halted, west of the British Isles it is stable but at a very depleted level, while it appears seriously depleted in Subdivisions I and II. In all areas the species is at a low level of abundance relative to when the fisheries commenced.

In most cases advice is given to stop directed fishing. Where blue ling is taken as a bycatch, seasonal closed areas can be an effective means of reducing exploitation.

There are no specific management objectives for blue ling in any area where it is fished.

9.4.11.1 Blue ling in Subdivisions Va and XIV

State of the stock

Based on cpue from Iceland trawlers the abundance of blue ling in Va and XIV has steadily declined from 1991 to 2000 and has remained at a low level since then.

Reference points

Reference points that were previously suggested for blue ling were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max.}$ ICES does not consider the available cpue series as suitable for defining $\mathbf{U}_{max}$ because the series is too short.

Exploitation boundaries

There should be no directed fisheries and measures should be implemented to reduce/minimise catches in mixed fisheries. Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.

Management considerations

Historically, a major part of this fishery has been on spawning aggregations. Two closed areas to protect spawning aggregations in Subdivision Va have been introduced in 2003.

Blue ling is mostly taken as a bycatch in fisheries for cod, haddock and saithe in Subdivision Va.

Scientific basis

The cpue series that is used as the basis for advice is derived from trips with only a limited bycatch of blue ling, in order to exclude target fishing on blue ling spawning aggregations (Figure 9.4.11.1.2).

Two trawl surveys are available. The spring survey does not cover the full depth range of blue ling and is considered inappropriate. The autumn survey does cover the full depth range but is too short to contain a useful signal (Figure 9.4.11.1.3).

Comparison with previous assessment and advice

There are no changes to the perception of state of the stock. Previous advice was given for a larger stock complex. The current advice is in line with previous advice.

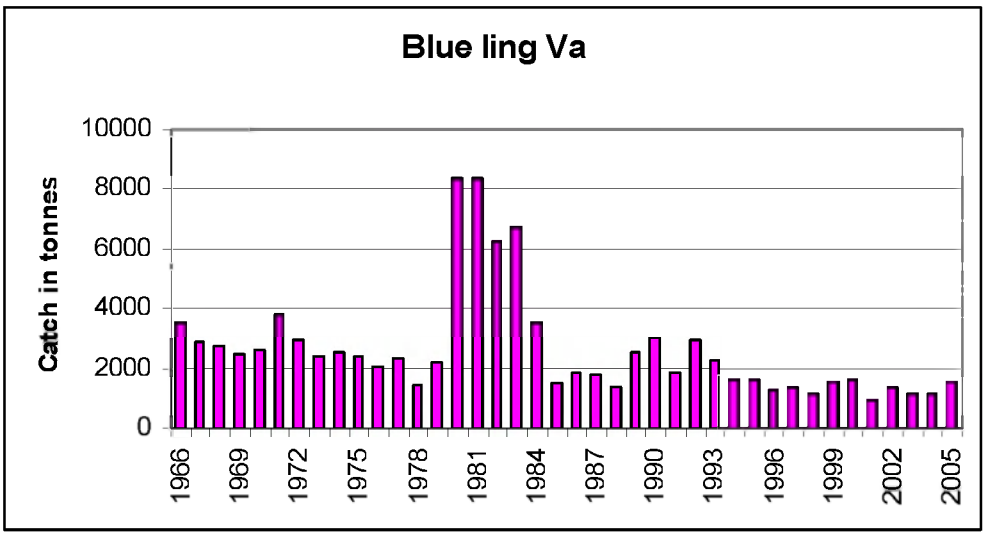


Figure 9.4.11.1.1 Blue ling in Subdivision Va. Total international catch.

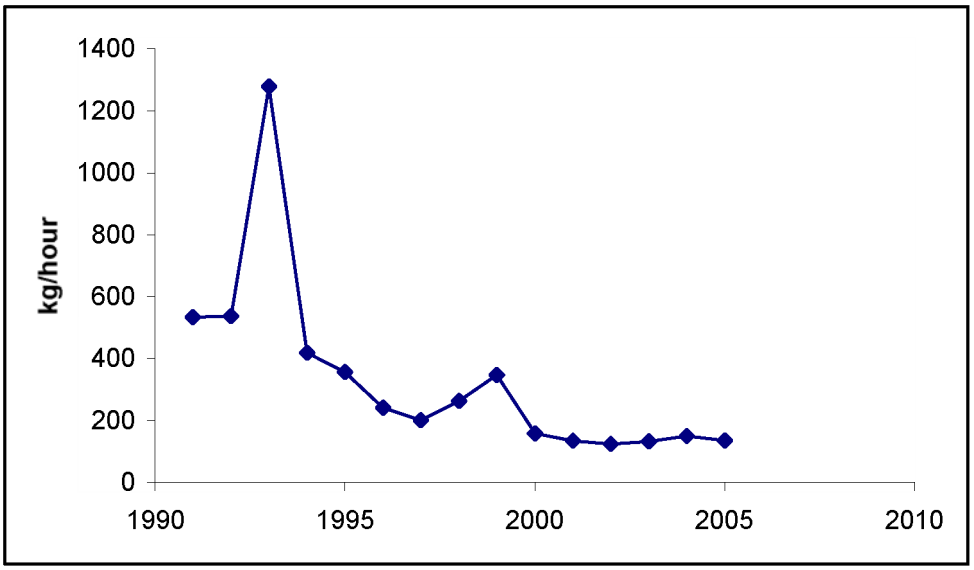


Figure 9.4.11.1.2 Blue ling. Cpue from the Icelandic trawler fleet. Tows used for calculations are those where blue ling comprised more than 10% of the total catch in each particular haul.

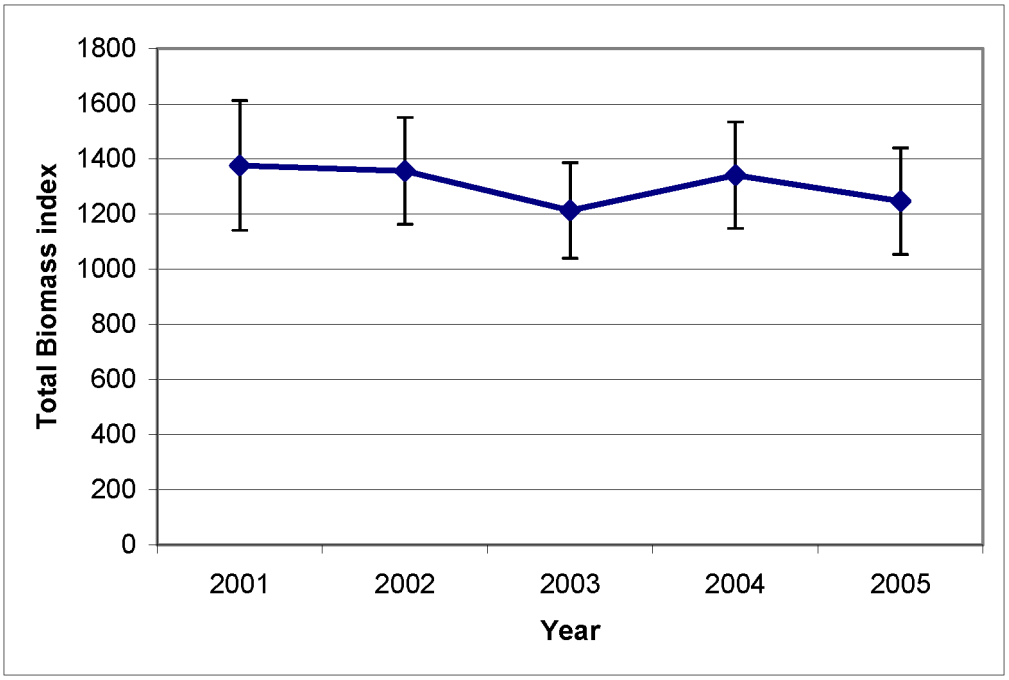


Figure 9.4.11.1.3 Blue ling biomass index calculated from the Icelandic autumn trawl survey.

Table 9.4.11.1.1 Blue ling. Landings in Subdivision Va (WG estimates, tonnes).

Blue ling Va

Year	Faroes	Germany	Iceland	Norway	E & W	Scotland	**Total**
1988	271		1893	7			**2171**
1989	403		2125	5			**2533**
1990	1029		1992				**3021**
1991	241		1582	1			**1824**
1992	321		2584	1			**2906**
1993	40		2193				**2233**
1994	89	1	1542				**1632**
1995	113	3	1519				**1635**
1996	36	3	1284				**1323**
1997	25		1319				**1344**
1998	59	9	1086				**1154**
1999	31	8	1819	8	8	3	**1877**
2000	36	7	1636	25	7		**1711**
2001	95	12	762	49	22	1	**941**
2002	28		1265	74	6	4	**1377**
2003	16	15	1098	6	15	8	**1158**
2004	37	9	1090	49	20		**1205**
2005	17	20	1500	20	19		**1576**

*Preliminary.

Table 9.4.11.1.2 Blue ling. Landings in Subdivision XIV (WG estimates, tonnes).

Blue ling XIV

Year	Faroes	France	Germany	Greenland	Iceland	Norway	E & W	Scotland	Spain	**Total**
1988	21		218	3						**242**
1989	13		58							**71**
1990			64	5			10			**79**
1991			105	5			45			**155**
1992			27	2		50	27	4		**110**
1993		390	16		3124	173	21	1		**3725**
1994	1		15		300	11	57			**384**
1995	0		5		117		16	3		**141**
1996	0		12				2			**14**
1997	1		1				2			**4**
1998	48					1	6			**55**
1999						1	7			**8**
2000					4		2		526	**532**
2001	1						6		91	**98**
2002						1			18	**19**
2003						36	4		909	**949**
2004						1	3	4	177	**185**
2005*	2					1		3		**6**

*Preliminary.

Table 9.4.11.1.3 Blue ling. Landings in Subdivisions Va and XIV (WG estimates, tonnes).

Year	Va	XIV	**Total**
1988	2171	242	**2413**
1989	2533	71	**2604**
1990	3021	79	**3100**
1991	1824	155	**1979**
1992	2906	110	**3016**
1993	2233	3725	**5958**
1994	1632	384	**2016**
1995	1635	141	**1776**
1996	1323	14	**1337**
1997	1344	4	**1348**
1998	1154	55	**1209**
1999	1877	8	**1885**
2000	1711	532	**2243**
2001	941	98	**1039**
2002	1377	19	**1396**
2003	1158	949	**2107**
2004	1205	185	**1390**
2005*	1576	*6*	**1582**

*Preliminary.

9.4.11.2 Blue ling in Subdivisions Vb, VI, and VII

State of the stocks

Cpue information suggests that the abundance of blue ling remains at a low level.

Reference points

Reference points that were previously suggested for blue ling were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max.}$ Given that the catch history of ling extends well before the beginning of the available survey series, $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

There should be no directed fisheries and measures should be implemented to reduce/minimise catches in mixed fisheries to the lowest possible level. Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.

Management considerations

Blue ling is now mostly taken in deepwater fisheries in Subdivisions Vb ,VI, and XIIb. Landings from Subdivision VII are small. Historically, a major part of this fishery has been on spawning aggregations. Experience in Divisions Va and Vb indicates that once stocks are fished down they do not recover even when fishing pressure has been low. The introduction of closed areas to protect spawning aggregations should be accelerated. It is suggested that the blue ling stock definition area should be expanded to include the Western part of Hatton Bank (new ICES area XIIb).

Scientific basis

Survey data were available, but only for a short period. It is recognised that cpue based largely on data from spawning aggregations is not the most reliable indicator of exploitable biomass. However, French cpue calculated for a range of reference areas showed consistent trends. Exploratory assessments were attempted, but further investigations on some key assumptions underlying the model (e.g. number of year classes in the recruitment) are required.

Landings by ICES Subareas and Division by country are given in Table 9.4.11.2.1 and Figure 9.4.11.2.1.

Information from the fishing industry

In collaboration with the French industry, IFREMER has carried out investigations to refine CPUE series for French trawlers. These analyses are still under development.

The French industry provide information on modifications of vessel activities witch could have an effect on yields (catch limitations for commercial reasons, closed areas,…). Information on catches and discards in the French deep sea fishery and a preliminary analysis of data from VMS and CPUE distribution according to depth was also provided by the industry.

Uncertainties in the assessment and advice

Landings from the southern parts of Subarea VII and southwards reported as blue ling (*Molva dypterygia*) may comprise a related species *Molva macropthalma*.

Comparison with previous assessment and advice

New exploratory assessments have not altered the perception of a declining stock. The advice remains for closed areas and reduction in exploitation.

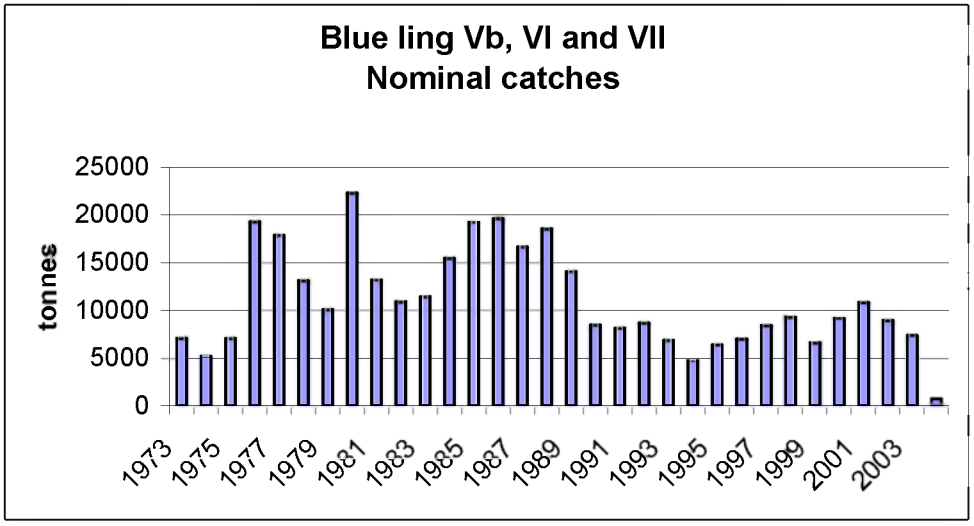


Figure 9.4.11.2.1 Blue ling in Subdivisions Vb, VI, and VII. Official landings (tonnes).

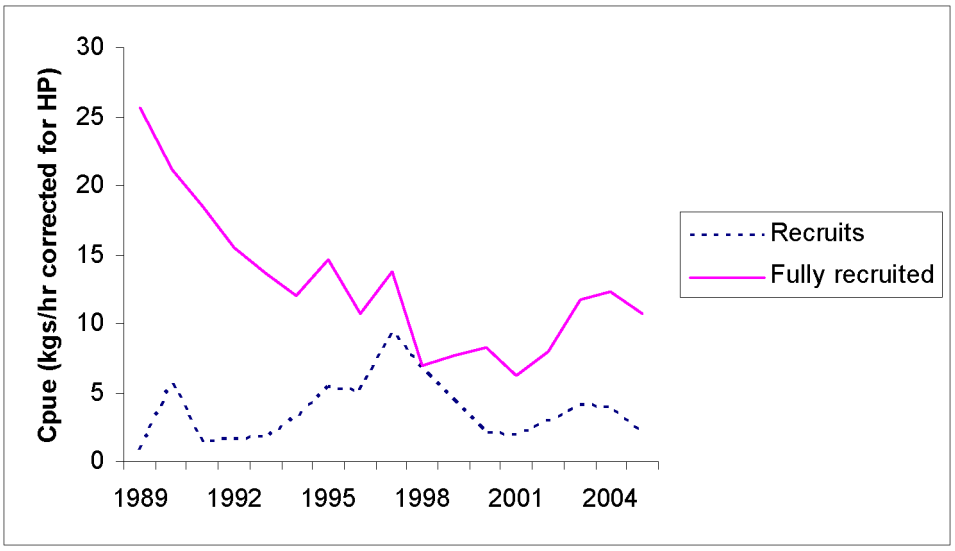


Figure 9.4.11.2.2 French commercial trawl cpue (recruits <80 cm and fully recruited >80 cm) in reference rectangles in Subdivisions Vb, VI, and VII.

Table 9.4.11.2.1. Blue ling (*Molva dypterygia*). Working Group estimates of landings (tonnes).

Blue ling Vb1

Year	Faroes	France(3)	Germany(2)	Norway	E & W(2)	Scotland (1)	Ireland	Russia	Total
1988	3487	3036	49	94					**6666**
1989	2468	1800	51	228					**4547**
1990	946	3073	71	450					**4540**
1991	1573	1013	36	196	1				**2819**
1992	1918	407	21	390	4				**2740**
1993	2088	192	24	218	19				**2541**
1994	1065	147	3	173					**1388**
1995	1606	588	2	38	4				**2238**
1996	1100	301	3	82					**1486**
1997	778	1656		65	11				**2510**
1998	1026	1411	0	24	1				**2462**
1999	1730	1068	4	38	4				**2844**
2000	1677	575	1	163	33			1	**2450**
2001	1407	433	4	130	11		2		**1987**
2002	1003	574		274	8				**1859**
2003	2465	1133		12	1				**3611**
2004	751	1131		20				13	**1915**
2005*	904	750		15	1				**1670**

*Preliminary. (1) Included in Vb2. (2) Includes Vb2 (3) Reported as Vb.

Blue ling Vb2

Year	Faroes	Norway	Scotland (1)	E & W	**Total**
1988	2788	72			**2860**
1989	622	95			**717**
1990	68	191			**259**
1991	71	51	21		**143**
1992	1705	256	1		**1962**
1993	182	22	91		**295**
1994	239	16	1		**256**
1995	162	36	4		**202**
1996	42	62	12		**116**
1997	229	48	11		**288**
1998	64	29	29		**122**
1999	15	49	24		**88**
2000	0	37	37		**74**
2001	0	69	63		**132**
2002		21	140		**161**
2003		84	120		**204**
2004	710	6	68		**784**
2005*	569	14	6		**589**

*Preliminary. (1) Includes Vb1.

Table 9.4.11.2.1. (Cont'd)

Blue ling VIa

Year	Faroes	France	Germany	Ireland	Norway	Spain (1)	E & W	Scotland	Lithuania(1)	**Total**
1988	14	6614	2		29		2	1		**6662**
1989	6	7382	2		143					**7533**
1990		4882	44		54			1		**4981**
1991	8	4261	18		63		1	35		**4386**
1992	4	5483	4		129			24		**5644**
1993		4311	48	3	27		13	42		**4444**
1994		2999	24	73	90	433	1	91		**3711**
1995	0	2835		11	96	392	34	738		**4106**
1996	0	4115	4		50	681	9	1407		**6266**
1997	0	3845		1	29	190	789	1021		**5875**
1998	0	4644	3	1	21	142	11	1416		**6238**
1999	0	3730		10	55	119	5	1105		**5024**
2000		4443	94	9	102	108	24	1300		**6080**
2001		2693	6	52	117	797	116	2136		**5917**
2002		2005		62	61	285	16	2027		**4456**
2003	7	2000		2	106	195	3	428		**2741**
2004	10	2259		1	24	24	1	482		**2801**
2005*	17	1957		2	33	135		390	29	**2534**

*Preliminary. (1) Includes VIb.

Blue ling VIb

Year	Poland	Russia	Faroes	France	Germany	Norway	E & W	Scotland	Iceland	Ireland	Estonia	**Total**
1988			2000	499	37	42	9	14				**2601**
1989			1292	61	22	217		16				**1608**
1990			360	703		127		2				**1192**
1991			111	2482	6	102	5	15				**2721**
1992			231	348	2	50	2	14				**647**
1993			51	373	109	50	66	57				**706**
1994			5	89	104	33	3	25				**259**
1995			1	305	189	12	11	38				**556**
1996			0	87	92	7	37	74				**297**
1997			138	331		6	65	562	1			**1103**
1998			76	469		13	190	287	122	11		**1168**
1999			204	690		9	168	2411	610	4		**4096**
2000				508		184	500	966		7		**2165**
2001			238	202	1	256	337	1803		4	85	**2926**
2002		3	79	319		273	141	497		1		**1313**
2003	4	2		510		102	14	113			5	**750**
2004	1	5	4	486		2	10	96			3	**607**
2005*		15	1	223		1	9	73				**322**

*Preliminary.

Table 9.4.11.2.1. (Cont'd)

Blue ling VIIa

Year	France (1)	UK (Scot)	**Total**
1988			**0**
1989			**0**
1990			**0**
1991		1	**1**
1992			**0**
1993			**0**
1994			**0**
1995			**0**
1996			**0**
1997			**0**
1998			**0**
1999			**0**
2000			**0**
2001			**0**
2002			**0**
2003			**0**
2004			**0**
2005*			**0**

*Preliminary. (1) Included in Via.

Blue ling VIIbc

Year	France	Germany	Ireland	Norway	Spain (1)	E & W Scotland	**Total**
1988	21	1					**22**
1989	269			2			**271**
1990	177						**177**
1991	157						**157**
1992	126			3		6	**135**
1993	106			2	11	28	**147**
1994	100		1	1	6	22	**130**
1995	95		3		3	11	**112**
1996	118			1	15	57	**191**
1997	113		0	2	36	3	**154**
1998	157			1	60	6	**224**
1999	37		3	1	24	7	**72**
2000	46	1	45	5	9	2	**108**
2001	37		169	5	16	3	**230**
2002	21		152		43	1	**217**
2003	6		12		2		**20**
2004	8		9			1	**18**
2005*	2		8				**10**

*Preliminary. (1) Included in VIIg-k.

Table 9.4.11.2.1. (Cont'd)

Blue ling VIIde

Year	France	**Total**
1988		**0**
1989	1	**1**
1990	0	**0**
1991	10	**10**
1992	15	**15**
1993	3	**3**
1994	8	**8**
1995	4	**4**
1996	4	**4**
1997	1	**1**
1998	3	**3**
1999		
2000		
2001		
2002		
2003		
2004		
2005*		

*Preliminary.

Blue ling VIIg-k

Year	France	Germany	Spain (1)	E & W	Scotland	Ireland	**Total**
1988							**0**
1989	21						**21**
1990	46						**46**
1991	44						**44**
1992	256						**256**
1993	164			5	2		**171**
1994	190		4	3	4		**201**
1995	56		13	40	5		**114**
1996	67		21	42	40		**170**
1997	65	8	0	134	12	9	**228**
1998	92		22	223	24	10	**371**
1999	40	2	59	144	11	24	**280**
2000	39	1	65	22	15	30	**172**
2001	43	2	64	13	14	325	**461**
2002	17		42	33	54	120	**266**
2003	13	1	42	6	16	16	**94**
2004	12	1	15	4		8	**40**
2005*	11		25	1		2	**39**

*Preliminary. (1) Reported as VII.

Table 9.4.11.2.1. (Cont'd)

Blue ling. Total landings by Subarea/Division and grand total.

Year	Vb	VI	VII	**Total**
1988	9526	9263	22	**18811**
1989	5264	9141	293	**14698**
1990	4799	6173	223	**11195**
1991	2962	7107	212	**10281**
1992	4702	6291	406	**11399**
1993	2836	5150	321	**8307**
1994	1644	3970	339	**5953**
1995	2440	4662	230	**7332**
1996	1602	6563	365	**8530**
1997	2798	6978	383	**10159**
1998	2584	7406	598	**10588**
1999	2932	9120	352	**12404**
2000	2524	8245	280	**11049**
2001	2119	8843	691	**11653**
2002	2020	5769	483	**8272**
2003	3815	3491	114	**7420**
2004	2699	3408	58	**6165**
2005*	2259	2856	49	**5164**

*Preliminary.

9.4.11.3 Blue ling in other areas (Subdivisions I, II, IIIa, IVa, VIII, IX, and XII)

State of the stocks

Trends in landings suggest serious local depletion or stock depletion, at least in Subareas IIa and IIb.

Exploitation boundaries

There should be no directed fisheries and measures should be taken to minimise the bycatch of this species in mixed fisheries to the lowest possible level. Such measures could include closing known spawning grounds during spawning.

Management considerations

Blue ling has been an important bycatch in the trawl fisheries for mixed deepwater species on Hatton Bank (Subarea XII).

Scientific basis

Very few biological and fisheries data are available for blue ling. The assessment in 2006 is based solely on trends in landings.

Uncertainties in the assessment and advice

It should be noted that landings reported from the southern parts, Subareas VIII and IX, as blue ling (*Molva dypterygia*) may comprise a related species *Molva macropthalma*.

Comparison with previous assessment and advice

There have been no significant changes to the perception of blue ling in these areas.

Table 9.4.11.3.1 Blue ling (*Molva dypterygia*). Working Group estimates of landings (tonnes).

Blue ling I

Year	Iceland	Norway	Germany	**Total**
1988				
1989				
1990				
1991				
1992				
1993				
1994		3		**3**
1995		5		**5**
1996				**0**
1997		1		**1**
1998		1		**1**
1999				**0**
2000		1		**1**
2000		3		**3**
2001		1		**1**
2002		1		**1**
2003				**0**
2004		1		**1**
2005*		1		**1**

*Preliminary.

Blue ling IIa and b

Year	Faroes	France	Germany	Greenland	Norway	E & W	Scotland	Sweden	Russia	**Total**
1988	77	37	5		3416	2				**3537**
1989	126	42	5		1883	2				**2058**
1990	228	48	4		1128	4				**1412**
1991	47	23	1		1408					**1479**
1992	28	19		3	987	2				**1039**
1993		12	2	3	1003					**1020**
1994		9	2		399	9				**419**
1995	0	12	2	2	342	1				**359**
1996	0	8	1		254	2	2			**267**
1997	0	10	1		280					**291**
1998	0	3			272		3			**278**
1999	0	1	1		287		2			**291**
2000		2	4		240	1	2			**249**
2001	8	7			190	1	2			**208**
2002	1	1			129	1	17			**149**
2003	30				115		1	1		**147**
2004	28	1			144				1	**174**
2005*	21	3			144	1			2	**171**

*Preliminary.

Blue ling III

Year	Denmark	Norway	Sweden	**Total**
1988	10	11	1	**22**
1989	7	15	1	**23**
1990	8	12	1	**21**
1991	9	9	3	**21**
1992	29	8	1	**38**
1993	16	6	1	**23**
1994	14	4		**18**
1995	16	4		**20**
1996	9	3		**12**
1997	14	5	2	**21**
1998	4	2		**6**
1999	5	1		**6**
2000	13	1		**14**
2001	20	4		**24**
2002	8	1		**9**
2003	18	1		**19**
2004	18	1		**19**
2005*	48	1		49

*Preliminary.

Table 9.4.11.3.1 (Cont'd)

Blue ling IVa

Year	Denmark	Faroes	France (IV)	Germany	Norway	E & W	Scotland	Ireland	**Total**
1988	1	13	223	6	116	2	2		**363**
1989	1		244	4	196	12			**457**
1990			321	8	162	4			**495**
1991	1	31	369	7	178	2	32		**620**
1992	1		236	9	263	8	36		**553**
1993	2	101	76	2	186	1	44		**412**
1994			144	3	241	14	19		**421**
1995		2	73		201	8	193		**477**
1996		0	52	4	67	4	52		**179**
1997		0	36		61	0	172		**269**
1998		1	31		55	2	191		**280**
1999	2		21		94	25	120	2	**264**
2000	2		15	1	53	10	46	2	**129**
2001	7		9		75	7	145	9	**252**
2002	6		11		58	4	292	5	**376**
2003	8		8		49	2	25		**92**
2004	7		17		45		14		**83**
2005*	6		7		51	3	2		**69**

*Preliminary

Blue ling IVb

Year	France	E & W	Norway	Faroes	Denmark	Germany	Scotland	**Total**
1988								**0**
1989	2							**2**
1990	6							**6**
1991	7							**7**
1992	1							**1**
1993	0	3						**3**
1994	0							**0**
1995	3	3						**6**
1996	5	5	1					**11**
1997	1							**1**
1998	5		1					**6**
1999	0	1	0					**1**
2000	1							**1**
2001	0							**0**
2002			1					**1**
2003			1		8			**9**
2004								**0**
2005*	1							**1**

*Preliminary.

Blue ling IVc

Year	E & W	Norway	**Total**
1988			**0**
1989			**0**
1990			**0**
1991			**0**
1992			**0**
1993			**0**
1994	3		**3**
1995			**0**
1996			**0**
1997			**0**
1998			**0**
1999			**0**
2000			**0**
2001			**0**
2002			**0**
2003			**0**
2004			**0**
2005*			

*Preliminary.

Table 9.4.11.3.1 (Cont'd)

Blue ling VIII & IX

Year	France	Spain	**Total**
1997		14	**14**
1998		33	**33**
1999	1	3	**4**
2000	2	2	**4**
2001	2	4	**6**
2002	3	26	**29**
2003	2	20	**22**
2004*	4	18	**22**

*Preliminary.

Blue ling XII

Year	Faroes	France	Germany	Spain	E & W	Scotland	Norway	Iceland	Poland	Lithuania	Russia	**Total**
1988		263										**263**
1989		70										**70**
1990		5										**5**
1991		1147										**1147**
1992		971										**971**
1993	654	2591	90									**3335**
1994	382	345	25									**752**
1995	514	47			12							**573**
1996	445	60		264		19						**788**
1997	1	1		411	4							**417**
1998	36	26		375	1							**438**
1999	156	17		943	8	43		186				**1353**
2000	89	23		406	18	23	21	14				**594**
2001	6	26		415	32	91	103	2				**675**
2002	19			1234	8		9					**1270**
2003		7		971		2	40		12	37		**1069**
2004		27		610							7	**644**
2005										8		**8**

*Preliminary.

9.4.12 Tusk (*Brosme brosme*) in all areas

There is insufficient scientific information to establish the extent of putative stocks; however, tusk may be sufficiently isolated at separate fishing grounds to be considered as individual management units. On this basis advice is presented for the following management units: I and II (Arctic), Va (Iceland), and IIIa, IVa, Vb,VI, VII, VIII, IX, XII, and XIV (other areas). The latter grouping is a combination of isolated fishing grounds and these areas are grouped due to their mutual of lack of data.

Tusk is primarily fished in the depth range 200–500 m, though it is also found at shallower depths. Tusk is more vulnerable to overexploitation than ling due to a slower growth rate and higher age at first maturity.

The status of this species in the different management units is either unknown or increasing from a low level.

The precautionary advice is to decrease catches compared to last year in areas where indicators show stable (and low) abundance, and to maintain stable catches in areas where indicators show increasing abundance.

There are no specific management objectives for tusk in any of the units given below.

The advice in 2004 was for an effort reduction of 30% compared to the 1998 effort. The current advice is for reductions in catches compared to recent average landings or for stable catches when indicators show an increase in stock size.

9.4.12.1 Management unit I and II (Arctic)

Tusk has been exploited in Subareas I and II for centuries, but landings increased from the 1950s onwards. The state of the stock is unknown. Cpue has in recent years been well below historical levels.

Reference points

Reference points that were previously suggested for tusk were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$, and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$. Given that the catch history of tusk extends well before the beginning of the available cpue series, the cpue in the early part of the series is very noisy and the available cpue for early and later periods are differently defined (see Figure 9.4.12.1.2). $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

Landings of tusk have declined in recent years and the overall cpue on tusk has remained at reduced levels. ICES recommends to reduce catches to 5000 t (about 30%) and to monitor whether the indicators show an increase in stock sizes.

Management considerations

Tusk is taken in mixed fisheries with ling and as a bycatch of cod, mainly in longline fisheries. Tusk is more vulnerable to overexploitation than ling due to a slower growth rate and higher age at first maturity.

Factors affecting the fisheries

There is no species-specific management of the tusk fishery in Subareas I and II, and the species is a bycatch. The exploitation is influenced by regulations aimed at other groundfish species, e.g. cod and haddock. Catches are primarily by Norwegian vessels and since 2003 EU vessels have been subject to a restricted TAC of 35 t (includes also Area XIV).

Changes in fishing technology and fishing patterns

The major fisheries are the Norwegian longline and gillnet fisheries, but there are also bycatches by other gears, i.e., trawls and handline. Of the Norwegian landings, around 85% is taken by longlines, 10% by gillnets, and the remainder by a variety of other gears. Other nations catch tusk as a bycatch in trawl fisheries.

Scientific basis

Summaries of the total landings for all areas are given in Table 9.4.12.1.1 and Figure 9.4.12.1.1. Landings by Subarea and by nation are given in Table 9.4.12.1.2.

Landings are available for all relevant fleets. No new discard information was available. Length compositions/mean lengths from 1976 to present were available for some fleets.

Cpue series from several fleets are shown in Figure 9.4.12.1.2.

Comparison with previous assessment and advice

The information base is similar to previous assessments. The previous advice was for a 30% reduction in fishing effort. compared to the 1998 level. The current advice reduce current catches (by around 30%).

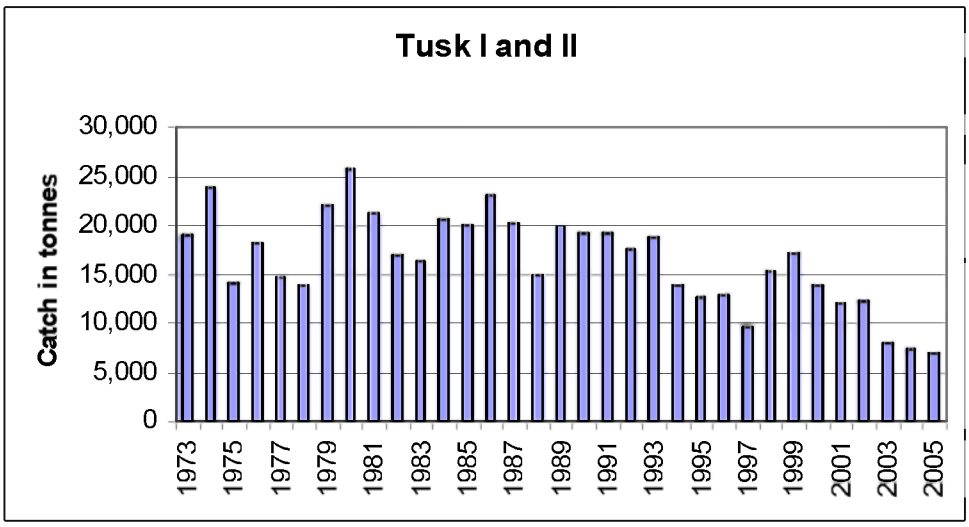


Figure 9.4.12.1.1 Total international landings.

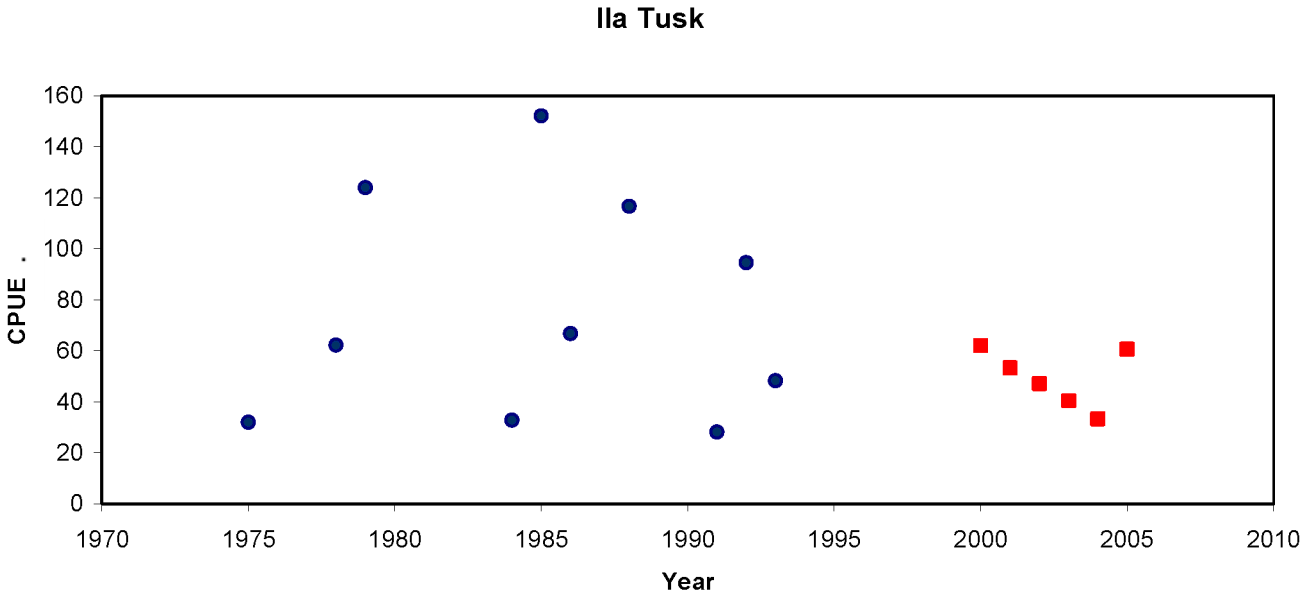


Figure 9.4.12.1.2 Estimates of cpue (kg/1000 hooks) of tusk based on skippers' logbooks (pre-1994) and official logbooks (post-2000).

Table 9.4.12.1.1 Landings.

Year	ACFM Catch
1988	14
1989	19
1990	19
1991	18
1992	16
1993	18
1994	13
1995	12
1996	13
1997	9
1998	15
1999	17
2000	14
2001	12
2002	12
2003	8
2004	7
2005	7

Weights in '000 t.

Table 9.4.12.1.2 Tusk in Subareas I and II. Landings by area and country.

Tusk I. WG estimates of landings.

Year	Norway	Russia	Faroes	Iceland	Ireland	Total
1996	587					587
1997	665					665
1998	805					805
1999	907					907
2000	738	43	1	16		798
2001	595	6		13		614
2002	791	8	n/a	0		799
2003	571	5			5	581
2004	620	2			1	623
2005*	562					562

*Preliminary

Tusk IIa. WG estimates of landings.

Year	Faroes	France	Germany	Greenland	Norway	E&W	Scotland	Russia	Ireland	Total
1988	115	32	13		14,241	2				14,403
1989	75	55	10		19,206	4				19,350
1990	153	63	13		18,387	12	+			18,628
1991	38	32	6		18,227	3	+			18,306
1992	33	21	2		15,908	10				15,974
1993		23	2	11	17,545	3	+			17,584
1994	281	14	2		12,266	3				12,566
1995	77	16	3	20	11,271	1				11,388
1996	0	12	5		12,029	1				12,047
1997	1	21	1		8,642	2	+			8,667
1998		9	1		14,463	1	1			14,475
1999		7	+		16,213		2	28		16,250
2000		8	1		13,120	3	2	58		13,192
2001	11	15	+		11200	1	3	66	5	11301
2002		3			11303	1	4	39	5	11355
2003	6	2			7284		3	21		7316
2004	12	2			6607		1	61	1	6684
2005*	15	6			6238			37	3	6299

(1)Includes IIb.

*Preliminary

Table 9.4.12.1.2 Continued
Tusk IIb. WG estimates of landings.

Year	rway	E&W	Russia	Total
1988				0
1989				0
1990				0
1991				0
1992				0
1993		1		1
1994				0
1995	229			229
1996	161			161
1997	92	2		94
1998	73	+		73
1999	26		4	26
2000	15		3	18
2001	141		5	146
2002	30		7	37
2003	43			43
2004	114		5	119
2005*	148		16	164

*Preliminary

Tusk I & II. WG estimates of total landings by Sub-areas or Division

Year	I	IIa	IIb	All areas
1988		14403	0	14403
1989		19350	0	19350
1990		18628	0	18628
1991		18306	0	18306
1992		15974	0	15974
1993		17584	1	17585
1994		12566	0	12566
1995		11388	229	11617
1996	587	12047	161	12795
1997	665	8667	94	9426
1998	805	14475	73	15353
1999	907	16250	26	17183
2000	798	13192	18	14008
2001	614	11301	146	12061
2002	799	11355	37	12191
2003	581	7316	43	7940
2004	623	6684	119	7426
2005*	562	6299	164	7025

*Preliminary

9.4.12.2 Tusk in Division Va (Iceland)

State of the stock

A survey index shows that abundance has remained stable in recent years, lower than in the mid-1980s. Recruitment (< 40 cm) has increased substantially from a low level in 1995. The impact of increased recruitment will only be detected in the fishable stock after 8–10 years.

Reference points

Reference points that were previously suggested for tusk were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$. Given that the catch history of tusk extends well before the beginning of the available survey series, $\mathbf{U}_{max}$ is difficult to define.

Exploitation boundaries

The survey index shows an increasing trend in abundance while the catches have been stable. However, it also suggests a lower current abundance than in the 1980s. Therefore advice in a precautionary context is to maintain catches at the recent level (average 2001–2004) of about 5000 t, which is assumed to permit an increase in abundance.

Management considerations

Tusk and ling are caught together as bycatch of the Icelandic longline and trawl fisheries, which is mainly directed at cod. Tusk is caught both in shelf areas and on the continental slope.

Factors affecting the fisheries

The fisheries are managed through TACs. Closed areas of the south and southeast coast of Iceland have been implemented in 2003 to prevent the fishing on juveniles in Division Va.

Scientific basis

The perception of the state of the stock is based on the Icelandic March groundfish survey. The trends are confirmed by the October survey, except for recruitment. The October survey is not expected to reflect recruitment dynamics, because it is conducted on deeper waters compared to the distribution of the juvenile fish. The trend in recruitment is confirmed by the length distribution of tusk in the catches.

The commercial cpue series were not used in the assessment because fishing trips resulting in zero catches were not accounted for in the calculation.

Comparison with previous assessment and advice

The perception of the adult stock has changed since the last advice, from being stable at a very low level to being slightly increasing. This has led to a change in the advice from reducing exploitation by 30% compared to the 1998 level to maintaining recent catch levels.

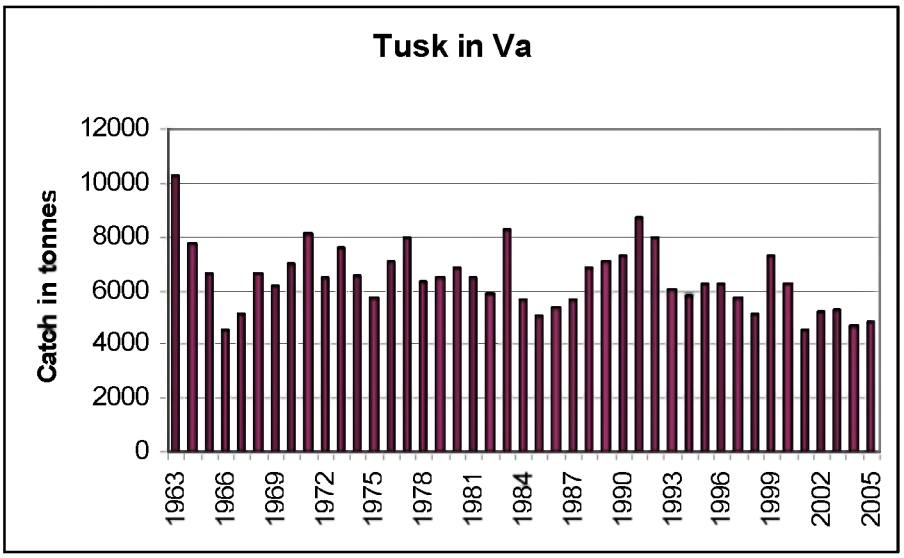


Figure 9.4.12.2.1 Tusk in Division Va. Total catch.

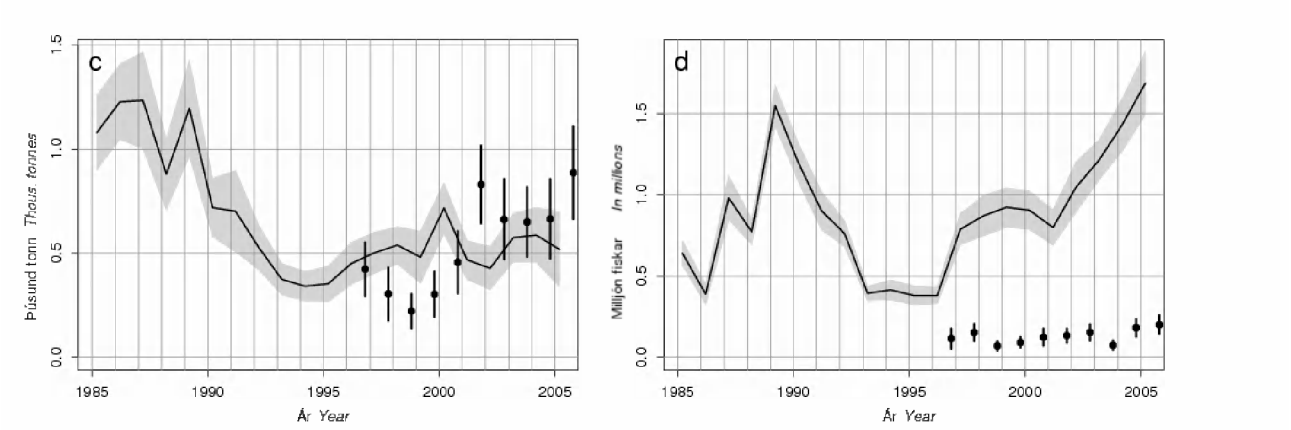


Figure 9.4.12.2.2 Tusk in Division Va. Indices from the groundfish survey in Spring c) Biomass 60 cm and larger, d) Abundance of < 40 cm. Corresponding indices from the Autumn survey are also shown (single dots and bars).

Table 9.4.12.2.1. Tusk in Division Va. Single-stock exploitation boundaries (advice), management, and catch/landings.

Year	ICES Advice	Predicted landings corresp. to (single-stock) exploitation boundaries/advice	Agreed TAC[1]	Official landings	ACFM landings
1988					6 864
1989					7 076
1990					7 291
1991					8 732
1992					8 009
1993					6 058
1994					5 827
1995					6 230
1996					6 240
1997					5 758
1998					5 145
1999					7 289
2000					6 239
2001			4500		4 525
2002			3500		5 248
2003			3500		5 314
2004			3500		4 665
2005			3500		4 824
2006					
2007		4900			

1. TACs set by Iceland

Table 9.4.12.2.2 Tusk in Division Va. Total international landings (tonnes).

Year	Iceland	Other nations	Total
1963	5 872	4 425	10 297
1964	3 532	4 214	7 746
1965	2.263	4 347	6 610
1966	2 107	2 468	4 575
1967	2 699	2 433	5 132
1968	4 604	2 028	6 632
1969	4 075	2 143	6 218
1970	4 357	2 630	6 987
1971	3 793	4 319	8 112
1972	2 815	3 645	6 460
1973	2 366	5 241	7 607
1974	1 857	4 679	6 536
1975	1 673	4 058	5 731
1976	2 935	4 177	7 112
1977	3 122	4 826	7 948
1978	3 352	2 980	6 332
1979	3 558	2 895	6 453
1980	3 089	3 801	6 890
1981	2 827	3 649	6 476
1982	2 804	3 076	5 880
1983	3 469	4 818	8 287
1984	3 430	2 262	5 692
1985	3 068	1 996	5 064
1986	2 548	2 832	5 380
1987	2 987	2 657	5 644
1988	3 087	3 777	6 864
1989	3 158	3 918	7 076
1990	4 816	2 475	7 291
1991	6 446	2 286	8 732
1992	6 442	1 567	8 009
1993	4 729	1 329	6 058
1994	4 615	1 212	5 827
1995	5 245	985	6 230
1996	5 226	1 014	6 240
1997	4 814	944	5 758
1998	4 118	1 027	5 145
1999	5 795	1 494	7 289
2000	4 711	1 528	6 239
2001	3 392	1 133	4 525
2002	3 906	1 342	5 248
2003	4 030	1 284	5 314
2004	3 135	1 530	4 665
2005[1)]	3 539	1 285	4 824

9.4.12.3 Tusk in Divisions IIIa, IVa, Vb, VI, VII, VIII, IX, XII, and XIV (other areas)

State of the stock

The cpue series of the main fleet in Divisions IVa, VIa, and VIb suggest that the abundance has remained at a reduced level (Figure 9.4.12.2).

Reference points

Reference points that were previously suggested for tusk were: $\mathbf{U}_{lim}$= 0.2* $\mathbf{U}_{max}$ and $\mathbf{U}_{pa}$= 0.5* $\mathbf{U}_{max}$. ICES considers that the available cpue series are not suitable for defining $\mathbf{U}_{max}$ because the definition of effort may not be consistent between different periods.

Exploitation boundaries

Landings of tusk have declined in recent years and the overall cpue on tusk has remained at a reduced level. There has been no response in the cpue series and a further reduction of 30% is advised. ICES recommends to limit catches to 5000 t and to monitor whether an increase in stock size is indicated.

Management considerations

Tusk is a bycatch species in longline, trawl, and gillnet fisheries. Norway has traditionally landed a dominant portion of the total and around 90% of the Norwegian landings are taken by longliners.

Tusk is more vulnerable to overexploitation than ling due to a slower growth rate and higher age at first maturity.

Factors affecting the fisheries

There is a licensing scheme and effort limitation in Area Vb, and the minimum landing size for tusk in area Vb is 40 cm.

The TAC for the EU fleet was 1155 tonnes per year for 2003 onwards in EU waters and international waters. Norway, caught 5000 tonnes in 2003–2005 and 4000 tonnes in 2006 in EU waters. Norway has bilaterally agreed quotas in Va and Vb. Norway has also implemented a licensing scheme.

The effort in the NEAFC regulatory area has been frozen for 2003 and 2004.

Scientific basis

Total landings were available for all relevant fleets, discard data were not available.

The cpue series in the period 1971–1994 is derived from skippers' logbooks. The cpue series for 2000–2005 is based on catch and effort in number of hooks per day. The consistency between the two series needs to be further explored (see Figure 9.4.12.2). Genetics investigations are currently on-going, which may clarify the stock structure of tusk.

Comparison with previous assessment and advice

The interpretation of the information on the stock has changed since the advice in 2004. The advice in 2004 was for a 30% decrease in effort compared to 1998. However, because there is no information on effort and because landings have decreased substantially since 1998 but this has not lead to a response in increase CPUE, the advice this year is for a further 30% reduction in landings.

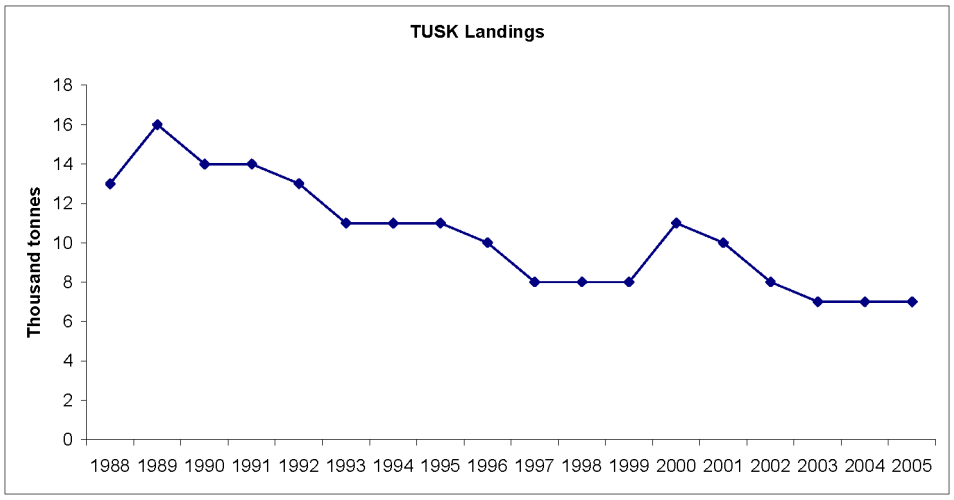


Figure 9.4.12.3.1 Landings of tusk in Divisions and Subareas IIIa, IV, Vb, VI, VII, XII, and XIV, based on ICES estimates.

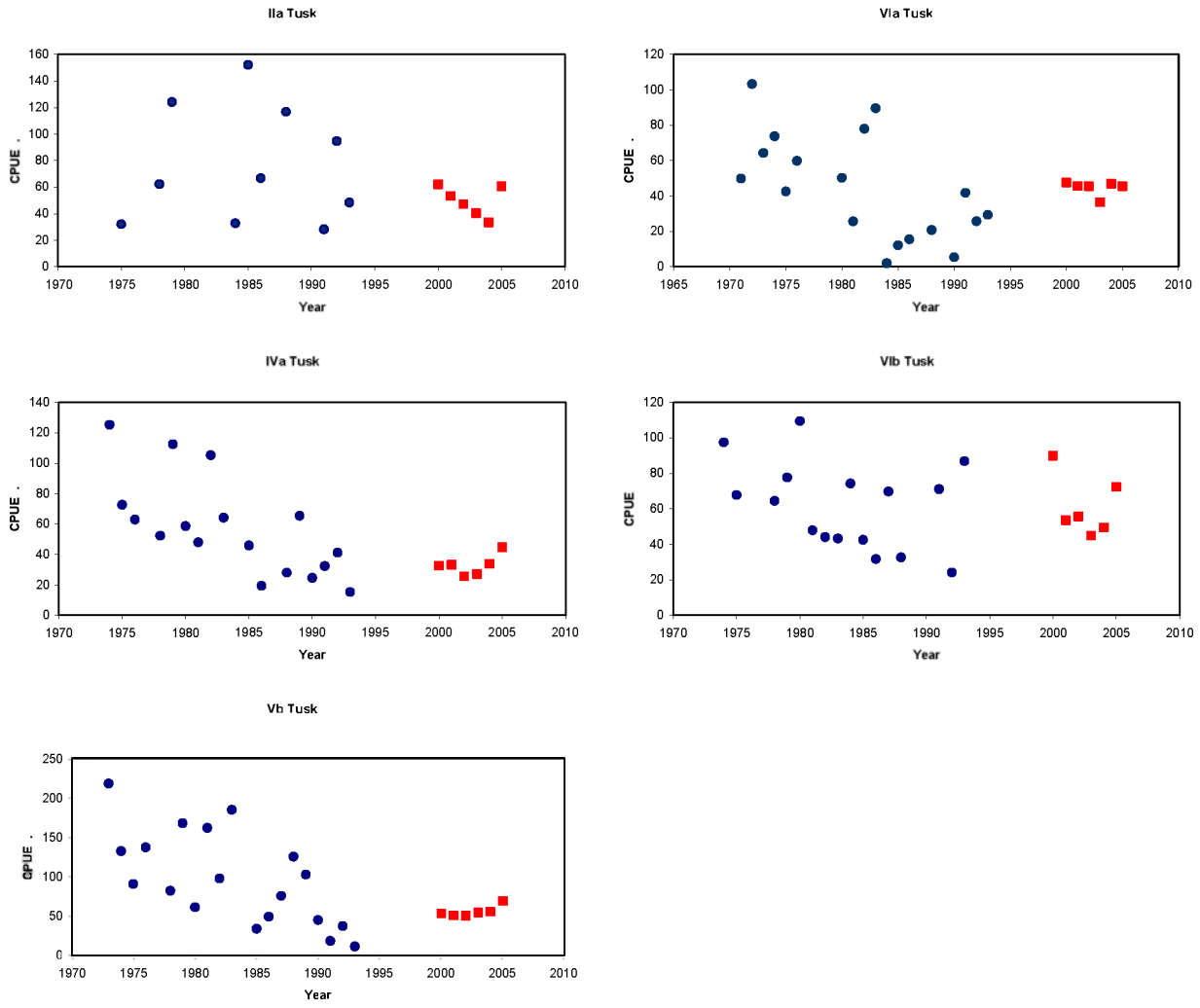


Figure 9.4.12.3.2 Estimates of cpue (kg/1000 hooks) of tusk based on skippers' logbooks (pre-2000, blue dots) and official logbooks (post-2000, red squares). Note gap in the time-series between 1993 and 2000, and the differences in cpue scale between areas.

Table 9.4.12.3.1 Tusk (*Brosme brosme*). ICES estimates of landings (tonnes).

TUSK IIIa

Year	Denmark	Norway	Sweden	**Total**
1988	8	51	2	**61**
1989	18	71	4	**93**
1990	9	45	6	**60**
1991	14	43	27	**84**
1992	24	46	15	**85**
1993	19	48	12	**79**
1994	6	33	12	**51**
1995	4	33	5	**42**
1996	6	32	6	**44**
1997	3	25	3	**31**
1998	2	19		**21**
1999	4	25		**29**
2000	8	23	5	**36**
2001	10	41	6	**57**
2002	17	29	4	**50**
2003	15	32	4	**51**
2004	18	21	6	**45**
2005*	9	30	5	**44**

*Preliminary

TUSK IVa

Year	Denmark	Faroes	France	Germany	Norway	Sweden[1]	E & W	N.I.	Scotland	Ireland	**Total**
1988	83	1	201	62	3,998	-	12	-	72		**4,429**
1989	86	1	148	53	6,050	+	18	+	62		**6,418**
1990	136	1	144	48	3,838	1	29	-	57		**4,254**
1991	142	12	212	47	4,008	1	26	-	89		**4,537**
1992	169	-	119	42	4,435	2	34	-	131		**4,932**
1993	102	4	82	29	4,768	+	9	-	147		**5,141**
1994	82	4	86	27	3,001	+	24	-	151		**3,375**
1995	81	6	68	24	2,988		10		171		**3,348**
1996	120	8	49	47	2,970		11		164		**3,369**
1997	189	0	47	19	1,763	+	16		238	-	**2,272**
1998	114	3	38	12	2,943		11		266	-	**3,387**
1999	165	7	44	10	1,983		12		213	1	**2,435**
2000	208	+	32	10	2,651	2	12		343	1	**3,259**
2001	258		26	8	2443	1	11		343	1	**3091**
2002	199		21		2438	1	8		294		**2961**
2003	217		19	6	1560		4		191		**1997**
2004	137	+	13	3	1370	+	2		140		**1665**
2005*	123		11	4	1559	1	2		75		**1775**

ıdes IVb 1988-1993

Table 9.4.12.3.1 (Cont'd)

TUSK IVb

Year	Denmark	France	Norway	Germany	E & W	Scotland	**Total**
1988		n.a.		-	-		
1989		3		-	1		**4**
1990		5		-	-		**5**
1991		2		-	-		**2**
1992	10	1		-	1		**12**
1993	13	1		-	-		**14**
1994	4	1		-	2		**7**
1995	4	-	5	1	3	2	**15**
1996	134[1]	-	21	4	3	1	**163**
1997	6	1	24	2	2	3	**38**
1998	4	0	55	1	3	3	**66**
1999	8	-	21	1	1	3	**34**
2000	8		106	+	-	2	**116**
2001	6		45[1]	1	1	3	**56**
2002	6		61	1	1	2	**71**
2003	2		5	1			**8**
2004	2		19	1		1	**23**
2005*	2		5	1			**8**

[1] Includes IVc

TUSK Vb1

Year	Denmark	Faroes[4]	France	Germany	Norway	E & W	Scotland [1]	**Total**
1988	+	2,827	81	8	1,143	-		**4,059**
1989	-	1,828	64	2	1,828	-		**3,722**
1990	-	3,065	66	26	2,045	-		**5,202**
1991	-	3,829	19	1	1,321	-		**5,170**
1992	-	2,796	11	2	1,590	-		**4,399**
1993	-	1,647	9	2	1,202	2		**2,862**
1994	-	2,649	8	1 [2]	747	2		**3,407**
1995		3,059	16	1 [2]	270	1		**3,347**
1996		1,636	8	1	1,083			**2,728**
1997		1,849	11	+	869		13	**2,742**
1998		1,272	20	-	753	1	27	**2,073**
1999		1956	27	1	1522		11[3]	**3517**
2000		1150	13	1	1191	1	11[3]	**2367**
2001		1916	14	1	1572	1	20	**3524**
2002		1033	10		1642	1	36	**2722**
2003		1200	11		1504	1	17	**2733**
2004		1705	13		1798	1	19	**3536**
2005*		1822	12		1398		6	**3238**

. [3]Reported as Vb.(4) 2000-2003 Vb1 ans Vb2 combined

Table 9.4.12.3.1 (Cont'd)

TUSK Vb2

Year	Faroe	Norway	E & W	Scotland [1]	Total
1988	545	1,061	-	+	**1,606**
1989	163	1,237	-	+	**1,400**
1990	128	851	-	+	**979**
1991	375	721	-	+	**1,096**
1992	541	450	-	1	**992**
1993	292	285	-	+	**577**
1994	445	462	+	2	**909**
1995	225	404	[2]	2	**631**
1996	46	536			**582**
1997	157	420			**577**
1998	107	530			**637**
1999	132	315			**447**
2000		333			**333**
2001		469			**469**
2002		281			**281**
2003		559			**559**
2004		107			**107**
2005*		306			**306**

[2]See Vb_1. [3]Included in Vb_1.

TUSK VIa

Year	Denmark	Faroes	France [1]	Germany	Ireland	Norway	E & W	N.I.	Scot.	Spain	Total
1988	-	-	766	1	-	1,310	30	-	13		**2,120**
1989	+	6	694	3	2	1,583	3	-	6		**2,297**
1990	-	9	723	+	-	1,506	7	+	11		**2,256**
1991	-	5	514	+	-	998	9	+	17		**1,543**
1992	-	-	532	+	-	1,124	5	-	21		**1,682**
1993	-	-	400	4	3	783	2	+	31		**1,223**
1994	+		345	6	1	865	5	-	40		**1,262**
1995		0	332	+	33	990	1		79		**1,435**
1996		0	368	1	5	890	1		126		**1,391**
1997		0	359	+	3	750	1		137	11	**1,261**
1998			395	+		715	-		163	8	**1,281**
1999			193	+	3	113	1		182	47	**539**
2000			238	+	20	1327	8		231	158	**1982**
2001			173	+	31	1201	8		279	37	**1729**
2002			113		8	636	5		274	64	**1100**
2003			105		4	905	3		104	13	**1134**
2004		1	140		22	470			93	17	**743**
2005*		2	202		7	702			89	16	**1018**

d by divisions before 1993.
*Preliminary

Table 9.4.12.3.1 (Cont'd)

TUSK VIb

Year	Faroes	France	Germany	Ireland	Iceland	Norway	E & W	N.I.	Scot.	Russia	**Total**
1988	217		-	-		601	8	-	34		**860**
1989	41	1	-	-		1,537	2	-	12		**1,593**
1990	6	3	-	-		738	2	+	19		**768**
1991	-	7	+	5		1,068	3	-	25		**1,108**
1992	63	2	+	5		763	3	1	30		**867**
1993	12	3	+	32		899	3	+	54		**1,003**
1994	70	1	+	30		1,673	6	-	66		**1,846**
1995	79	1	+	33		1,415	1		35		**1,564**
1996	0	1		30		836	3		69		**939**
1997	1	1		23		359	2		90		**476**
1998		1		24	18	630	9		233		**915**
1999				26	-	591	5		331		**953**
2000		2		22		1933	14		372	1	**2,344**
2001	1	1		31		476	10		157	6	**681**
2002		9		3		515	8		88		**623**
2003		7		18		452	11		72	1	**561**
2004		9		1		508	4		45	60	**627**
2005*		5		9		503	5		31	137	**690**

TUSK VIIa

Year	France	E & W	Scotland	**Total**
1988	n.a.	-	+	+
1989	2	-	+	**2**
1990	4	+	+	**4**
1991	1	-	1	**2**
1992	1	+	2	**3**
1993	-	+	+	+
1994	-	-	+	+
1995	-	-	1	**1**
1996	-	-		
1997	-	-	1	**1**
1998	-	-	1	**1**
1999	-	-	+	+
2000		-	+	+
2001		-	1	1
2002	n/a	-	-	-
2003		-	-	-
2004				
2005*				

TUSK VIIb,c

Year	France	Ireland	Norway	E & W	N.I.	Scotland	**Total**
1988	n.a.	-	12	5	-	+	**17**
1989	17	-	91	-	-	-	**108**
1990	11	3	138	1	-	2	**155**
1991	11	7	30	2	1	1	**52**
1992	6	8	167	33	1	3	**218**
1993	6	15	70	17	+	12	**120**
1994	5	9	63	9	-	8	**94**
1995	3	20	18	6		1	**48**
1996	4	11	38	4		1	**58**
1997	4	8	61	1		1	**75**
1998	3		28	-		2	**33**
1999	-	16	130	-		1	**147**
2000	3	58	88	12		3	**164**
2001	3	54	177	4		25	**263**
2002	1	31	30	1		3	**66**
2003	1	19		1			**21**

Table 9.4.12.3.1 (Cont'd)

TUSK VIIg-k

Year	France	Germany	Ireland	Norway	E & W	Scotland	Spain	**Total**
1988	n.a.		-	-	5	-		**5**
1989	3		-	82	1	-		**86**
1990	6		-	27	0	+		**33**
1991	4		-	-	8	2		**14**
1992	9		-	-	38	-		**47**
1993	5		17	-	7	3		**32**
1994	4		12	-	12	3		**31**
1995	3		8	-	18	8		**37**
1996	3		20	-	3	3		**29**
1997	4	4	11	-		+	0	**19**
1998	2	3	4	-		1	0	**10**
1999	1	1	-	-		+	6	**8**
2000	3		5	-	-	+	6	**14**
2001	3		-	9	-	+	2	**14**
2002	1				1		3	**5**
2003	1		1				1	**3**
2004	1							**1**
2005*	1							**1**

TUSK VIIIa

Year	E & W	France	**Total**
1988	1	n.a.	**1**
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	+	+	+
1998	-	1	**1**
1999	-	-	**0**
2000	-		-
2001	-		-
2002	-	+	+
2003	-	-	-
2004			
2005*			

TUSK XII

Year	Faroes	France	Iceland	Norway	Scotland	Russia	**Total**
1988		1					**1**
1989		1					**1**
1990		0					**0**
1991		1					**1**
1992		1					**1**
1993		12	+				**12**
1994		1	+				**1**
1995	8	-	10				**18**
1996	7	-	9	142			**158**
1997	11	-	+	19			**30**
1998		1		-			**1**
1999		1		+	1		**1**
2000				5	+		**5**
2001		1		51	+		**52**
2002				27			**27**
2003				83			**83**

Table 9.4.12.3.1 (Cont'd)

ΓUSK XIVa

Year	Germany	Norway	**Total**
1988	2		**2**
1989	1		**1**
1990	2		**2**
1991	2		**2**
1992	+		+
1993	+		+
1994	-		+
1995	-		+
1996			+
1997		-	+
1998		-	+
1999		+	+
2000		-	-
2001		0	**0**
2002	-	-	-
2003	-	-	-
2004			
2005*		5	5

ΓUSK XIVb

Year	Faroes	Iceland	Norway	E & W	Russia	**Total**
1988			-	-		
1989	19	3	-	-		**22**
1990	13	10	7	-		**30**
1991	-	64	68	1		**133**
1992	-	82	120	+		**202**
1993	-	27	53	+		**80**
1994	-	9	16	+		**25**
1995	-	57	30	+		**87**
1996	-	139	142			**281**
1997	-	10	108			**118**
1998	1	-	14			**15**
1999	-	n.a.	9			**9**
2000			11			**11**
2001	3		69			**72**
2002	4	28	30			**62**
2003			88			**88**
2004			40			**40**
2005*	1		36		8	**45**

*Preliminary

Table 9.4.12.3.2 Tusk. Total landings (ICES estimates).

Year	ACFM Catch
1988	13
1989	16
1990	14
1991	14
1992	13
1993	11
1994	11
1995	11
1996	10
1997	8
1998	8
1999	8
2000	11
2001	10
2002	8
2003	7
2004	7
2005	7

* Weights in '000 t.

9.4.13 Greater silver smelt or Argentine (*Argentina silus*)

There is insufficient scientific information to establish the extent of putative stocks; however, argentine may be sufficiently isolated at separate fishing grounds to be considered as individual management units. On this basis advice is presented for the following management units:

- Subarea Va (Iceland); and
- Subareas Vb, VI, VII I, II, IIIa, IVa, VIII, IX, and XII (other areas). The latter grouping is a combination of isolated fishing grounds and these areas are thus grouped due to their mutual of lack of data.

Argentine is primarily fished in the depth range 100–700 m. Argentine is vulnerable to over-exploitation due to its low productivity. It is particularly susceptible to rapid local depletion due to its highly aggregating behaviour.

There is no information on abundance of this species and cpue is not considered to reflect abundance due to the aggregating nature of the species. Landings in several areas show periodic short-term peaks. It is not known if this reflects the spasmodic nature of the rapid development of the fisheries or if it is due to local depletions.

In most cases advice is given that fisheries on argentine should always be accompanied by programmes to collect data on both target and bycatch fisheries, and that the fisheries should not be allowed to expand unless it can be shown that they are sustainable.

There are no specific management objectives for argentine in any area where it is fished. No reference points are defined for this species in any area where it is fished.

9.4.13.1 Greater silver smelt in Subdivision Va

State of the stock

There is no reliable index on which to determine the state of argentine abundance in Subdivision Va.

Exploitation boundaries

Due to its low productivity greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

The variability in the catches appears to reflect market demand. In Subdivision Va the fishery has changed from a bycatch to a targeted fishery. Smaller fish have been caught in recent years. This could be related to a change in fishing depth (Figure 9.4.13.1.2), to recruiting year classes, or to depletion of larger fish. Greater silver smelt have been caught in bottom trawls for years, as a bycatch in the redfish fishery. Only small amounts were reported prior to 1996 as most of the fish was discarded. Since 1997, direct fishery for greater silver smelt has been ongoing and the landings have increased significantly. The greater silver smelt is taken both in a directed fishery with a small mesh size belly and codends (80 mm), but also as a bycatch in the redfish fishery.

Factors affecting the fisheries

The fisheries of greater silver smelt have been managed through research licences issued by the Icelandic Ministry of Fisheries. The licenses are valid for a short time only and sampling is required in the licenses.

Catches increased in 1998 to 13 400 tonnes due to licenses issued for directed fishery. Subsequently, landings decreased with the declining interest in the fishery. The fishery has changed in depth range over time towards shallower waters.

Scientific basis

Cpue data are not useful for assessment because this is an aggregating and partly pelagic species. An Icelandic spring survey is available, but this covers only part of the depth range of the species and is therefore not appropriate as indicator of stock trends.

Comparison with previous assessment and advice

There is no assessment. The advice is similar to the most recent advice (in 2004) for a larger management unit.

Table 9.4.13.1.1. Greater silver smelt in Subdivision Va

Year	ACFM Catch
1988	0.2
1989	0.0
1990	0.1
1991	0.2
1992	0.7
1993	1.3
1994	0.6
1995	0.5
1996	0.8
1997	3.4
1998	13.4
1999	5.5
2000	4.6
2001	2.5
2002	4.4
2003	2.7
2004	3.6
2005*	4.4

*Preliminary. Weights in '000 t.

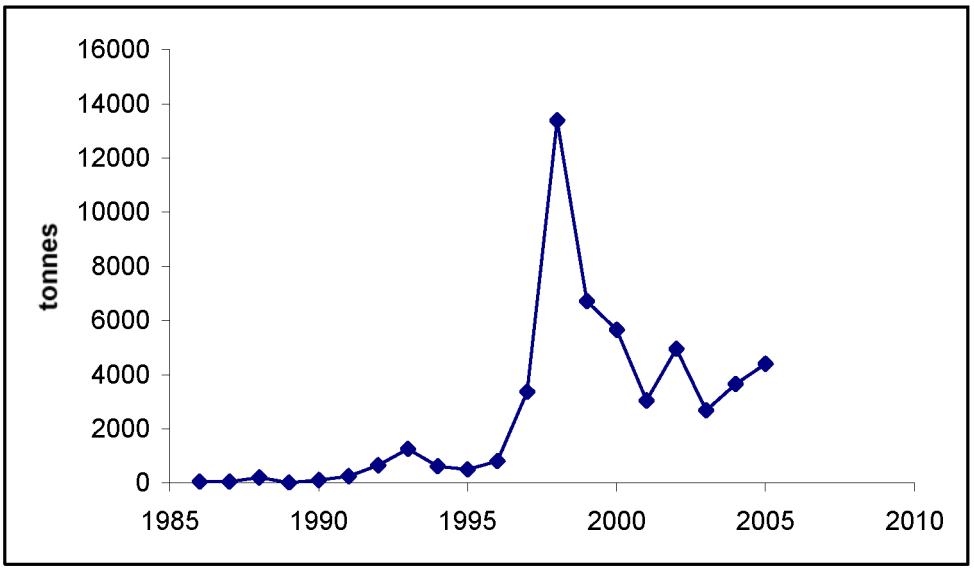


Figure 9.4.13.1.1 Greater silver smelt. Total landings.

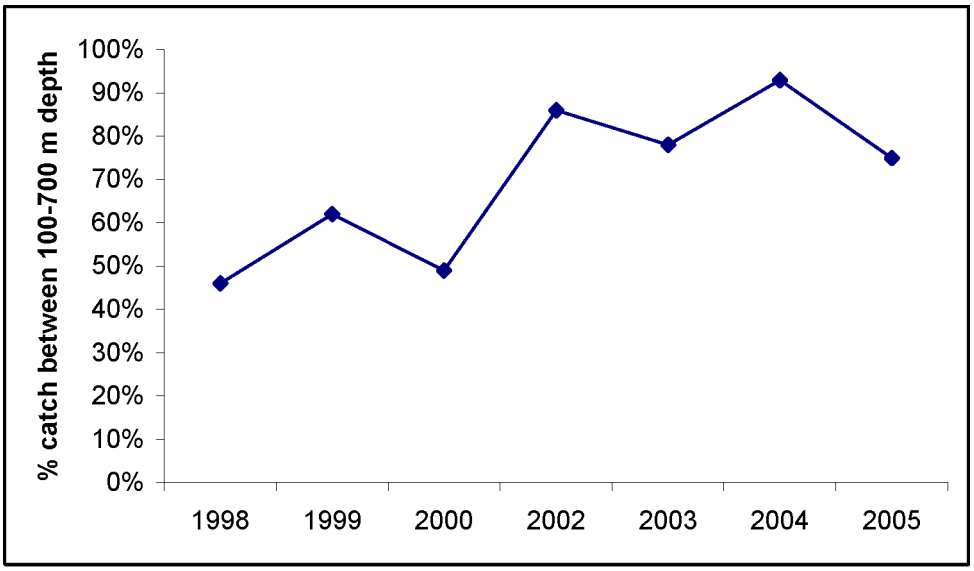


Figure 9.4.13.1.2 Greater silver smelt. Percentage of Icelandic catches taken between 100 and 700 m.

9.4.13.2 Greater silver smelt in other areas (Subdivisions I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, and XIV)

State of the stocks

The only sources of information on abundance trends are cpue series which show different patterns in different areas. Because greater silver smelt is an aggregating pelagic species, the use of cpue series to reflect stock abundance is questionable. Mean length in the catches in Subdivision Vb has decreased since 1995 which could be due to high exploitation rates.

Exploitation boundaries

Due to its low productivity greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fisheries. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

Greater silver smelt can be a very significant discard of the trawl fisheries of the continental slope of Subareas VI and VII, particularly at depths of 300–700m. The existing knowledge base is insufficient to determine if the current exploitation is sustainable.

The variability in the catches appears to reflect market demand.

Factors affecting the fisheries

In 2003 quota management was introduced in EU waters. For each year, quotas were set for greater silver smelt for community vessels fishing in community waters and international waters. A licensing scheme has been in place for several years in Norway and the Faroes instead of a TAC management.The licencing system regulates the number of trawlers that can take part in the directed fishery. There is no species-specific management of greater silver smelt in Subdivision Vb.

Scientific basis

Total landings by area are presented in Table 9.4.13.2.1 and Figure 9.4.13.2.1.

The only sources of information on abundance trends were cpue series from different fleets and areas. Because greater silver smelt is an aggregating pelagic species, the use of cpue series to reflect stock abundance is questionable. Length and age distributions in catches are available for Area Vb. Mean length in the catches has decreased since 1995 which could be due to high exploitation rates.

Comparison with previous assessment and advice

No significant changes to the perception of the stock. Advice is the same as in 2004.

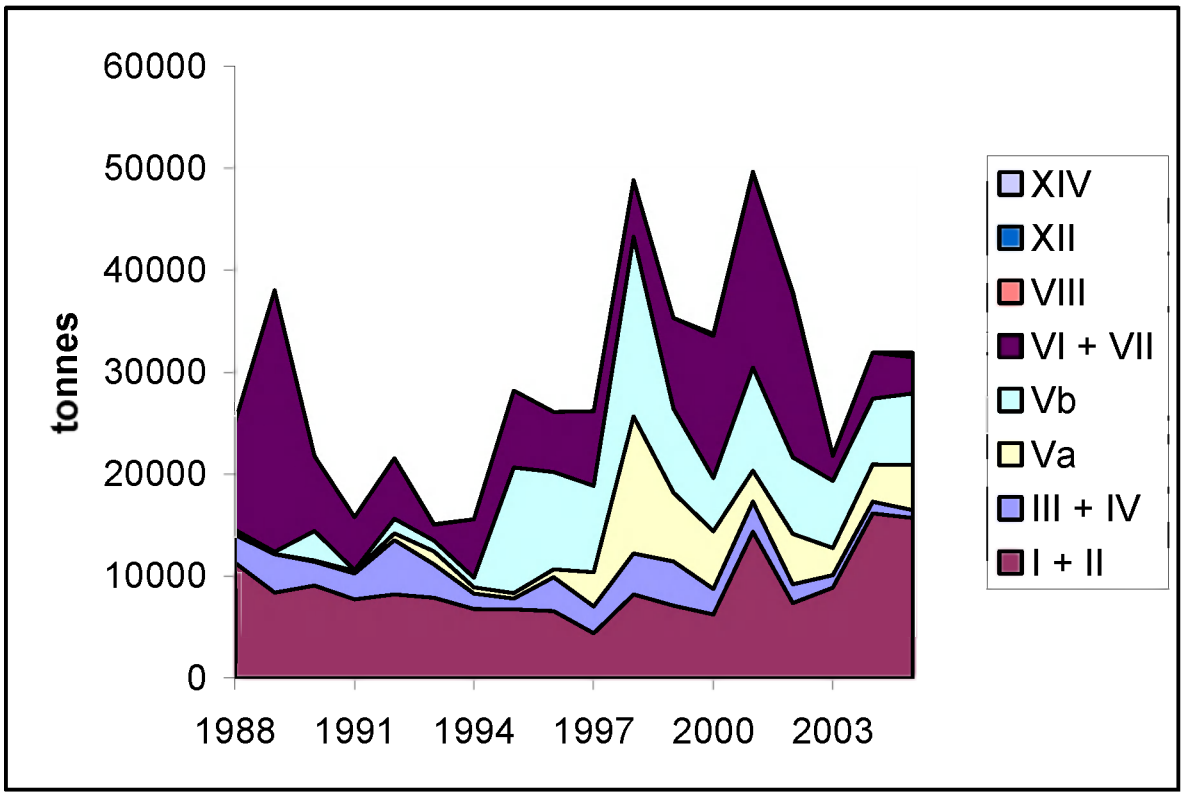


Figure 9.4.13.2.1 Greater silver smelt. Landings by area (ICES estimates).

Table 9.4.13.2.1 Greater silver smelt. International landings by area (tonnes).

Year	I + II	III + IV	Vb	VI + VII	VIII	XII	XIV	Total
1988	11351	2718	287	10438				24794
1989	8390	3786	227	25559				37962
1990	9120	2321	2888	7294			6	21629
1991	7741	2554	60	5197				15552
1992	8234	5319	1443	5906				20902
1993	7913	3269	1063	1577		6		13828
1994	6807	1508	960	5707				14982
1995	6775	1082	12286	7546				27689
1996	6604	3300	9498	5863		1		25266
1997	4463	2598	8433	7301				22795
1998	8261	3982	17570	5555				35368
1999	7163	4319	8214	8856		2		28554
2000	6293	2471	5209	13866			217	28056
2001	14369	2925	10081	19050			66	46491
2002	7407	1811	7471	15985	191			32865
2003	8917	1188	6549	2444	37			19135
2004	16158	1147	6451	4462	23	4		28245
2005*	15698	781	6978	3554	202	278		27491

*) Preliminary.

Table 9.4.13.2.2 Greater silver smelt. Landings by country and area (tonnes).

Greater silver smelt (Argentina silus) I and II

Year	Germany	Netherlan	Norway	Poland	Russia/US	Scotland	France	Faroes	TOTAL
1988			11332	5	14				**11351**
1989			8367		23				**8390**
1990		5	9115						**9120**
1991			7741						**7741**
1992			8234						**8234**
1993			7913						**7913**
1994			6217			590			**6807**
1995	357		6418						**6775**
1996			6604						**6604**
1997			4463						**4463**
1998	40		8221						**8261**
1999			7145			18			**7163**
2000		3	6075		195	18	2		**6293**
2001			14357		7	5			**14369**
2002			7405			2			**7407**
2003		555	8345		7	2	4	4	**8917**
2004		4601	11557						**16158**
2005*			15682		16				**15698**

Greater silver smelt (Argentina silus) III and IV

Year	Denmark	Faroes	France	Germany	Netherlan	Norway	Scotland	Sweden	Ireland	TOTAL
1988	1062			1		1655				**2718**
1989	1322				335	2128	1			**3786**
1990	737			13		1571				**2321**
1991	1421		1		3	1123	6			**2554**
1992	4449			1	70	698	101			**5319**
1993	2347				298	568	56			**3269**
1994	1480					4	24			**1508**
1995	1061					1	20			**1082**
1996	2695	370				213	22			**3300**
1997	1332			1		704	19	542		**2598**
1998	2716			128	277	434		427		**3982**
1999	3772		82		7	5	452		2	**4320**
2000	1806		270			32	78	273	12	**2471**
2001	1653		28			3	227	1011	3	**2925**
2002	1161					1	161	484	4	**1811**
2003	1119				42	6	20		1	**1188**
2004	1036			4	42	17	12		36	**1147**
2005*	733				28	2			18	**781**

Greater silver smelt (Argentina silus) Vb

Year	Faroes	Russia/US	UK (Scot	UK(EWN	Ireland	France	Netherlan	TOTAL
1988	287							**287**
1989	111	116						**227**
1990	2885	3						**2888**
1991	59		1					**60**
1992	1439	4						**1443**
1993	1063							**1063**
1994	960							**960**
1995	5534	6752						**12286**
1996	9495		3					**9498**
1997	8433							**8433**
1998	17570							**17570**
1999	8186		15	23		5		**8214**
2000	3713	1185	247			64		**5209**
2001	9572	414	94		1			**10081**
2002	7058	264	144				5	**7471**
2003	6261	245	1				42	**6549**
2004	3441	702	42				2266	**6451**
2005*	6908	59					11	**6978**

Table 9.4.13.2.2 (Cont'd)

Greater silver smelt (Argentina silus) VI and VII

Year	Faroes	France	Germany	Ireland	Netherlan	Norway	E & W	Scotland	N.I.	Russia	Spain	TOTAL
1988				5454		4984						**10438**
1989	188			6103	3715	12184	198	3171				**25559**
1990	689		37	585	5871			112				**7294**
1991		7		453	4723			10	4			**5197**
1992		1		320	5118			467				**5906**
1993					1168			409				**1577**
1994			43	150	4137			1377				**5707**
1995	1597		357	6	4136			146				**6242**
1996			1394	295	3953			221				**5863**
1997			1496	1089	4695			20				**7300**
1998			463	405	4687							**5555**
1999		21	24	394	8025			387		5		**8856**
2000		17	482	4703	3636			4965		29	34	**13866**
2001		12	189	7494	3659			7620		76		**19050**
2002			150	7589	4020			4197		29		**15985**
2003			164	95	1933			89		163		**2444**
2004		147		46	3731			526		12		**4462**
2005*		9		1	3465			75		4		**3554**

Greater silver smelt (Argentina silus) VIII

Year	Netherlan	TOTAL
2002	191	**191**
2003	37	**37**
2004	23	**23**
2005*	202	**202**

SPA WG data zero in all years 97-2001

Greater silver smelt (Argentina silus) XII

Year	Faroes	Iceland	Russia	Netherlan	TOTAL
1988					
1989					
1990					
1991					
1992					
1993	6				**6**
1994					
1995					
1996	1				**1**
1997					
1998					
1999					
2000		2			**2**
2001					
2002					
2003					
2004			4		**4**
2005*				278	**278**

Table 9.4.13.2.2 (Cont'd)

Greater silver smelt (Argentina silus) XIV

Year	Norway	Iceland	**TOTAL**
1988			
1989			
1990	6		**6**
1991			
1992			
1993			
1994			
1995			
1996			
1997			
1998			
1999			
2000		217	**217**
2001	66		**66**
2002			
2003			
2004			
2005*			

9.4.14 Orange roughy (*Hoplostethus atlanticus*) in all areas

State of the stocks

It is not known if individual aggregations are reproductively distinct. The state of the populations varies between ICES areas. Overall catches have fluctuated because of shifts in fishing effort between fishing grounds.

In Subarea VI orange roughy catches increased rapidly and subsequently dropped to about 5% of the maximum catch. It is presumed that the aggregations were fished out. Orange roughy fisheries in Subarea VII have exhibited a similar pattern to that in VI. High catches have not been sustained by individual fleets, suggesting sequential depletion. It is not clear if there are unfished aggregations remaining in Subarea VII. Based on an acoustic survey, a biomass of 19 000 t was estimated for orange roughy on six seamounts in Subarea VII. There is no information on stock status from other Subareas.

Management objectives

There are no management objectives for this stock.

Reference points

No reference points have been defined for this stock.

Single-stock exploitation boundaries

Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

Management considerations

Orange roughy are known to reach very old ages (highest estimated age of an individual is 187 years), and experience in other areas (e.g. South Pacific) has shown that this species is especially vulnerable to exploitation. Newly discovered aggregations are often overexploited before enough information is available to provide timely advice on management (Figure 9.4.14.1).

ICES provided information on vulnerable deep-sea aggregations in Section 3.13.3.b of the ACFM report 2003 (*ICES Cooperative Research Report No. 261*), see also answer to special request in Section 2.1.6.2 of the ACFM report 2004 (*ICES Advice,* 2004).

Factors affecting the fisheries and the stock

Regulations and their effects

Closed areas aimed at protecting orange roughy in Subdivisions VI and VII were implemented in 2005.

Changes in fishing technology and fishing pattern

The main fishery for orange roughy in the northern hemisphere is on separate aggregations west of Ireland in Subarea VII, this fishery has declined markedly in the past 2 years. The fishery in Subarea VI has decreased dramatically since the depletion of the main aggregation on the Hebrides Terrace Seamount in the early 1990s. Faroese fisheries in Subareas VI, XII, and X have ceased and so has an Icelandic fishery in Division Va.

Scientific basis

Data and methods

Information on landings by Division or Subarea and sporadic CPUE information is available, though not from the major fishing grounds. No analytical assessment was carried out. Provisional biomass estimates were derived from an acoustic survey in Subarea VII. However, the precision of these estimates was low.

Summaries of the total landings for all areas are given in Table 9.4.14.2. Landings by Subarea and by nation are given in Table 9.4.14.1.

Information from the fishing industry

Results from a cooperative project between the French industry and IFREMER indicate that there is no discard of orange roughy by French deep-sea trawlers in Subareas VI and VII.

Comparison with previous assessment and advice

The perception of the state of orange roughy spawning aggregations in Subarea VI as depleted and vulnerable remains unchanged since 2004, this perception now extends to include the aggregations in Subarea VII.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 2–11 May 2006, Vigo Spain (ICES CM 2006/ACFM:28).

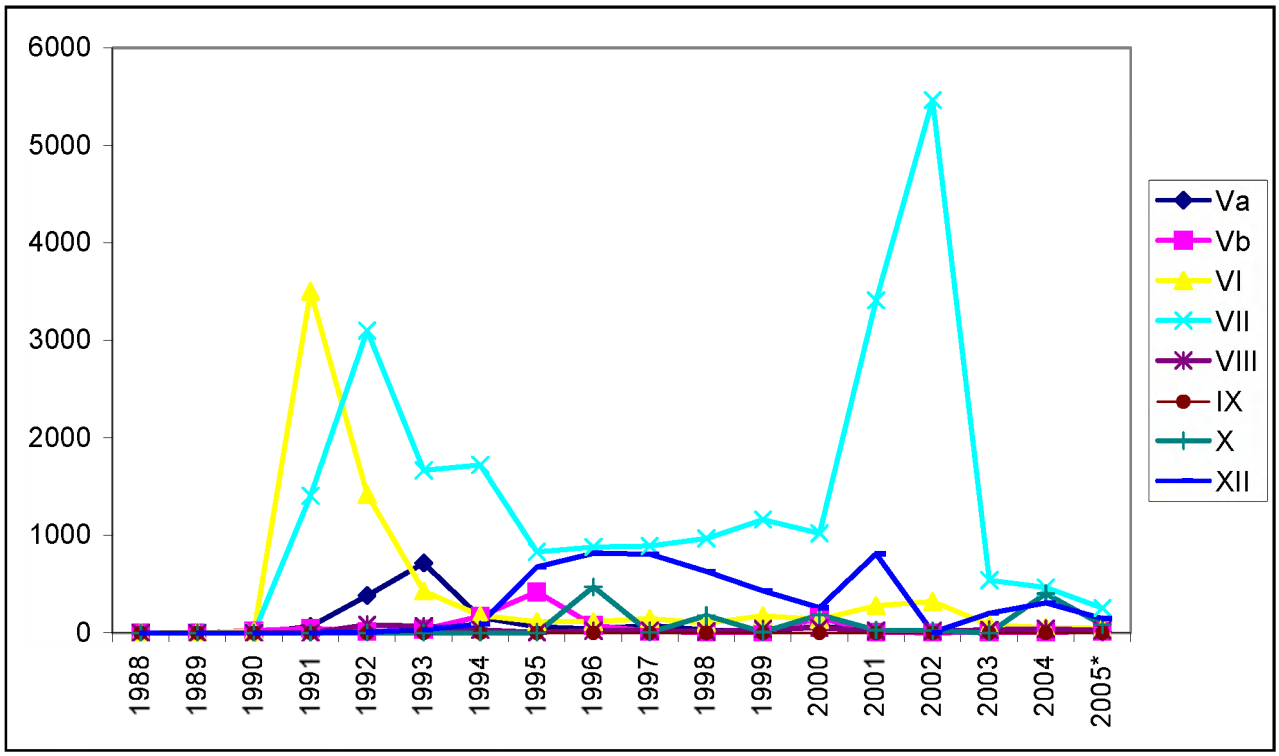


Figure 9.4.14.1 ICES estimates of international catch of orange roughy.

Table 9.4.14.1 Orange roughy. ICES estimates of catch by country and area.

Orange roughy in Division Va

Year	Iceland	**Total**
1988	-	**0**
1989	-	**0**
1990	-	**0**
1991	65	**65**
1992	382	**382**
1993	717	**717**
1994	158	**158**
1995	64	**64**
1996	40	**40**
1997	79	**79**
1998	28	**28**
1999	14	**14**
2000	68	**68**
2001	19	**19**
2002	10	**10**
2003	-	**0**
2004	28	**28**
2005*	9	**9**

*Preliminary.

Orange roughy in Division Vb

Year	Faroes	France	**Total**
1988	-	-	**0**
1989	-	-	**0**
1990	-	22	**22**
1991	-	48	**48**
1992	1	12	**13**
1993	36	1	**37**
1994	170	-	**170**
1995	419	1	**420**
1996	77	2	**79**
1997	17	1	**18**
1998	-	3	**3**
1999	4	1	**5**
2000	155	-	**155**
2001	1	4	**5**
2002	1	-	**1**
2003	2	3	**5**
2004		7	**7**
2005*	3	17	**20**

*Preliminary.

Orange roughy in Sub-area VI

Year	Faroes	France	UK	Ireland	Spain	**Total**
1988	-	-	-	-	-	**0**
1989	-	5	-	-	-	**5**
1990	-	15	-	-	-	**15**
1991	-	3,502	-	-	-	**3502**
1992	-	1,422	-	-	-	**1422**
1993	-	429	-	-	-	**429**
1994	-	179	-	-	-	**179**
1995	40	74	2	-	-	**116**
1996	-	116	-	-	-	**116**
1997	29	116	1	-	-	**146**
1998	-	100	-	-	2	**102**
1999	-	175	-	-	1	**176**
2000	-	136	-	2	-	**138**
2001	-	159	11	110	-	**280**
2002	n/a	152	41	130	-	**323**
2003	-	79	-	2	-	**81**
2004	-	54	-	2	-	**56**
2005*	-	39	-	6	-	**45**

* Preliminary.

Table 9.4.14.1 Orange roughy. ICES estimates of catch by country and area (continued).

Orange roughy in Sub-area VII

Year	France	Spain	UK	Ireland	Faroes	**Total**
1988	-	-	-	-	-	**0**
1989	3	-	-	-	-	**3**
1990	2	-	-	-	-	**2**
1991	1,406	-	-	-	-	**1406**
1992	3,101	-	-	-	-	**3101**
1993	1,668	-	-	-	-	**1668**
1994	1,722	-	-	-	-	**1722**
1995	831	-	-	-	-	**831**
1996	879	-	-	-	-	**879**
1997	893	-	-	-	-	**893**
1998	963	6	-	-	-	**969**
1999	1,157	4	-	-	-	**1161**
2000	1,019	-	-	1	-	**1020**
2001	1022	-	23	2367	-	**3412**
2002	300	-	47	5114	4	**5465**
2003	369	-	-	172	-	**541**
2004	279	-	-	188	-	**467**
2005*	165	-	-	90	-	**255**

*Preliminary.

Orange roughy in Sub-area VIII

Year	France	Spain VIII&IX	UK	**Total**
1988	-	-	-	**0**
1989	-	-	-	**0**
1990	-	-	-	**0**
1991	-	-	-	**0**
1992	83	-	-	**83**
1993	68	-	-	**68**
1994	31	-	-	**31**
1995	7	-	-	**7**
1996	22	-	-	**22**
1997	1	22	-	**23**
1998	4	10	-	**14**
1999	33	6	-	**39**
2000	47	-	5	**52**
2001	20	-	-	**20**
2002	20	-	-	**20**
2003	31	-	-	**31**
2004	43	-	-	**43**
2005*	27	-	-	**27**

*Preliminary.

Table 9.4.14.1 Orange roughy. ICES estimates of catch by country and area (continued).

Orange roughy in Sub-area IX

Year	Spain	**Total**
1988	-	**0**
1989	-	**0**
1990	-	**0**
1991	-	**0**
1992	-	**0**
1993	-	**0**
1994	-	**0**
1995	-	**0**
1996	-	**0**
1997	1	**1**
1998	1	**1**
1999	1	**1**
2000	-	**0**
2001	-	**0**
2002	-	**0**
2003	-	**0**
2004	-	**0**
2005*	-	**0**

*Preliminary.

Orange roughy in Sub-area X

Year	Faroes	France	Norway	UK	Portugal	Ireland	**Total**
1988	-		-	-	-	-	**0**
1989	-	-	-	-	-	-	**0**
1990	-	-	-	-	-	-	**0**
1991	-	-	-	-	-	-	**0**
1992	-	-	-	-	-	-	**0**
1993	-	-	1	-	-	-	**1**
1994	-	-	-	-	-	-	**0**
1995	-	-	-	-	-	-	**0**
1996	470	1	-	-	-	-	**471**
1997	6	-	-	-	-	-	**6**
1998	177	-	-	-	-	-	**177**
1999	-	10	-	-	-	-	**10**
2000	-	3	-	28	157	-	**188**
2001	84	-	-	28	343	-	**28**
2002	30	-	-	-	-	-	**22**
2003	-	1	-	-	-	-	**1**
2004	384	-	-	-	-	19	**403**
2005*	81	-	-	-	-	-	**83**

*Preliminary.

Orange roughy in Sub-area XII

Year	Faroes	France	Iceland	Spain	UK	Ireland	New Zealand	Russia	**Total**
1988	-	-	-	-	-	-	-	-	**0**
1989	-	-	-	-	-	-	-	-	**0**
1990	-	-	-	-	-	-	-	-	**0**
1991	-	-	-	-	-	-	-	-	**0**
1992	-	8	-	-	-	-	-	-	**8**
1993	24	8	-	-	-	-	-	-	**32**
1994	89	4	-	-	-	-	-	-	**93**
1995	580	96	-	-	-	-	-	-	**676**
1996	779	36	3	-	-	-	-	-	**818**
1997	802	6	-	-	-	-	-	-	**808**
1998	570	59	-	-	-	-	-	-	**629**
1999	345	43	-	43	-	-	-	-	**431**
2000	224	21	-	-	2	-	-	12	**259**
2001	345	14	-	-	2	-	450	-	**811**
2002	NA	6	-	-	-	-	-	-	**6**
2003	-	64	-	-	-	136	-	-	**200**
2004	176	131	-	-	-	-	-	-	**307**
2005*	111	35	-	-	-	-	-	-	**146**

*Preliminary.

Table 9.4.14.2 ICES estimates of international catch of orange roughy.

Year	Va	Vb	VI	VII	VIII	IX	X	XII	**Total**
1988	0	0	0	0	0	0	0	0	**0**
1989	0	0	5	3	0	0	0	0	**8**
1990	0	22	15	2	0	0	0	0	**39**
1991	65	48	3502	1406	0	0	0	0	**5021**
1992	382	13	1422	3101	83	0	0	8	**5009**
1993	717	37	429	1668	68	0	1	32	**2952**
1994	158	170	179	1722	31	0	0	93	**2353**
1995	64	420	116	831	7	0	0	676	**2114**
1996	40	79	116	879	22	0	471	818	**2425**
1997	79	18	146	893	23	1	6	808	**1974**
1998	28	3	102	969	14	1	177	629	**1923**
1999	14	5	176	1161	39	1	10	431	**1837**
2000	68	155	138	1020	52	0	188	259	**1880**
2001	19	5	280	3412	20	0	28	811	**4575**
2002	10	1	323	5465	20	0	22	6	**5847**
2003	NA	5	81	541	31	0	1	200	**859**
2004	28	7	56	467	43	0	403	307	**1311**
2005*	9	13	45	255	27	0	83	146	**578**
Total	1681	1001	7131	23795	480	3	1390	5224	**40705**

*Preliminary.

9.4.15 Roundnose grenadier (*Coryphaenoides rupestris*)

State of the stock

This section deals with a species distributed over a wide area which may be composed of several populations. The scientific basis for stock identification is uncertain. The Wyville-Thomson Ridge and fjord sills, between Western Scotland and the edge of the North Sea slope, could be natural physical boundaries. It is therefore considered that the northern North Sea and the Norwegian Deep could represent a separate unit. The roundnose grenadier on the Mid-Atlantic Ridge and the Hatton Bank are separated by a major oceanic basin and may constitute separate units. This would indicate that the units could be split as:

- Divisions IIa, IIIa, and IVa;
- Divisions Vb, VI, VII, VIII, IX, and XIIa (Hatton bank);
- Mid-Atlantic ridge (Subdivisions Xb, XIIc, Va1, XIIa1, and XIVb1) and Division Va;
- All other areas.

The state of roundnose grenadiers in these areas is uncertain, but probably at a low level.

Survey data from the west of Scotland (Division VI) indicates that the shallower component of the stock has been depleted (Figure 9.4.15.2). Length distribution of French landings indicate a change towards smaller fish (Figure 9.4.15.3). The results of an exploratory age-structured assessment of the stock in Subareas VI and VII and in Division Vb indicate that the total biomass has declined consistently since 1996.

Cpue data for the Mid-Atlantic Ridge suggest an overall decline in catch rates since the 1970s (Figure 9.4.15.4). There is no cpue information for the other areas.

Management objectives

There are no management objectives for this stock.

Reference points

No reference points have been defined for this stock.

Single-stock exploitation boundaries

Catches in Division IIIa have increased sharply and are estimated around 12 000 t. For this fishery, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared to the level before the fishery expanded (1991–1999). This is interpreted as a reduction of 50% in landings and corresponds to a catch level around 1000 t in 2007.

For the fishery in Divisions Vb, VI, VII, and XIIb, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared to the level before the expansion of the fishery started (1990-1996). This is interpreted as a reduction in catches of 50% over that period. This means that the catch level in 2007 should be at most 6 000 t.

In addition to their low productivity, roundnose grenadier on the Mid-Atlantic Ridge (Areas Xb, XIIc, Va1, XIIa1, and XIVb1) and Division Va exhibit spatial distributions associated with seamounts and aggregating behaviour. These grenadiers are therefore easily overexploited. Landings from this area appear to be low in recent years, but the quality of the landings data is suspect. Fishery on such species should be permitted only when accompanied by programmes to collect data. The expansion of the fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.

Roundnose grenadier in other areas has a low productivity and the species can only sustain a low fishing mortality. Recovery of depleted stock(s) will be slow. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

Roundnose grenadier has a longevity of 80–100 years and a slow growth.

Roundnose grenadier is taken as one of the target species in a mixed-species fishery, along with other deepwater species (black scabbard and deepwater sharks in Division Vb, Subareas VI and VII) or as a bycatch in fisheries for other species (*Pandalus borealis* in the deeper parts of Division III). Any measures taken to manage the stocks of grenadier should take account of the advice given for all the species taken in the same deepwater mixed fishery.

There has been a directed fishery for roundnose grenadier in IIIa by a very small group of Danish vessels. The landings have recently increased from around 2000 t to around 12 000 t in 2005.

Catches in Subareas X and XII are believed to be underestimated due to misreporting.

Roundnose grenadier is taken in a targeted fishery on the Mid-Atlantic Ridge. Soviet data suggested initially high stock biomasses in the 1970–1980s (400 000–700 000 t), but cpue data for the Mid-Atlantic Ridge suggest an overall decline in catch rates since the 1970s (Figure 9.4.15.4). A Russian trawl acoustic survey in 2003 showed relatively low biomass of the pelagic component of the stock, an increasing depth of the aggregations, and a higher proportion of small immature fish.

Factors affecting the fisheries and the stock

Regulations and their effects

There is a licensing scheme for European Community vessels in community and international waters. Effort limitations apply in the NEAFC regulatory area (international waters) for all NEAFC contracting parties. Trends in overall effort are not available to ICES.

The northern part of ICES Division IIIa (Skagerrak) is shared between the EU and Norway. According to the trilateral treaty between Denmark, Norway, and Sweden (Skagerrak Treaty) fishing vessels from each of the 3 countries may operate freely in each country's waters. The directed fishery for roundnose grenadier is mainly carried out in the Norwegian EEZ. The EC introduced unilateral TACs for IIIa in 2004 and 2005, but this restriction did not apply in the Norwegian EEZ. Therefore, the Danish (and Swedish) fleet(s) were able to fish unrestricted by the (EU) TAC. Following an agreement between the EU and Norway in February 2006, a TAC of 2700 t for the EU in 2006 was set for Division IIIa – including the Norwegian EEZ. Norwegian vessels have traditionally taken only a small amount of grenadier. It is not known if a catch of 2700 t is sustainable.

There is a licensing scheme and effort limitation in Divisions XIIc, Xb, and Subdivisions XIIa1, XIVb1, and Va1.

Changes in fishing technology and fishing patterns

The observed increasing cpue over recent years in Subareas VI and VII and Division Vb is believed to reflect a change in the fleet distribution or in the fish accessibility, and not an increase in stock size.

Scientific basis

Data and methods

Cpue data are available for roundnose grenadier in Division IIIa. Changes in fishing patterns, with increased targeting by a limited number of vessels, means that the cpue cannot be used as an index of total stock size or of SSB.

In Subareas VI and VII and in Division Vb, the cpue series are considered to be uninformative with respect to stock trends without further detailed analysis of spatial trends in the fishery. A preliminary age-based assessment has been performed. Discards are not included in catch estimates or in the assessment.

On the Mid-Atlantic Ridge the only available information is the catch statistics and a cpue series from the Soviet/Russian official data (Figure 9.4.15.4). The most recent Russian trawl acoustic survey was carried out in 2003 in the area between 47° and 58°N.

Landings by Subarea and by nation are given in Tables 9.4.15.1a-l. Summaries of the total landings by area are given in Table 9.4.15.2 and Figure 9.4.15.1.

Information from the fishing industry

In collaboration with the French industry, IFREMER has carried out investigations to refine cpue series for French trawlers. These analyses are still under development.

The French industry provides information on modifications of vessel activities which could have an effect on yields (catch limitations for commercial reasons, closed areas, etc.). Information on catches and discards in the French deep-sea fishery and a preliminary analysis of data from VMS and cpue distribution according to depth was also provided by the industry. Results from this cooperative project indicate that discards of commercial species by French deep-sea trawlers in Subareas VI and VII are mainly composed of roundnose grenadier mixed with rabbitfish.

Comparison with previous assessment and advice

Past advice has stated that a 50% reduction in fishing effort was needed to permit stock rebuilding and that the expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable. The present advice is consistent with previous advice.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 18–24 February 2004 (ICES CM 2004/ACFM: 15).

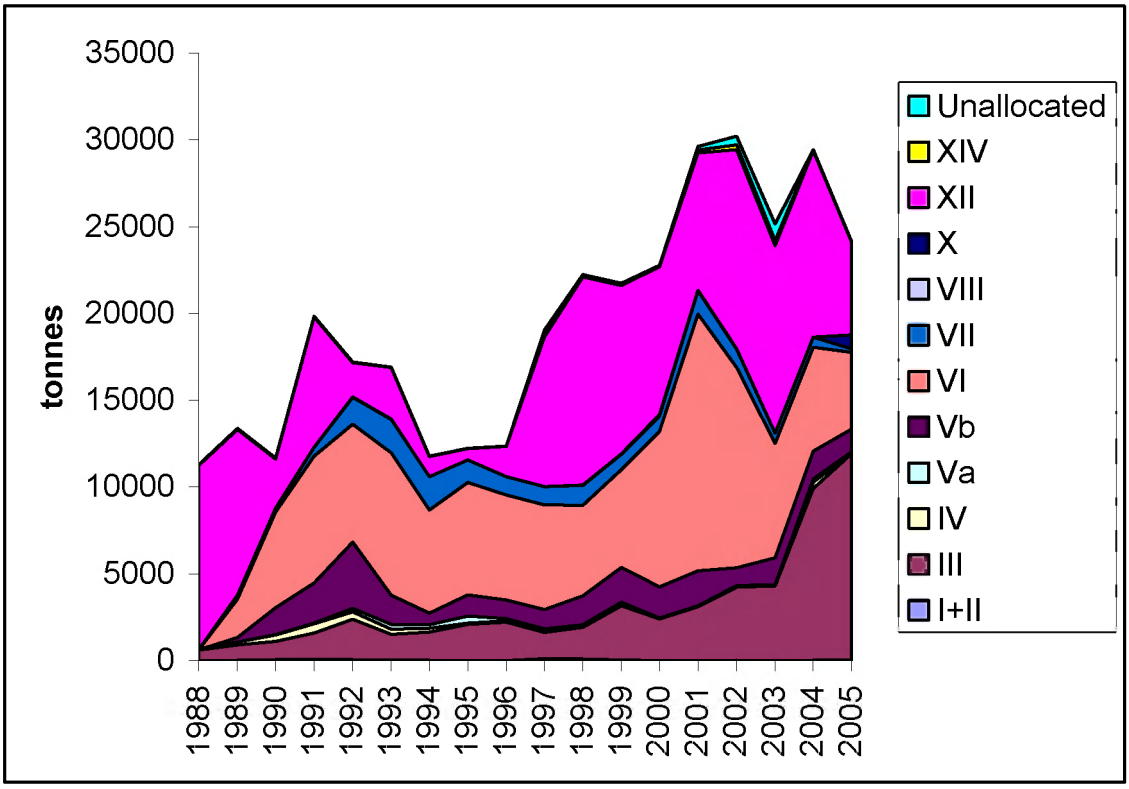


Figure 9.4.15.1 Roundnose grenadier. Landings by area as estimated by ICES.

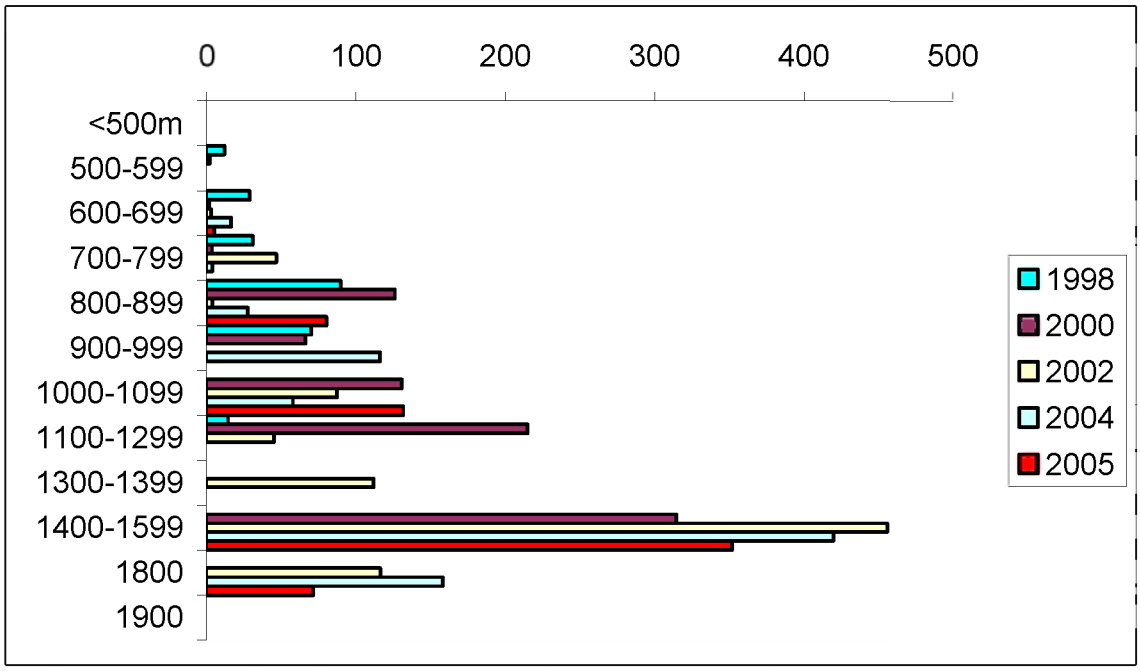


Figure 9.4.15.2 FRS survey to the west of Scotland (Division VI), cpue (kg h^{-1}) for *C. rupestris* at different depths between 55.5 and 58.5° N.

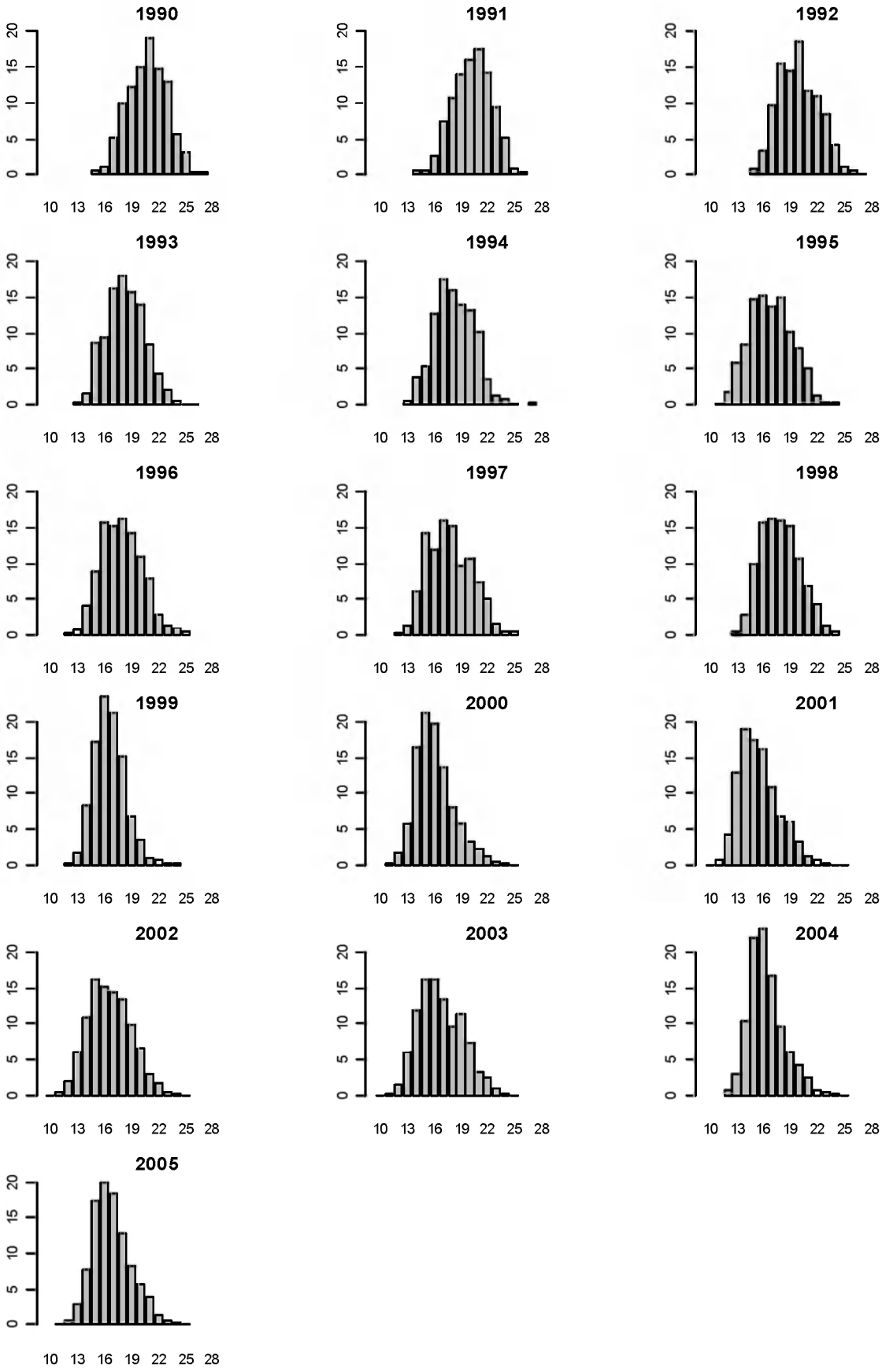


Figure 9.4.15.3 Roundnose grenadier. Length distribution of the French landings, 1990–2005.

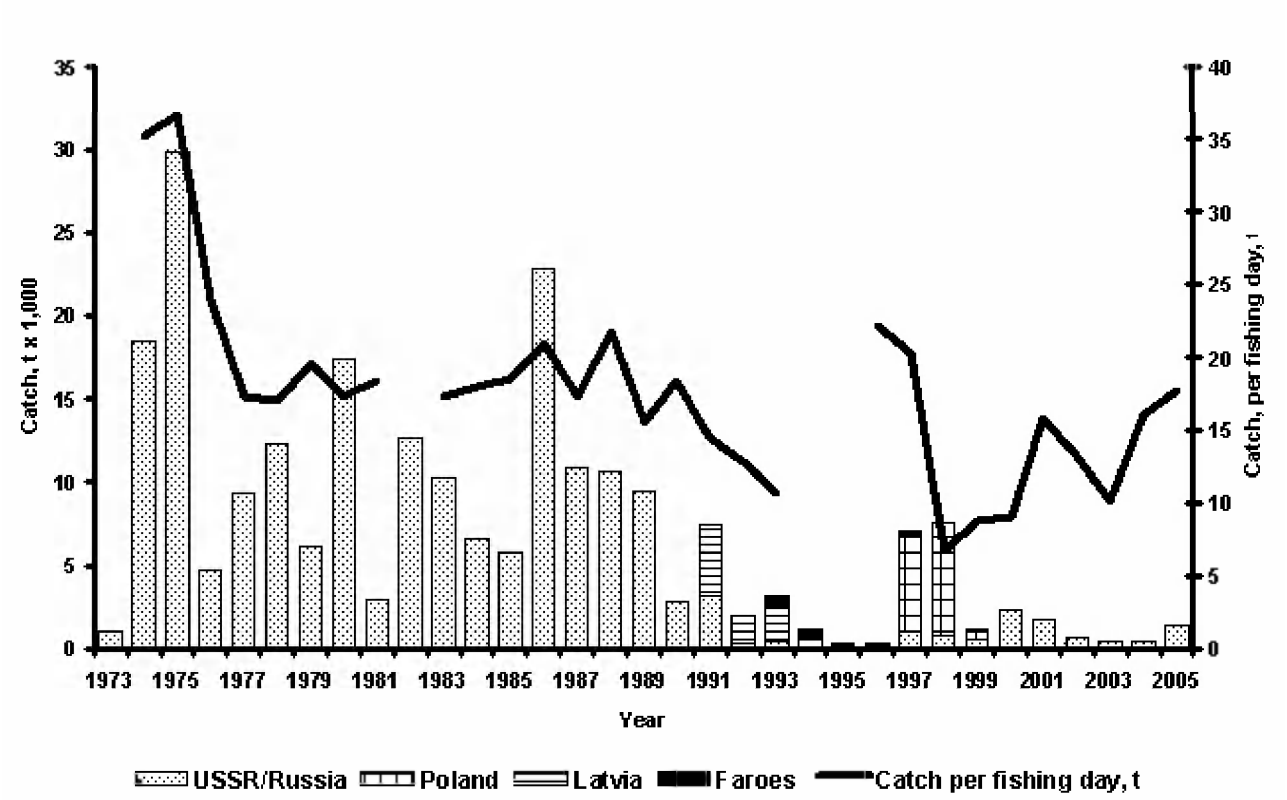


Figure 9.4.15.4 Roundnose grenadier. International catch and Soviet/Russian cpue on the Mid-Atlantic Ridge (1973–2005).

Table 9.4.15.1a Roundnose grenadier (*Coryphaenoides rupestris*) in I and II. Study Group estimates of landings (tonnes).

Year	Faroes	Denmark	France	Germany	Norway	Russia/USSR	E. Germany	UK (E+W)	UK (Scot)	**TOTAL**
1988										**0**
1989			1	2		16	3			**22**
1990			32	2		12	3			**49**
1991			41	3	28					**72**
1992		1	22		29					**52**
1993			13		2					**15**
1994			3	12						**15**
1995			7							**7**
1996			2							**2**
1997	1		5		100					**106**
1998					87	13				**100**
1999					44	2				**46**
2000										**0**
2001								2		**2**
2002					11	1				**12**
2003					4					**4**
2004					27					**27**
2005*			1		9					**10**

* Preliminary data.

Table 9.4.15.1b Roundnose grenadier (*Coryphaenoides rupestris*) in III. Study Group estimates of landings (tonnes).

Year	Denmark	Norway	Sweden	**TOTAL**
1988	612		5	**617**
1989	884		1	**885**
1990	785	280	2	**1067**
1991	1214	304	10	**1528**
1992	1362	211	755	**2328**
1993	1455	55		**1510**
1994	1591		42	**1633**
1995	2080		1	**2081**
1996	2213			**2213**
1997	1356	124	42	**1522**
1998	1490	329		**1819**
1999	3113	13		**3126**
2000	2400	4		**2404**
2001	3067	35		**3102**
2002	4196	24		**4220**
2003	4302			**4302**
2004	9874	16		**9890**
2005*	11922			**11922**

* Preliminary data.

Table 9.4.15.1c Roundnose grenadier (*Coryphaenoides rupestris*) in IV. Study Group estimates of landings (tonnes).

Year	France	Germany	Norway	UK (Scot)	Denmark	**TOTAL**
1988		1				**1**
1989	167	1		2		**170**
1990	370	2				**372**
1991	521	4				**525**
1992	421			4	1	**426**
1993	279	4				**283**
1994	185	2			25	**212**
1995	68	1		15		**84**
1996	59			5	7	**71**
1997	1			10		**11**
1998	35					**35**
1999	56		5			**61**
2000	2					**2**
2001	2				17	**19**
2002	11		1	26		**38**
2003	5		1	11		**17**
2004	5			1	371	**377**
2005*	18					**18**

* Preliminary data.

Table 9.4.15.1d Roundnose grenadier (*Coryphaenoides rupestris*) in Va. Study Group estimates of landings (tonnes).

Year	Faroes	Iceland**	Germany	Russia	UK (E+W)	**TOTAL**
1988		2				**2**
1989	2	2				**4**
1990		7				**7**
1991		48				**48**
1992		210				**210**
1993		276				**276**
1994		210				**210**
1995		398				**398**
1996	1	139				**140**
1997		198				**198**
1998		120				**120**
1999		129				**129**
2000		54				**54**
2001		40				**40**
2002		60				**60**
2003		57				**57**
2004		181				**181**
2005*		76				**76**

* Preliminary data.

** includes other grenadiers from 1988 to 1996.

Table 9.4.15.1e Roundnose grenadier (*Coryphaenoides rupestris*) in Vb. Study Group estimates of landings (tonnes).

Year	Faroes	France	Norway	Germany	Russia/USSR	UK (E+W)	UK (Scot)	**TOTAL**
1988				1				**1**
1989	20	181		5	52			**258**
1990	75	1470		4				**1549**
1991	22	2281	7	1				**2311**
1992	551	3259	1	6				**3817**
1993	339	1328		14				**1681**
1994	286	381		1				**668**
1995	405	818						**1223**
1996	93	983		2				**1078**
1997	53	1059						**1112**
1998	50	1617						**1667**
1999	104	1861	2			29		**1996**
2000	48	1699		1		43		**1791**
2001	84	1932						**2016**
2002	176	768				81		**1025**
2003	490	1032				10		**1532**
2004	508	989			6		76	**1579**
2005*	440	858			1		17	**1316**

* Preliminary data.

Table 9.4.15.1f Roundnose grenadier (*Coryphaenoides rupestris*) in VI. Study Group estimates of landings (tonnes).

Year	Estonia	Faroes	France	Germany	Ireland	Lith.	Norway	Poland	Russia	Spain	UK (E+W)	UK (Scot)	**TOTAL**
1988		27		4							1		**32**
1989		2	2211	3								2	**2218**
1990		29	5484	2									**5515**
1991			7297	7									**7304**
1992		99	6422	142			5				2	112	**6782**
1993		263	7940	1								1	**8205**
1994			5898	15	14							11	**5938**
1995			6329	2	59							82	**6472**
1996			5888									156	**6044**
1997		15	5795		4							218	**6032**
1998		13	5170				21			3			**5207**
1999			5637	3	1					1			**5642**
2000			7478		41		1			1002	1	433	**8956**
2001	680	11	5897	6	31	137	32	58	3	6942	21	955	**14773**
2002	821		7209		12	1817		932			6	741	**11538**
2003	52	32	4924		11	939		452	3			185	**6598**
2004	26	12	4585		8	961		13	72	252		72	**6001**
2005*		24	2874		17	939	1		71	467		29	**4422**

* Preliminary data.

Table 9.4.15.1g Roundnose grenadier (*Coryphaenoides rupestris*) in VII. Study Group estimates of landings (tonnes).

Year	Faroes	France	Ireland	Spain	UK (Scot)	**TOTAL**
1988						**0**
1989		222				**222**
1990		215				**215**
1991		489				**489**
1992		1556				**1556**
1993		1916				**1916**
1994		1922				**1922**
1995		1295				**1295**
1996		1051				**1051**
1997		1033		5		**1038**
1998		1146		11		**1157**
1999		892		4		**896**
2000		889				**889**
2001		947	416			**1363**
2002	1	451	605		3	**1060**
2003		374	213		1	**588**
2004		253	320			**573**
2005*		141	55			**196**

* Preliminary data.

Table 9.4.15.1h Roundnose grenadier (*Coryphaenoides rupestris*) in VIII & IX. Study Group estimates of landings (tonnes).

Year	France	Spain	**TOTAL**
1988			**0**
1989			**0**
1990	5		**5**
1991	1		**1**
1992	12		**12**
1993	18		**18**
1994	5		**5**
1995			**0**
1996	1		**1**
1997			**0**
1998	1	19	**20**
1999	9	7	**16**
2000	5		**5**
2001	7		**7**
2002	3		**3**
2003	2		**2**
2004	2		**2**
2005*	7		**7**

* Preliminary data.

Table 9.4.15.1i Roundnose grenadier (*Coryphaenoides rupestris*) in X Study Group estimates of landings (tonnes).

Year	Faroes	France	Russia	UK (E+W)	**Total**
1988					**0**
1989					**0**
1990					**0**
1991					**0**
1992					**0**
1993					**0**
1994					**0**
1995					**0**
1996	3				**3**
1997	1				**1**
1998	1				**1**
1999	3	3			**6**
2000				74	**74**
2001					**0**
2002					**0**
2003		1			**1**
2004	1				**1**
2005*			799		**799**

* Preliminary data.

Table 9.4.15.1j Roundnose grenadier (*Coryphaenoides rupestris*) in XII Study Group estimates of landings (tonnes).

Year	Estonia	Faroes	France	Germany	Iceland	Ireland	Latvia	Lithuania	Russia/ USSR	Poland	Spain	UK (E+W)	UK (Scotl.)	Norway	**Total**
1988									10606						**10606**
1989			0						9495						**9495**
1990			0						2838						**2838**
1991			14				4296		3214						**7524**
1992			13				1684		295						**1992**
1993		263	26	39			2176		473						**2977**
1994		457	20	9			675								**1161**
1995		359	285												**644**
1996		136	179		77				208		1136				**1736**
1997		138	111						705	5867	1800				**8621**
1998		19	116						812	6769	4262				**11978**
1999		29	287				1		576	546	8251				**9690**
2000		6	391	9					2325		5791		6		**8528**
2001		2	156			3			1714	121	5922		7	1	**7926**
2002			14					18	737	1	10696	1	1		**11468**
2003			543			1		31	510	32	9684		3		**10804**
2004	28	8	1707					120	436	21	8423		4		**10747**
2005*		4	509					31	600		4199				**5343**

* Preliminary data.

** Spanish landings include VI.

***Origin of Estonian catch in 2004 is uncertain.

Table 9.4.15.1k Roundnose grenadier (*Coryphaenoides rupestris*) in XIV Study Group estimates of landings (tonnes).

Year	Faroes	Germany	Greenland	Iceland**	Norway	UK (E+ W)	UK (Scot)	Russia	Spain	**TOTAL**
1988		45	7							**52**
1989	3	42								**45**
1990		45	1			1				**47**
1991		23	4			2				**29**
1992		19	1	4	6		1			**31**
1993		4	18	4						**26**
1994		10	5							**15**
1995		13	14							**27**
1996		6	19							**25**
1997	6	34	12		7			336		**395**
1998	1	116	3		6					**126**
1999		105	0		19					**124**
2000		41	11		5			5		**62**
2001		11	5		7	2	72	69		**166**
2002		25	5		15	1	1	4	235	**286**
2003			15		5	1			272	**293**
2004		27	3					20		**50**
2005*			7		3					**10**

* Preliminary data.

** includes other grenadiers from 1988 to 1996.

Table 9.4.15.1l Roundnose grenadier (*Coryphaenoides rupestris*) unallocated landings in Vb, VI and VII (tonnes).

Year	Unallocated	**TOTAL**
1988		**0**
1989		**0**
1990		**0**
1991		**0**
1992		**0**
1993		**0**
1994		**0**
1995		**0**
1996		**0**
1997		**0**
1998		**0**
1999		**0**
2000		**0**
2001	208	**208**
2002	504	**504**
2003	952	**952**
2004		**0**
2005*		

* Preliminary data.

Table 9.4.15.2 Roundnose grenadier. Landings by area as estimated by ICES.

Year	I+II	IIIa	IV	Va	Vb	VI	VII	VIII +IX	X	XII	XIV	Unallocated	**Total**
1988	0	617	1	2	1	32	0	0	0	10606	52	0	**11,311**
1989	22	885	170	4	258	2218	222	0	0	9545	45	0	**13,369**
1990	49	1067	372	7	1549	5515	215	5	0	2838	47	0	**11,664**
1991	72	1528	525	48	2311	7304	489	1	0	7524	29	0	**19,831**
1992	52	2328	426	210	3817	6782	1556	12	0	1992	31	0	**17,206**
1993	15	1510	283	276	1681	8205	1916	18	0	2977	26	0	**16,907**
1994	15	1633	212	210	668	5938	1922	5	0	1161	15	0	**11,779**
1995	7	2081	84	398	1223	6472	1295	0	0	644	27	0	**12,231**
1996	2	2213	71	140	1078	6044	1051	1	3	1736	25	0	**12,364**
1997	106	1522	11	198	1112	6032	1038	0	1	8621	395	0	**19,036**
1998	100	1819	35	120	1667	5207	1157	20	1	11978	126	0	**22,230**
1999	46	3126	61	129	1996	5642	896	16	6	9690	124	0	**21,732**
2000	0	2404	2	54	1791	8956	889	5	74	8528	62	0	**22,765**
2001	2	3102	19	40	2016	14773	1363	7	0	7926	166	208	**29,622**
2002	12	4220	38	60	1025	11538	1060	3	0	11468	286	504	**30,214**
2003	4	4302	17	57	1532	6598	588	2	1	10804	293	952	**25,150**
2004	27	9890	377	181	1579	6001	573	2	1	10747	50	0	**29,428**
2005*	10	11922	18	76	1316	4422	196	7	799	5343	10	0	**24,119**

* Preliminary data.

** Spanish landings in VI included in XII.

9.4.16 Black scabbardfish (*Aphanopus carbo*)

Status of the stock

The stock structure is uncertain. This section deals with a species distributed over a wide area which may be composed of several populations. Two units are considered:

- northern (Subareas V, VI, VII, and XII);
- southern (Subareas VIII and IX).

In the northern area trawl cpue series shows a consistent decline to an historical low level in 1999. It is unlikely that the recent increase reflects a corresponding increase in stock abundance (Figure 9.4.16.1.)

Longline cpue in Division IXa has been relatively stable during the past decade (Fig. 9.4.16.2).

Management objectives

There are no management objectives for this stock.

Reference points

No reference points have been defined for these stocks.

Single-stock exploitation boundaries

Given the perceived decrease in stock abundance in the northern areas, ICES recommends a reduction in exploitation to the level before the expansion of the fishery started (1990-1996) in Subareas V, VI, VII, and XII, corresponding to landings of no more than 3500 t.

In the southern areas (Subdivisions VIII and IX) a sta*tus quo* exploitation level is advised.

Any measure taken to manage this species in these areas should take into account the advice given for other species taken in the same mixed fishery. Fisheries on black scabbard should be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

Black scabbardfish is caught in two very different fisheries, to the west of the British Isles and in waters off mainland Portugal (ICES Division IXa). To the west of the British Isles it is taken in mixed fisheries, mainly the French trawl fishery along with roundnose grenadier and sharks. In the waters off mainland Portugal it is taken in a targeted artisanal longline fishery and cpue data have been relatively stable over the years. There is also an artisanal longline fishery for black scabbardfish in the Madeira (Portugal) area.

In some ICES Subareas, particularly in Subarea V, black scabbardfish that was initially a bycatch in mixed trawl fisheries but is now a target species.

Due to the mixed character of the fisheries taking black scabbardfish, any measure taken to manage this species in these areas should take into account the advice given for other species taken in the same mixed fishery.

The TAC (3042 t) adopted for 2005 and 2006 in Subareas V, VI, VII, and XII could have lead to misreporting of landings.

Factors affecting the fisheries and the stock

Regulations and their effects

There is a licensing scheme and effort limitation in Division Vb, as well as TAC management in Subareas V, VI, VII, and XII.

Changes in fishing technology and fishing patterns

The difficulties in interpreting the trends of the French cpue series could be due to changes in the exploitation pattern of that fleet.

Scientific basis

Data and methods
In the absence of information on stock structure it has been agreed to use two separate assessment units until the stock structure is properly elucidated.

Summaries of the total landings by Subarea are given in Table 9.4.16.1. In the southern area landings are almost exclusively from Area IX and are caught in a Portuguese longline fishery. That fishery is restricted to a consistent area of a more widely distributed stock. Effort has been stable at least since the 1980s. Portuguese longline cpue are shown in Figure 9.4.16.3.

In the northern areas trends in French cpue were difficult to interpret and understand, and further analysis is needed.

Summaries of the total landings for all areas and by Subarea are given in Table 9.4.16.1. Landings by Subarea and by nation are given in Table 9.4.16.2.

French trawl cpue and Portuguese longline cpue data series are presented in Figures 9.4.16.2 and 9.4.16.3.

Length-frequency distribution is available for both survey and commercial landings in different subareas in northern areas. They are relatively stabile. The length ranges both in the commercial and surveys in Subareas Vb, VI, and VII are narrow. Fisheries operating in this area have been continuously acting on the young part of the population.

Length frequencies from the southern area in the period 2000 to 2005 are available and show no trend.

Information from the fishing industry

In collaboration with the French industry, IFREMER has carried out investigations to refine cpue series for French trawlers. These analyses are still under development.

The French industry provided information on modifications of vessel activities which could have an effect on yields (catch limitations for commercial reasons, closed areas, etc.). Information on catches and discards in the French deep-sea fishery and a preliminary analysis of data from VMS and cpue distribution according to depth was also provided by the industry. Results from this cooperative project indicate that there is no discard of black scabbard by French deep-sea trawlers in Subareas VI and VII. Information from fishers indicates that in Division IXa there are almost no discards. This is mainly due to the fact that small specimens are only occasionally caught in the trawl and longline fisheries.

Comparison with previous assessment and advice

There is no change in the perception of the stocks or in the basis for the advice.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 18–24 February 2004 (ICES CM 2004/ACFM:15).

Table 9.4.16.1 Black scabbardfish. Landings and TAC (tonnes).

	ACFM landings			TAC		
Year	III, IV	V, VI, XII	VII, VIII, IX, X	III, IV	V, VI, XII	VII, IX, X
1988	0	0	2602			
1989	6	354	3473			
1990	140	1460	3274			
1991	215	2537	3979			
1992	438	3548	4398			
1993	68	4984	4524			
1994	92	4092	3434			
1995	13	4008	4272			
1996	12	4310	3689			
1997	3	3265	3555			
1998	12	1789	3152			
1999	10	2449	2752			
2000	8	4276	2404			
2001	13	5899	2767			
2002	24	9134	2725			
2003	5	5504	2664	30	3 110	4 000
2004	9	4582	2502	30	3 110	4 000
2005	5	3506	2770			
2006						

Table 9.4.16.2 Black scabbardfish. ICES estimates of landings (tonnes).

Black scabbardfish in Subarea II

Year	France	Faroes	**Total**
1988			**0**
1989	0		**0**
1990	1		**1**
1991	0		**0**
1992	0		**0**
1993	0		**0**
1994	0		**0**
1995	1		**1**
1996	0		**0**
1997	0		**0**
1998	0		**0**
1999	0		**0**
2000	0		**0**
2001	0		**0**
2002	0		**0**
2003	0		**0**
2004	0		**0**
2005	0	0	**0**

Black scabbardfish in Subarea IV

Year	France	**Total**
1988		**0**
1989	3	**3**
1990	70	**70**
1991	107	**107**
1992	219	**219**
1993	34	**34**
1994	45	**45**
1995	6	**6**
1996	6	**6**
1997	0	**0**
1998	2	**2**
1999	4	**4**
2000	2	**2**
2001	1	**1**
2002	0	**0**
2003	0	**0**
2004	5	**5**
2005	2	**2**

Table 9.4.16.2 (Cont'd)

Black scabbardfish in Subareas III and IV

Year	Germany	Scotland	E&W&NI	**Total**
1988	-	-	-	**0**
1989	-	-	-	**0**
1990	-	-	-	**0**
1991	-	-	-	**0**
1992	-	-	-	**0**
1993	-	-	-	**0**
1994	3	-	-	**3**
1995	-	2	-	**2**
1996	-	1	-	**1**
1997	-	2	-	**2**
1998	-	9	-	**9**
1999	-	3	-	**3**
2000	0	3	-	**3**
2001	0	10	1	**11**
2002		24		**24**
2003		4		**4**
2004		0		**0**
2005		0		**0**

* Preliminary.

Black scabbardfish in Division Va

Year	Iceland	**Total**
1988	-	**0**
1989	-	**0**
1990	-	**0**
1991	-	**0**
1992	-	**0**
1993	0	**0**
1994	1	**1**
1995	+	**0**
1996	0	**0**
1997	1	**1**
1998	0	**0**
1999	9	**9**
2000	10	**10**
2001	5	**5**
2002	13	**13**
2003	14	**14**
2004	19	**19**
2005	19	**19**

* Preliminary.

Table 9.4.16.2 (Cont'd)

Black scabbardfish in Division Vb

Year	Faroes	France	Germany	Scotland	E&W&NI	**Total**
1988	-		-	-	-	
1989	-	170	-	-	-	**170**
1990	12	415	-	-	-	**427**
1991	1	134	-	-	-	**135**
1992	4	101	-	-	-	**105**
1993	202	75	9	-	-	**286**
1994	114	45	1	-	-	**160**
1995	249	175	-	-	-	**424**
1996	57	129	-	-	-	**186**
1997	18	50	-	-	-	**68**
1998	36	144	-	-	-	**180**
1999	31	135	-	6	-	**172**
2000	116	186	0	9	-	**311**
2001	404	447	0	20	0	**871**
2002	1360	311		80		**1751**
2003	1451	171		11		**1633**
2004	699	93		70		**862**
2005	393	98		11		**502**

*
Preliminary.

Black scabbardfish in Subarea VIa

Year	France VIa	France VIb	Lituania	**Total**
1988				
1989	138	0		**138**
1990	971	53		**1023**
1991	2244	62		**2307**
1992	2998	113		**3110**
1993	2857	87		**2944**
1994	2331	55		**2386**
1995	2598	15		**2613**
1996	2980	1		**2981**
1997	2278	16		**2295**
1998	1094	3		**1098**
1999	1610	8		**1618**
2000	2695	25		**2720**
2001	3269	28		**3298**
2002	3473	131		**3604**
2003	2830	60		**2890**
2004	2595	98		**2694**
2005	2441	57	12	**2510**

Table 9.4.16.2 (Cont'd)

Black scabbardfish in Subarea VII

Year	France VIIA	VIIB	VIIC	VIIE	VIIF	VIIG	VIIH	VIIJ	VIIK	**Total**
1988										
1989	0	0	0	0	0	0	0	0	0	**0**
1990	0	2	8	0	0	0	0	0	0	**10**
1991	0	14	17	1	0	4	2	7	49	**94**
1992	0	9	69	0	0	3	8	49	183	**322**
1993	0	24	149	1	0	4	10	170	109	**468**
1994	0	32	165	0	0	4	4	120	336	**662**
1995	0	52	121	0	0	3	5	74	385	**641**
1996	0	104	130	0	1	0	2	60	360	**658**
1997	0	24	200	0	0	0	1	33	202	**461**
1998	0	15	60	0	1	0	5	45	79	**205**
1999	0	7	97	0	0	0	2	70	177	**354**
2000	0	25	169	0	0	0	3	88	238	**524**
2001	0	39	227	0	0	0	5	161	249	**682**
2002	0	29	102	0	0	1	4	115	51	**303**
2003	0	15	28	1	0	0	3	157	36	**240**
2004	0	31	28	8	0	0	8	124	63	**262**
2005	3	6	11	1	0	0	16	99	21	**157**

Black scabbardfish in Subareas VI and VII

Year	Faroes	Germany	Ireland	Spain	Scotland	E&W&NI	**Total**
1988							
1989	46						**46**
1990							**0**
1991							**0**
1992	3						**3**
1993	62	48	8				**118**
1994		46	3		2		**51**
1995		3			18		**21**
1996		2			36	1	**39**
1997	3		0	1	235	2	**241**
1998			0	3	148	1	**152**
1999			1	0	191	1	**193**
2000		0	59	1	377	40	**477**
2001	3	0	68	150	673	37	**931**
2002	2		1050	0	1320	43	**2415**
2003	45		159	0	119	5	**328**
2004	59		293	17	123	2	**494**
2005	36		79	0	80	0	**195**

* Preliminary.

Table 9.4.16.2 (Cont'd)

Black scabbardfish in Subarea VIII

Year	France VIIIa	France VIIIb	France VIIId	Spain	**Total**
1988				-	**0**
1989	0	0	0	-	**0**
1990	0	0	0	-	**0**
1991	1	0	0	-	**1**
1992	4	0	4	-	**9**
1993	5	0	7	-	**11**
1994	3	0	2	-	**5**
1995	0	0	0	-	**0**
1996	0	0	0	3	**3**
1997	1	0	0	1	**2**
1998	2	0	0	3	**5**
1999	7	0	4	0	**11**
2000	11	0	21	1	**33**
2001	15	0	7	1	**23**
2002	16	2	14	1	**33**
2003	25	0	8	1	**34**
2004	24	0	13	1	**39**
2005	17	0	6	1	**24**

* Preliminary.

Black scabbardfish in Subarea IX

Year	Portugal	**Total**
1988	2602	**2602**
1989	3473	**3473**
1990	3274	**3274**
1991	3978	**3978**
1992	4389	**4389**
1993	4513	**4513**
1994	3429	**3429**
1995	4272	**4272**
1996	3686	**3686**
1997	3553	**3553**
1998	3147	**3147**
1999	2741	**2741**
2000	2371	**2371**
2001	2744	**2744**
2002	2692	**2692**
2003	2630	**2630**
2004	2463	**2463**
2005	2746	**2746**

* Preliminary.

Table 9.4.16.2 (Cont'd)

Black scabbardfish in Subarea X

Year	Faroes	Portugal	France	Ireland	**Total**
1988	-	-			**0**
1989	-	-	0		**0**
1990	-	-	0		**0**
1991	-	166	0		**166**
1992	370	-	0		**370**
1993	-	2	0		**2**
1994	-	-	0		**0**
1995	-	3	0		**3**
1996	11	0	0		**11**
1997	3	0	0		**3**
1998	31	68	0		**99**
1999	-	46	66		**112**
2000	-	112	1		**113**
2001	-	16	0		**16**
2002	2	0	0		**2**
2003		91	0		**91**
2004	111	2	0		**113**
2005*	47	323	0	0	**370**

* Preliminary.

Black scabbardfish in Subarea XII

Year	Faroes	France	Germany	Spain	Scotland	Ireland	E&W&NI	Lituania	**Total**
1988	-		-	-	-				**0**
1989	-	0	-	-	-				**0**
1990	-	0	-	-	-				**0**
1991	-	2	-	-	-				**2**
1992	-	7	-	-	-				**7**
1993	1051	24	93	-	-				**1168**
1994	779	9	45	-	-				**833**
1995	301	8	-	-	-				**309**
1996	187	7	-	253	-				**447**
1997	102	1	-	98	-				**201**
1998	20	0	-	134	-				**154**
1999	-	3	-	109	0				**112**
2000	1	6	0	237	-				**244**
2001		3	0	115	-				**118**
2002		0	0	1059	1		0		**1060**
2003		7		403		1			**412**
2004	95	10		165	1				**271**
2005*	127	14		0	0	0		1	**142**

* Preliminary [(1)] Includes VIb.

Table 9.4.16.2 (Cont'd)

Black scabbardfish (*Aphanopus carbo*). All ICES areas

	II	IV	III + IV	Va	Vb	VI+VII	VIII	IX	X	XII	XIV	**Total**
1988	0	0	0	0	0	0	0	2602	0	0	0	**2602**
1989	0	3	3	0	170	184	0	3473	0	0	0	**3833**
1990	1	70	70	0	427	1034	0	3274	0	0	0	**4875**
1991	0	107	107	0	135	2401	1	3978	166	2	0	**6897**
1992	0	219	219	0	105	3436	9	4389	370	7	0	**8753**
1993	0	34	34	0	286	3530	11	4513	2	1168	0	**9579**
1994	0	45	48	1	160	3099	5	3429	0	833	0	**7620**
1995	1	6	8	0	424	3275	0	4272	3	309	0	**8297**
1996	0	6	7	0	186	3678	3	3686	11	447	0	**8023**
1997	0	0	2	1	68	2996	2	3553	3	201	0	**6827**
1998	0	2	11	0	180	1455	5	3147	99	154	2	**5055**
1999	0	4	7	9	172	2166	11	2741	112	112	0	**5333**
2000	0	2	5	10	311	3721	33	2371	113	244	90	**6900**
2001	0	1	12	5	871	4910	23	2744	16	118	0	**8700**
2002	0	0	24	13	1751	6322	33	2692	2	1060	8	**11906**
2003	0	0	4	14	1633	3458	34	2630	91	412	2	**8280**
2004	0	5	5	19	862	3450	39	2463	113	271	0	**7225**
2005*	0	2	2	19	502	2862	24	2746	370	142	0	**6671**

Black scabbardfish (*Aphanopus carbo*) by assessment units.

	Vb,VI,VII,XII	**VIII,IX**	**other**	**Total**
1988	0	2602	0	2602
1989	354	3473	6	3833
1990	1460	3274	141	4875
1991	2537	3979	381	6897
1992	3548	4398	808	8753
1993	4984	4524	70	9579
1994	4092	3434	93	7620
1995	4008	4272	17	8297
1996	4310	3689	23	8023
1997	3265	3555	7	6827
1998	1789	3152	113	5055
1999	2449	2752	131	5333
2000	4276	2404	221	6900
2001	5899	2767	34	8700
2002	9134	2725	47	11906
2003	5504	2664	112	8280
2004	4582	2502	141	7225
2005*	3506	2770	394	6671

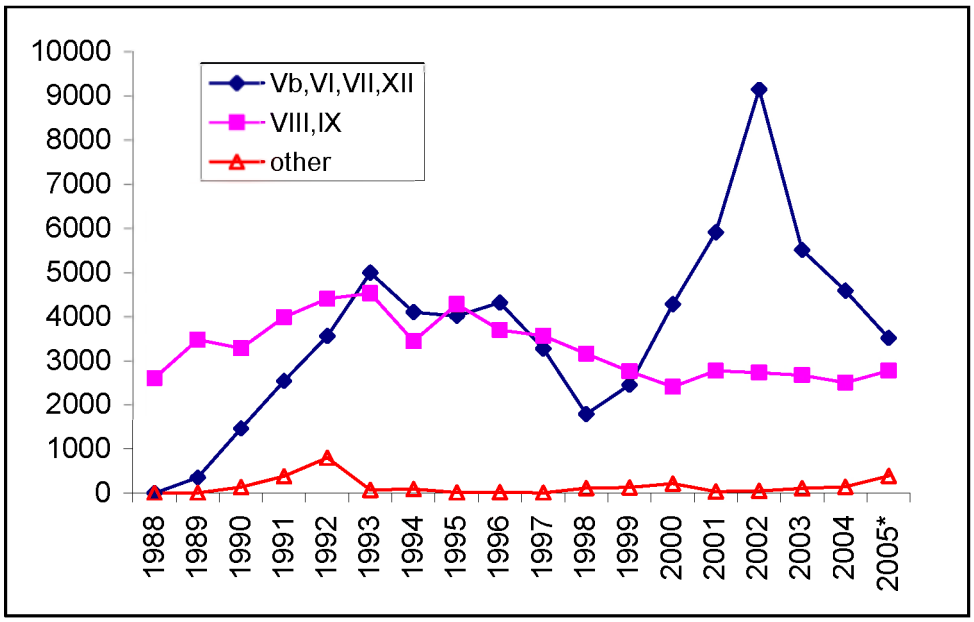


Figure 9.4.16.1 Black scabbardfish. Landings by assessment unit.

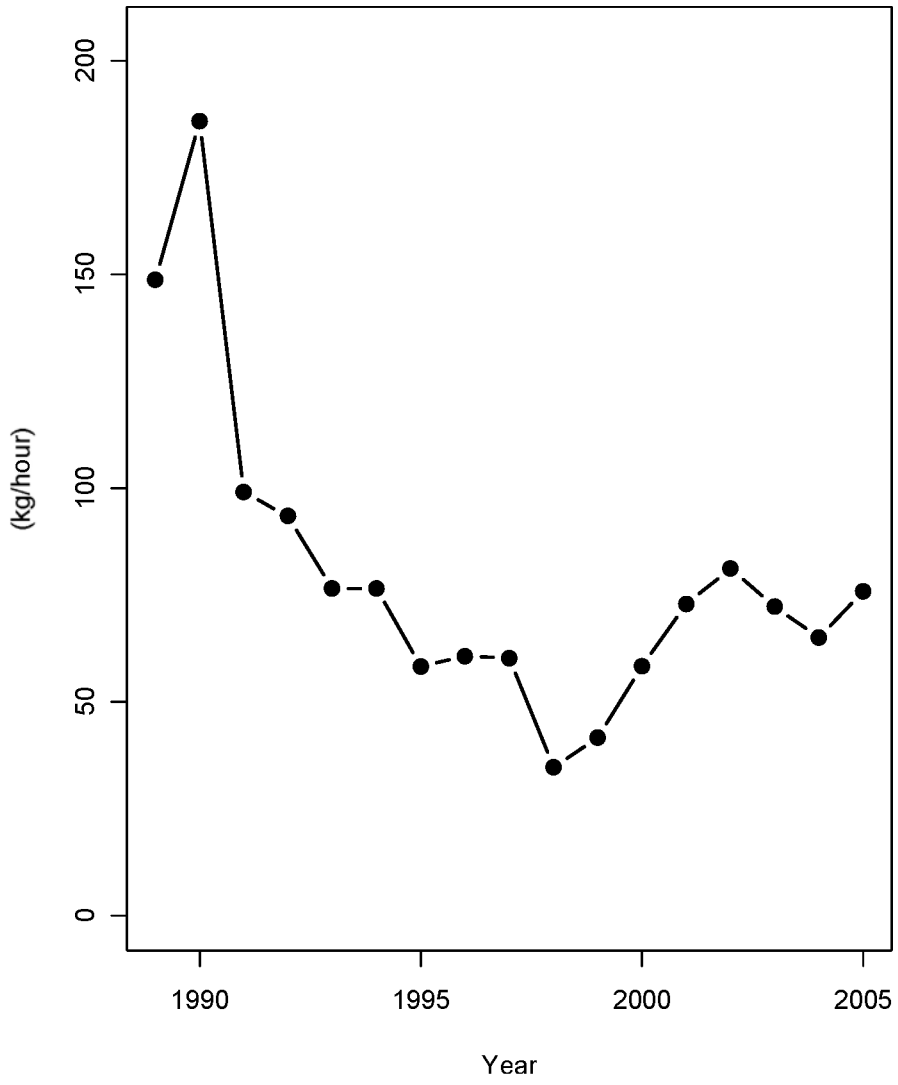


Figure 9.4.16.2 French trawl cpue data series for combined ICES Subareas V, VI, and VII (1989–2005).

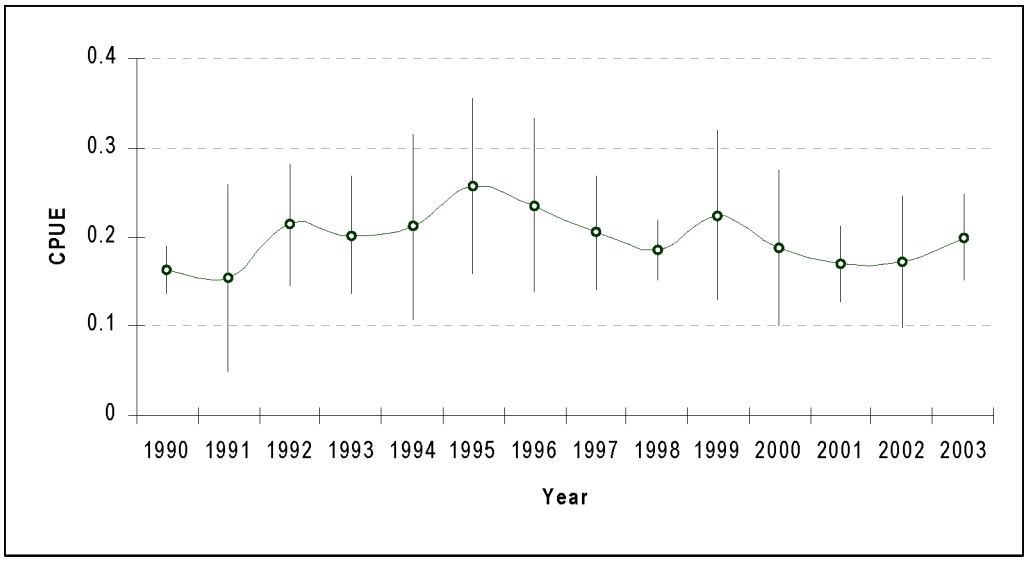


Figure 9.4.16.3 Annual cpue average estimates from Portuguese longline fishery in ICES Division IXa (1990–2003).

9.4.17 Greater forkbeard (*Phycis blennoides*)

State of the stock

There is no information available that allows for evaluation of the stock trends. The state of the stock is unknown.

Management objectives

There are no management objectives for this stock.

Reference points

No reference points have been defined for these stocks.

Single-stock exploitation boundaries

Fisheries on greater forkbeard should be accompanied by programmes to collect data. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

The landings of greater forkbeard are mainly bycatch from demersal trawl and longline fisheries targeting species such as hake, megrim, monkfish, ling, and blue ling. Fluctuations in landings may not necessarily be linked with changes in forkbeard abundance. The species should not be managed in a single-species context and any advice should take into account advice on other species/fisheries.

Factors affecting the fisheries and the stock

Changes in fishing technology and fishing patterns

In 2000–2005, 80% of the total landings of forkbeard in ICES area came from Subareas VI and VII. During this period, landings from Subareas I–V increased considerably. The increase in Subareas I and II was dependent on market prices. From 2000 to 2005, landings in Subareas VIII and IX were higher than in previous years. This situation is probably due to the development of a longline fishery targeting deep-sea species. However, the total landings in this period decreased.

Summaries of the total landings for all areas and by Subarea/Division are given in Table 9.4.17.1.

Scientific basis

Data and methods

International landings are shown by area in Table 9.4.17.1 and in total in Figure 9.4.17.1

There is insufficient information to support an analytical assessment. There are spatial limitations in the available length data.

Uncertainties in assessment and forecast

Landings do not make a clear distinction between the species *Phycis blennoides, Phycis phycis,* and *Phycis* spp., and also with Morids in landings.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 2–11 May 2006, Vigo Spain (ICES CM 2006/ACFM:28).

Table 9.4.17.1 Greater forkbeard landings by Subarea (tonnes).

Year	I+II	III+IV	Vb	VI+VII	VIII+IX	X	XII	**TOTAL**
1988	0	15	2	1898	81	29	0	**2025**
1989	0	12	1	1815	145	42	0	**2015**
1990	23	115	38	1921	234	50	0	**2381**
1991	39	181	53	1574	130	68	0	**2045**
1992	33	145	49	1640	179	81	1	**2128**
1993	1	34	27	1462	395	115	1	**2035**
1994	0	12	4	1571	320	135	3	**2045**
1995	0	3	9	2138	384	71	4	**2609**
1996	0	18	7	3590	456	45	2	**4118**
1997	0	7	7	2335	361	30	2	**2742**
1998	0	12	8	3040	664	38	1	**3763**
1999	0	31	34	3458	378	41	0	**3941**
2000	0	11	32	4919	411	94	6	**5472**
2001	8	26	100	4349	494	83	8	**5068**
2002	318	585	148	3352	489	57	6	**4955**
2003	155	233	73	3257	422	45	11	**4196**
2004	75	142	48	2447	461	37	43	**3253**
2005	51	82	45	2011	337	22	63	**2612**

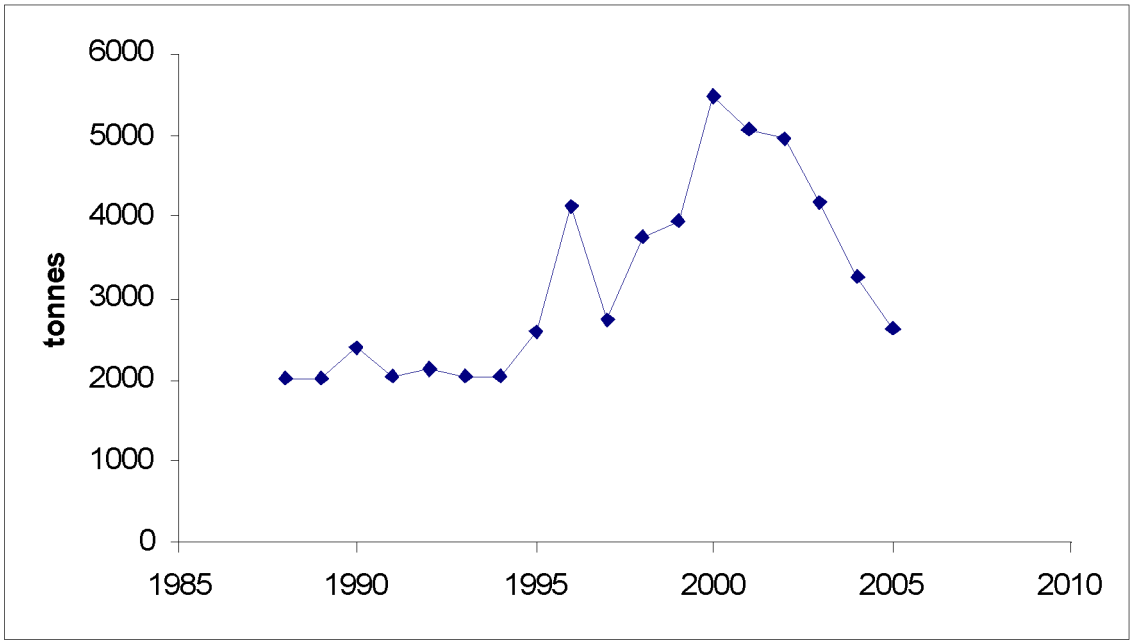


Figure 9.4.17.1 Total international landings of greater forkbeard

9.4.18 Alfonsinos/Golden eye perch (*Beryx* spp.)

State of the stocks

The section deals with two species, *Beryx splendens* and *B. decadactylus*. They are distributed over a wide area which may be composed of several populations. Their stock structure is uncertain.

Standardized cpue from the Azores longline commercial fishery indicates an overall slowly decreasing trend for *Beryx decadactylus*.

Management objectives

There are no management objectives for this stock.

Reference points

No reference points have been defined for these stocks due to lack of appropriate data.

Single-stock exploitation boundaries

Due to their spatial distribution associated with seamounts, their life history and their aggregation behaviour, alfonsinos are easily overexploited by trawl fishing; they can only sustain low rates of exploitation. Fisheries on such species should not be allowed to expand above current levels unless it can be shown that such expansion is sustainable. To prevent wiping out entire subpopulations that have not yet been mapped and assessed the exploitation of new seamounts should not be allowed.

Management considerations

The general absence of data on species composition of the catches and biological parameters are important limiting factors for the knowledge of these fish stocks. Underreporting of catches from international waters is suspected.

Most of the landings of *Beryx* spp. are taken by handlines and longlines within the Azorean EEZ of Subarea X and by trawl outside the EEZ on the Mid-Atlantic Ridge. The trawl fishery landings refer to both species combined.

The species have limited spatial distributions on seamounts and are highly aggregating.

Factors affecting the fisheries and the stock

Regulations and their effects

There is no TAC regulation for this species. Trawling is forbidden in Subarea X (Azores).

Alfonsinos are a relatively short-lived species (longevity 11–13 years).

Scientific basis

Data and methods

Total landings are presented in Table 9.4.18.1. Underreporting of catches from international waters is suspected.

Recent work has been carried on standardization of commercial cpue. Abundance indices are available from longline cpue.

An analytical assessment is not available for these stocks.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 2–11 May 2006, Vigo Spain (ICES CM 2006/ACFM:28).

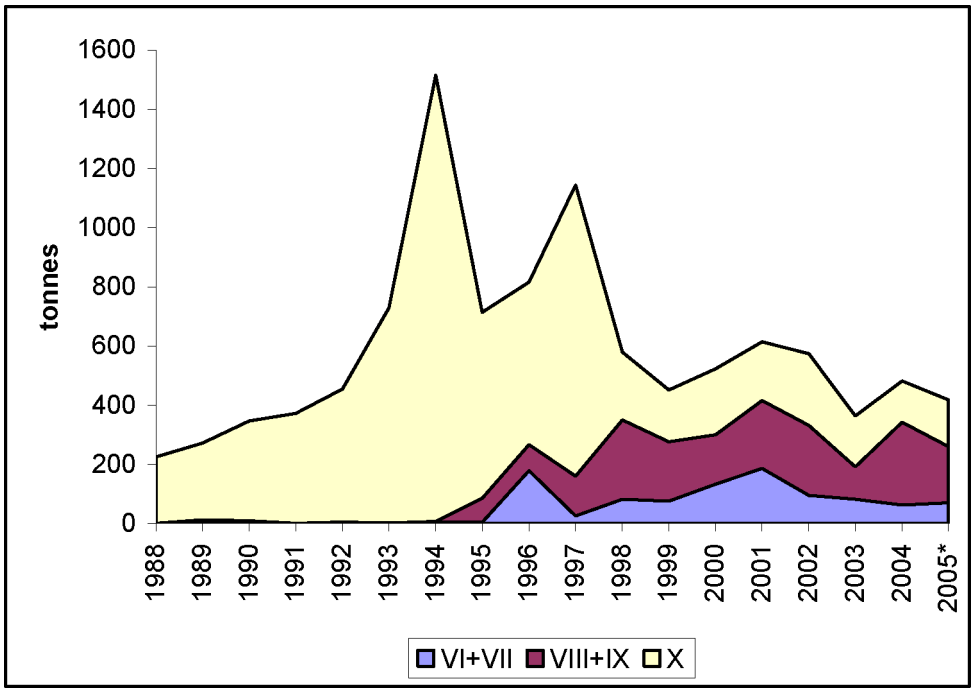


Figure 9.4.18.1 Landings of alfonsinos in main areas (Subareas VI, VII, VIII, IX, and X).

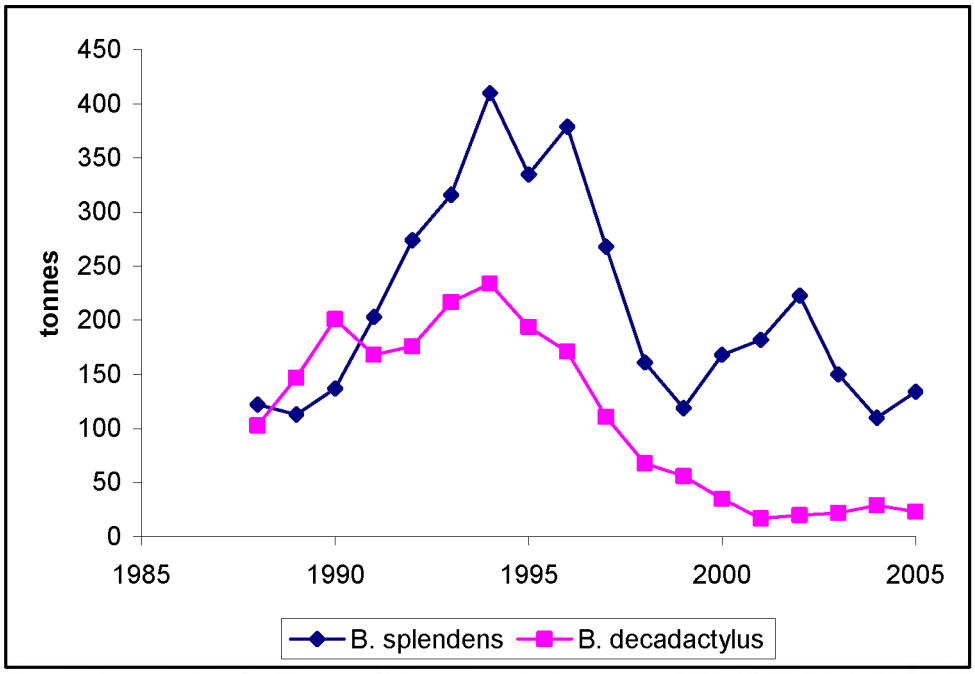


Figure 9.4.18.2 Landings (tonnes) of alfonsinos split by species in Azorean waters (Portuguese EEZ in Subarea X).

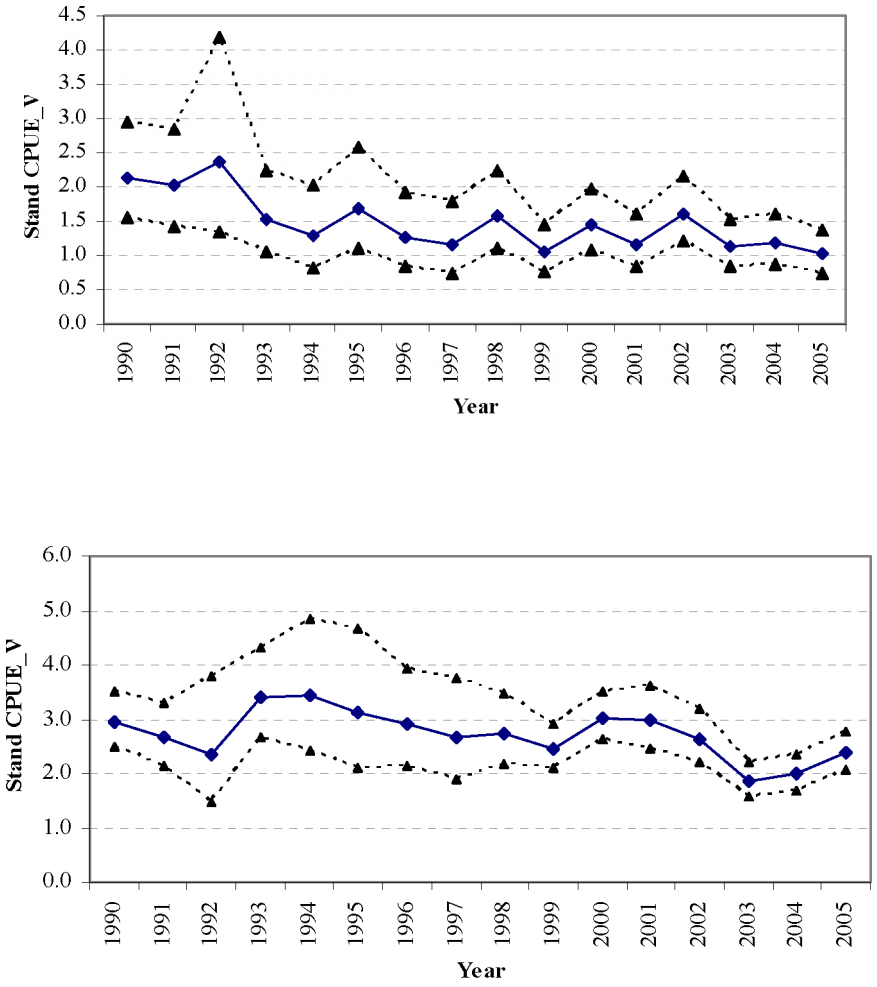


Figure 9.4.18.3 Annual standardized cpue in biomass (kg per 1000 hooks) and upper and lower 95% confidence intervals for *B. decadactylus* (top) and *B. splendens* (bottom) from the Azores longline fishery (ICES Subarea X).

Table 9.4.18.1 Alfonsinos. Working Group estimates of landings (tonnes).

ALFONSINOS (*Beryx* spp.) Subarea IV

Year	France	**TOTAL**
1988	0	**0**
1989	0	**0**
1990	1	**1**
1991	0	**0**
1992	2	**2**
1993	0	**0**
1994	0	**0**
1995	0	**0**
1996	0	**0**
1997	0	**0**
1998	0	**0**
1999	0	**0**
2000	0	**0**
2001	0	**0**
2002	0	**0**
2003	0	**0**
2004	0	**0**
2005*	0	**0**

*Preliminary.

ALFONSINOS (*Beryx* spp.) Subarea Vb

Year	Faroes	France	**TOTAL**
1988			**0**
1989			**0**
1990		5	**5**
1991		0	**0**
1992		4	**4**
1993		0	**0**
1994		0	**0**
1995	1	0	**1**
1996	0	0	**0**
1997	0	0	**0**
1998	0	0	**0**
1999	0	0	**0**
2000	0	0	**0**
2001	0	0	**0**
2002	0	0	**0**
2003	0	0	**0**
2004	0	0	**0**
2005*	0	0	**0**

*Preliminary.

Table 9.4.18.1 (Cont'd)
ALFONSINOS (*Beryx* spp.) Subareas VI and VII

Year	France	E & W	Spain	Ireland	**TOTAL**
1988					
1989	12				**12**
1990	8				**8**
1991					**0**
1992	3				**3**
1993	0		1		**1**
1994	0		5		**5**
1995	0		3		**3**
1996	0		178		**178**
1997	17	4	4		**25**
1998	10	0	71		**81**
1999	55	0	20		**75**
2000	31	2	100		**133**
2001	58	13	115		**186**
2002	34	15	45		**94**
2003	18	5	55	4	**82**
2004	13	3	46		**62**
2005*	14	0	55	0	**69**

*Preliminary.

ALFONSINOS (*Beryx* spp.) Subareas VIII and IX

Year	France	Portugal	Spain	E & W	**TOTAL**
1988					**0**
1989					**0**
1990	1				**1**
1991					**0**
1992	1				**1**
1993	0				**0**
1994	0		2		**2**
1995	0	75	7		**82**
1996	0	43	45		**88**
1997	69	35	31		**135**
1998	1	9	259		**269**
1999	11	29	161		**201**
2000	6	40	117	4	**167**
2001	7	43	179	0	**229**
2002	12	60	151	14	**237**
2003	9	0	100	0	**109**
2004	14	53	213	0	**280**
2005*	4	45	142	0	**191**

*Preliminary.

Table 9.4.18.1 (Cont'd)

ALFONSINOS (*Beryx* spp.) Subarea X

Year	Faroes	Norway	Portugal	Russia	E & W	TOTAL
1988			225			**225**
1989			260			**260**
1990			338			**338**
1991			371			**371**
1992			450			**450**
1993		195	533			**728**
1994		0	644	864		**1508**
1995	0	0	529	100		**629**
1996	0	0	550	0		**550**
1997	5	0	379	600		**984**
1998	0	0	229	0		**229**
1999	0	0	175	0		**175**
2000	0	0	203	5	15	**223**
2001	0	0	199	0	0	**199**
2002	0	0	243	0	0	**243**
2003	0	0	172	0	0	**172**
2004	0	0	139	0	0	**139**
2005*	0	0	157	0	0	**157**

*Preliminary.

ALFONSINOS (*Beryx* spp.) Subarea XII

Year	Faroes	**TOTAL**
1988		**0**
1989		**0**
1990		**0**
1991		**0**
1992		**0**
1993		**0**
1994		**0**
1995	2	**2**
1996	0	**0**
1997	0	**0**
1998	0	**0**
1999	0	**0**
2000	0	**0**
2001	0	**0**
2002	0	**0**
2003	0	**0**
2004	0	**0**
2005*	0	**0**

*Preliminary.

Table 9.4.18.1 (Cont'd)

ALFONSINOS (*Beryx* spp.). All areas

Year	IV	Vb	VI+VII	VIII+IX	X	XII	**TOTAL**
1988				0	225		**225**
1989			12	0	260		**272**
1990	1	5	8	1	338		**353**
1991			0	0	371		**371**
1992	2	4	3	1	450		**460**
1993			1	0	728		**729**
1994			5	2	1508		**1515**
1995		1	3	82	629	2	**717**
1996			178	88	550		**816**
1997			25	135	984		**1144**
1998			81	269	229		**579**
1999			75	201	175		**451**
2000			133	167	223		**523**
2001			186	229	199		**614**
2002			94	237	243		**574**
2003			82	109	172		**363**
2004			62	280	139		**481**
2005*			69	191	157		**417**
*Preliminary.							

9.4.19 Red (=blackspot) seabream (*Pagellus bogaraveo*)

State of the stock

The stock structure is uncertain. This section deals with a species distributed over a wide area which may be composed of several populations. Three units are considered:

- Subareas VI, VII, and XII;
- Subarea IX;
- Subarea X.

Stock trends of seabream are largely unknown. Exploratory analyses indicate that the stock in IX has been stable or slowly declining for the past decade. Based on historical catches, the stock in VI, VII, and VIII appears to be depleted.

Management objectives

There are no management objectives for this stock, but one area (Strait of Gibraltar) is subject to a local fishing plan with the objective of recovery of the resource.

Reference points

No reference points have been defined for these stocks.

Single-stock exploitation boundaries

Red seabream are hermaphroditic and are particularly susceptible to overexploitation, thus measures to ensure balanced exploitation between younger fish (males) and older fish (females) are critical. Fisheries on red seabream should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.

Management considerations

Recent studies show that there are no genetic differences between populations from different ecosystems within the Azores region, but there are genetic differences between Azores (ICES area Xa2) and mainland Portugal (ICES area IXa). These results, combined with the known distribution of the species by depth, suggest that the area Xa2 component of this stock can be considered as a separate management unit.

This species changes sex as they age, starting as males and becoming females betweeen ages 4 and 6. Hermaphroditic species are particularly susceptible to overexploitation and thus measures to ensure balanced exploitation between younger fish (males) and older fish (females) are critical.

Factors affecting the fisheries and the stock

Regulations and their effects

These are multispecies and multigear fisheries operating in an area regarded as vulnerable, and which is protected by EU regulations banning bottom trawls and bottom gillnets. Local technical regulations are also in force (minimum landing size, hook size regulation, licensing, size restrictions by zone for gears and vessels, and a quota system by islands and vessel).

A TAC for area X was introduced in 2003 (1116 t). Landings in successive years have been within the TAC.

A TAC of 350 t was introduced for red sea bream in 2002 for areas VI, VII, and VIII. In 2005 the TAC was reduced to 298 t. Landings have been below 300 t since 1991, averaging about 140 t over the last decade. From 1960 until the 1980s, landings were of the order of 10 000 t per year.

A Regional Recovery Plan for *P. bogaraveo* relating to the Spanish fishery in the Strait of Gibraltar area has been implemented by the Regional Government of Andalucía for 2003–2008. Technical measures adopted in this plan include the closure of the fishing season for two-and-half months (15th January–31st March), a minimum landing size (33 cm total length), authorised vessels list, hook size, maximum hooks per line (100), maximum number of lines per boat (30), maximum number of automatic machines for hauling per boat (3), and restricted ports for landing (only Tarifa and Algeciras).

Changes in fishing technology and fishing patterns

Red seabream have been caught in hook and line fisheries off the Azores since the 16th Century. There are now directed artisanal handline as well as longline fisheries in area Xa2. Historically, improvements in fishing technology have taken place in the directed handline and longline fisheries. These include the introduction of bottom longlines and bigger fishing vessels. The resulting improvement on fishing efficiency has not been quantified.

In Subareas VI, VII, and VIII red seabream appears mostly as bycatch in longline and trawl fisheries.

There are directed handline and longline fisheries in Subareas IX.

Scientific basis

Data and methods

Figure 9.4.19.3 shows total landings for area Xa2.

Catch-at-age data, a standardised longline cpue series, and a longline survey are available for area X. Exploratory assessments have been carried out and the SSB and F estimates appear consistent with the fishery and survey information.

Source of information

Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, 2–11 May 2006, Vigo Spain (ICES CM 2006/ACFM:28).

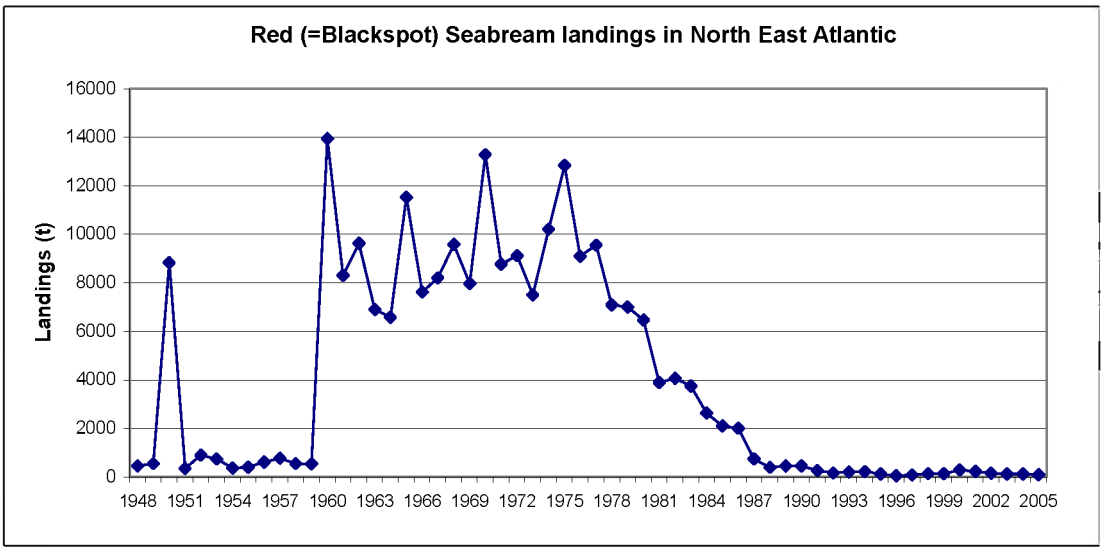


Figure 9.4.19.1 Red seabream (*Pagellus bogaraveo*). Long-term trends in landings in the North Atlantic.

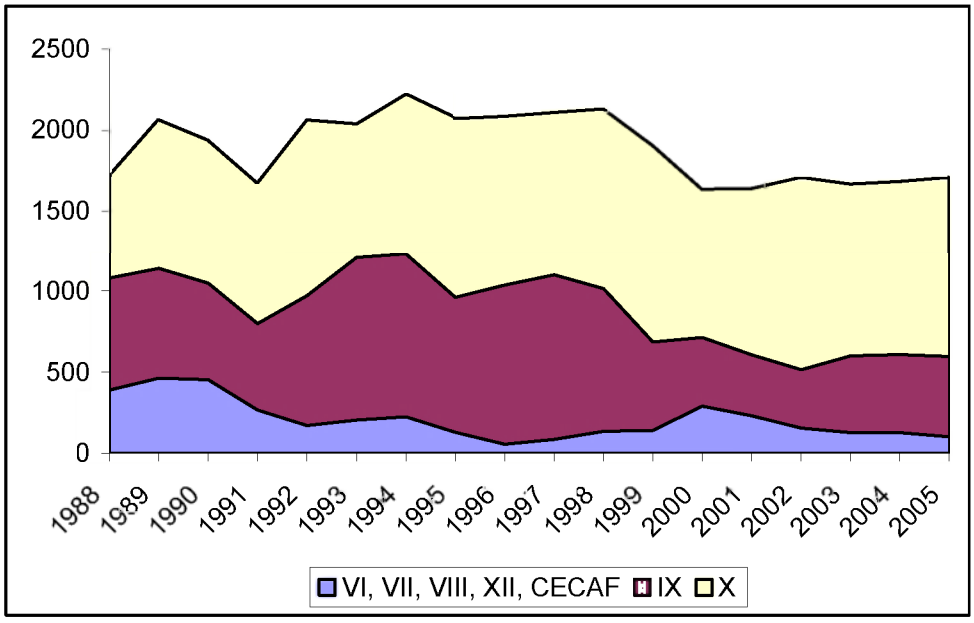


Figure 9.4.19.2 Red seabream (*Pagellus bogaraveo*). Landings by assessment unit.

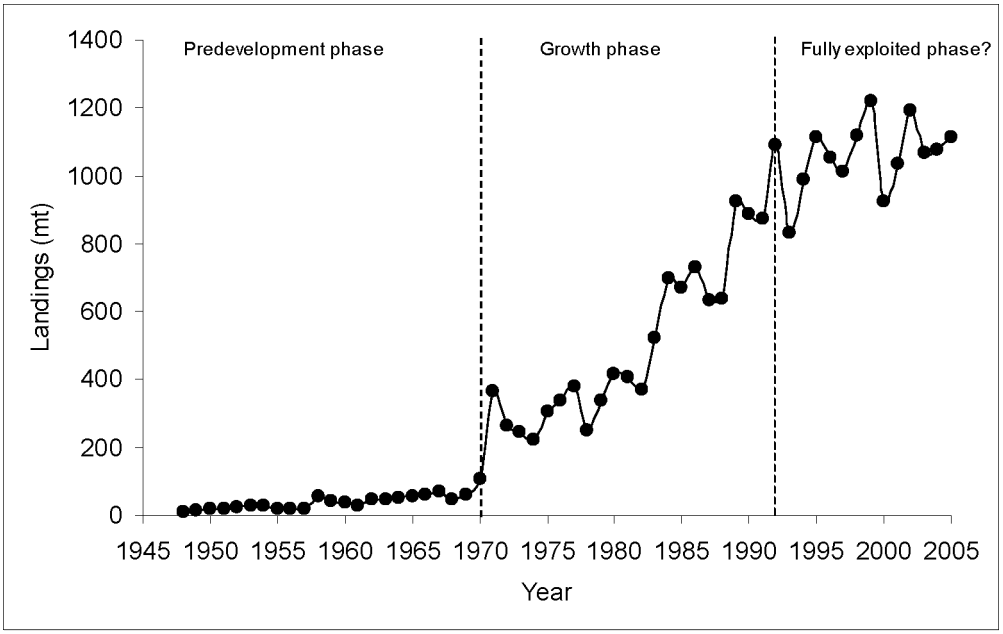


Figure 9.4.19.3 Historical landings of red seabream (*Pagellus bogaraveo)* from the Azores (ICES area Xa2). Indicated are descriptions of the historical phases of the fishery.

Table 9.4.19.1 Red seabream landings by area and country.

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) VI and VII

Year	France	Ireland	Spain	E & W	Ch. Islands	**TOTAL**
1988	52	0	47	153	0	**252**
1989	44	0	69	76	0	**189**
1990	22	3	73	36	0	**134**
1991	13	10	30	56	14	**123**
1992	6	16	18	0	0	**40**
1993	5	7	10	0	0	**22**
1994	0	0	9	0	1	**10**
1995	0	6	5	0	0	**11**
1996	0	4	24	1	0	**29**
1997	0	20	0	36		**56**
1998	0	4	7	6		**17**
1999	0	8	0	15		**23**
2000	4	n.a.	3	13		**20**
2001	1	11	2	37		**51**
2002	3	0	9	13		**25**
2003	11	0	7	20		**38**
2004	19		4	18		**41**
2005	n.a		4	6		**10**

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) VIII

Year	France	Spain	England [1]	**TOTAL**
1988	37	91	9	**137**
1989	31	234	7	**272**
1990	15	280	17	**312**
1991	10	124	0	**134**
1992	5	119	0	**124**
1993	3	172	0	**175**
1994	0	131	0	**131**
1995	0	110	0	**110**
1996	0	23	0	**23**
1997	18	7	0	**25**
1998	18	86	0	**104**
1999	20	84	0	**104**
2000	81	189	0	**270**
2001	11	168	0	**179**
2002	19	111	0	**130**
2003	6	83	0	**89**
2004	3	82	8	**94**
2005	n.a	90	0	**90**

[1] in 2005 England & Wales.

Table 9.4.19.1 Red seabream landings by area and country (Cont'd).

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) IX

Year	Portugal	Spain	**TOTAL**
1988	370	319	**689**
1989	260	416	**676**
1990	166	428	**594**
1991	109	423	**532**
1992	166	631	**797**
1993	235	765	**1000**
1994	150	854	**1004**
1995	204	625	**829**
1996	209	769	**978**
1997	203	808	**1011**
1998	357	520	**877**
1999	265	278	**543**
2000	83	338	**421**
2001	97	277	**374**
2002	111	248	**359**
2003	142	329	**471**
2004	183	297	**480**
2005*	129	365	**494**

*
Preliminary.

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) X

Year	Portugal (azores)	**TOTAL**
1988	637	637
1989	924	924
1990	889	889
1991	874	874
1992	1090	1090
1993	830	830
1994	989	989
1995	1115	1115
1996	1052	1052
1997	1012	1012
1998	1119	1119
1999	1222	1222
2000	924	924
2001	1034	1034
2002	1193	1193
2003	1068	1068
2004	1075	1075
2005*	1113	1113

* Preliminary.

Table 9.4.19.1 Red seabream landings by area and country (Cont'd).

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) XII

Year	Latvia	**TOTAL**
1988		
1989		
1990		
1991		
1992		
1993		
1994	75	**75**
1995		
1996		
1997		
1998		
1999		
2000		
2001		
2002		
2003		
2004		
2005		

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) in Madeira (Portugal) (CECAF area)

Year	Portugal	**TOTAL**
1988		
1989		
1990	6	**6**
1991	8	**8**
1992	7	**7**
1993	8	**8**
1994	7	**7**
1995	8	**8**
1996	4	**4**
1997	5	**5**
1998	14	**14**
1999	13	**13**
2000		
2001		
2002		
2003		
2004		
2005		

Table 9.4.19.1 Red seabream landings by area and country (Cont'd).

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) in all areas.

Year	VI+VII	VIII	IX	X	XII	CECAF	**TOTAL**
1988	252	137	689	637			**1715**
1989	189	272	676	924			**2061**
1990	134	312	594	889		6	**1935**
1991	123	134	532	874		8	**1671**
1992	40	124	797	1090		7	**2058**
1993	22	175	1000	830		8	**2035**
1994	10	131	1004	989	75	7	**2216**
1995	11	110	829	1115		8	**2073**
1996	29	23	978	1052		4	**2086**
1997	56	25	1011	1012		5	**2109**
1998	17	104	877	1119		14	**2131**
1999	23	104	543	1222		13	**1905**
2000	20	270	421	924			**1635**
2001	51	179	374	1034			**1638**
2002	25	130	359	1193			**1707**
2003	38	89	471	1068			**1666**
2004	31	95	480	1075			**1681**
2005	10	90	494	1113			**1707**

9.4.20 Portuguese dogfish and leafscale gulper shark in the Northeast Atlantic (ICES Areas I–XIV)

State of stocks

Total international landings of these species combined have risen from very low levels to around 11 000 t in 2003 and appear to have declined since. Substantial declines in CPUE series for both *C. coelolepis* and *C. squamosus* in Subareas VI, VII, and XII suggest that the stocks of both species are depleted. CPUE for both species in the northern area have displayed strong downward trends leading to the conclusion that the stocks are being exploited at unsustainable levels. In Division IXa, CPUE series, although short, appear to be stable.

Reference points

In common with other deepwater stocks, $\mathbf{U}_{lim}$ is set at 0.2 × virgin biomass and $\mathbf{U}_{pa}$ is set at 0.5 × virgin biomass (ICES, 1998).

Single-stock exploitation boundaries

No target fisheries should be permitted unless there are reliable estimates of current exploitation rates and stock productivity. TAC should set at zero for the entire distribution area of the stocks and additional measures should be taken to prevent bycatch of Portuguese dogfish and leafscale gulper shark in fisheries targeting other species.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Portuguese dogfish and leafscale gulper shark are long-lived, slow-growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality. Population productivity is low, with low fecundity and a protracted gestation period. In the light of this, the risk of depletion of reproduction potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

Management considerations

A long-term management strategy for fisheries on this species would consist of an initial low scientific fishery. This initial low fishery level should aim to identify harvest rates that are sustainable in the long term. A gradual expansion of the fishery from the initial low level should only be allowed if harvest rates that are sustainable in the long term are clearly identified and a management strategy has been identified and decided upon. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries.

At present, there is insufficient information to determine stock identity. In the absence of such information, they are considered as single stocks for assessment purposes although smaller units may be appropriate for management.

CPUE of both species has shown a strong decline in northern areas (Subareas V, VI, VII, and XII). In the south (Subarea IX), CPUE for both species appears to be stable.

Species-specific data have not been provided by all countries involved in these fisheries but are needed for the assessment of these two species and their management.

Factors affecting the fisheries and the stock

Regulations and their effects

A series of TACs is set for EC waters and EC vessels in international waters of Subareas V–XII. The TAC applies to all deepwater sharks. The sum of these TACs is 7000 t for 2005 and 2006. It is clear that the quota is restrictive for some countries, if adequately enforced. For other countries, the quotas are not effective in regulating fishing effort.

These sharks are often taken in mixed fisheries. An effort restriction regime has been in place since 2003 (EC Reg. No. 2347/2002, 27/2005) for fisheries taking these sharks in EC waters and for EC vessels in international waters.

Norwegian vessels in EC waters are subject to a multi-species quota for these species and spurdog. This quota is about equal to recent Norwegian catches of deepwater sharks in EC waters and does not appear to be restrictive.

Changes in fishing technology and fishing patterns

The ban on gillnetting in EC and international waters may have diverted fishing effort to other gears, most likely to longline fisheries. Sharks are known to be vulnerable to longline fisheries.

The environment

Demersal fishing in deep water exploits species that are particularly sensitive to exploitation because of their life history characteristics (long-lived, slow growth, low fecundity, poor productivity). In addition, the impact of ghost fishing is considered to be more important in deep water because of the type of gear and their persistence in the environment. There are also many potentially vulnerable and sensitive habitats (e.g. biogenic reefs). Deepwater demersal communities tend to have high biodiversity which may be compromised by fishing.

Scientific basis

Data and methods

No analytical assessment was carried out in 2006. The assessment is based on commercial CPUE trends and survey trends.

Uncertainties in assessment and forecast

Landings data on these species remain very problematical and, in many cases, reliable data are only available for combined siki sharks. Many countries continue to report landings in amalgamated categories such as "various sharks N.E.I.". Retrospective splitting of the data into species categories and reconstruction of historic data from mixed categories is based on limited information and is problematic.

The CPUE data available consisted of un-standardized point estimates, with an incomplete description of the sampling designs used to collect effort and landing/catch data either from surveys or commercial landings. There was no other auxiliary information to improve the standardization process. In particular; dates of collection, location and fleet composition.

Environment conditions

Comparison with previous assessment and advice

Evidence available in 2006 shows that the upward trend in 2001 was due to a movement of the fishery to new grounds within Subareas V and VI and that this masked the decline in catch per unit effort for traditional grounds.

Information available this year does not alter the perception of the state of the stocks from 2005 and the advice is consistent with last year.

Source of information

Report of the Working Group on Elasmobranch Fishes, 2006 (ICES CM 2006/ACFM:31).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresponding to advice	Predicted catch corresponding to single-stock exploitation boundaries	Agreed TAC[1]	ACFM landings	Disc. slip.	ACFM Catch
1992	No advice					4.6		
1993	No advice					5.2		
1994	No advice					6.5		
1995	No advice					6.5		
1996	No advice					7.2		
1997	No advice					8.2		
1998	No advice					7.7		
1999	No advice					6.5		
2000	No advice					7.1		
2001	No advice					10.1		
2002	No advice					8.1		
2003	No advice					10.9		
2004	No advice					9.0		
2005	No advice				7.1	5.1		
2006	Zero catch	F=0			7.1			
2007	Zero catch	F=0						

Weights in '000 t.

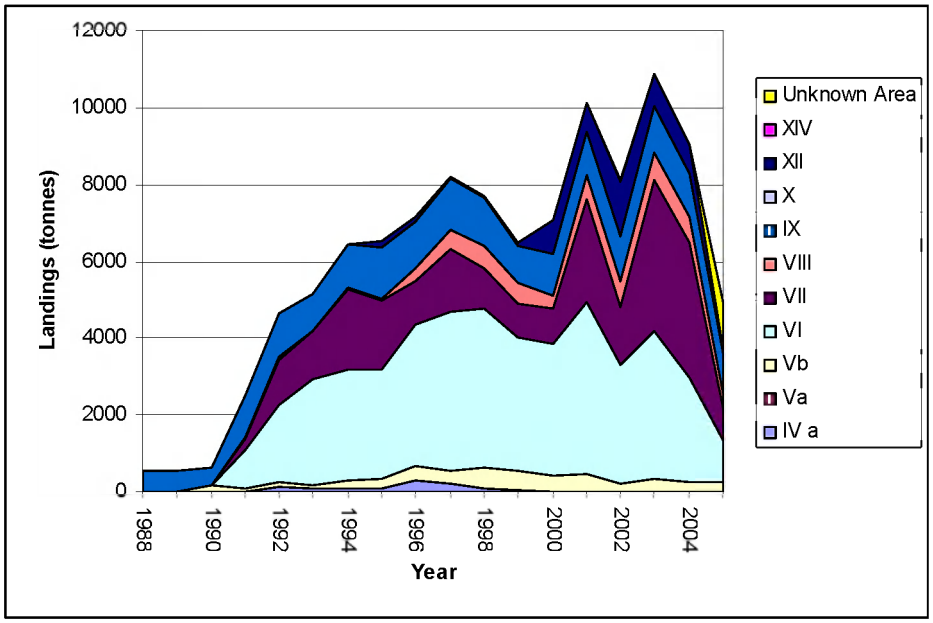


Figure 9.4.20.1 Portuguese dogfish and leafscale gulper shark in the Northeast Atlantic: International landings by ICES Subarea or Division.

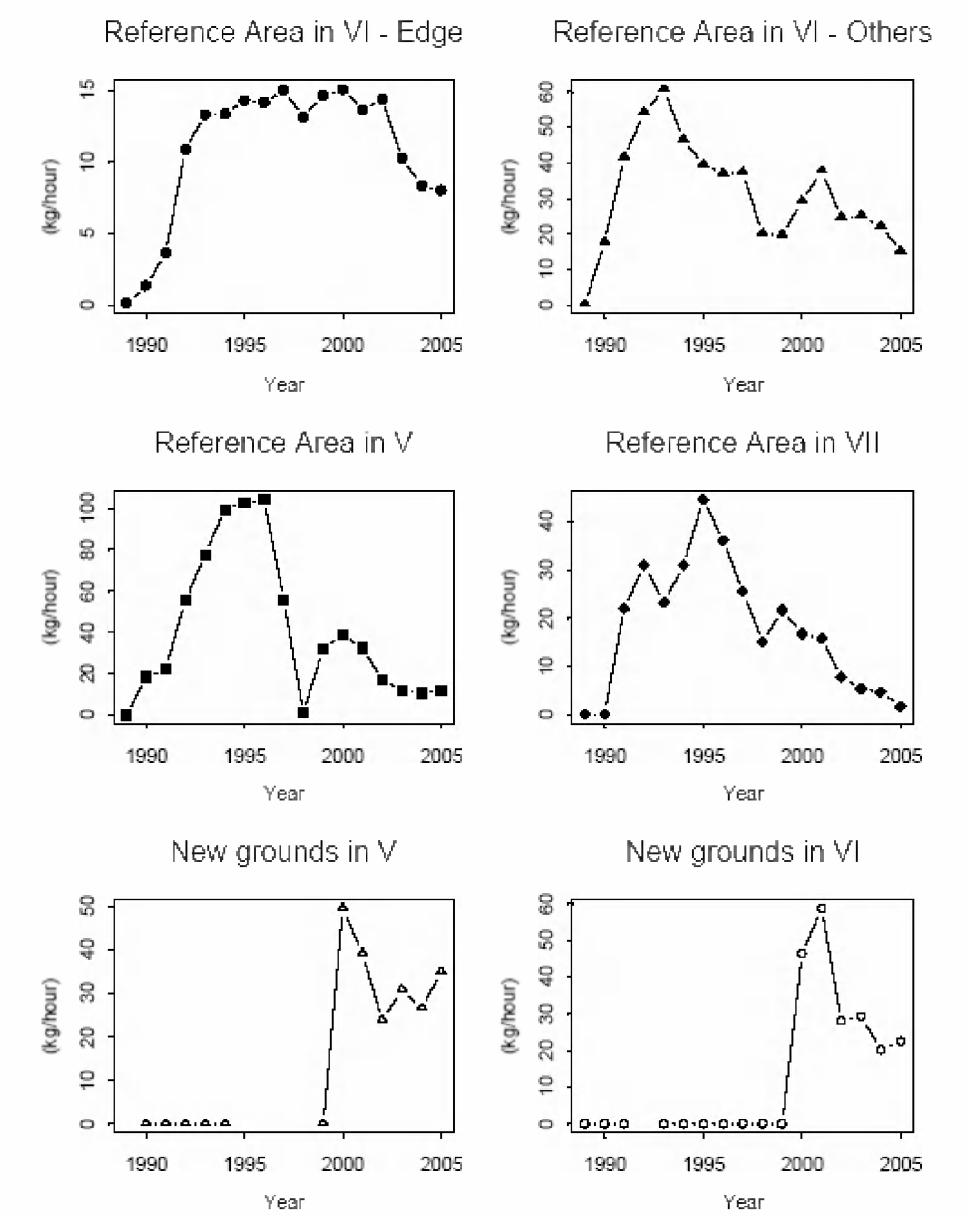


Figure 9.4.20.2 Portuguese dogfish and leafscale gulper shark in the Northeast Atlantic. French CPUE in ICES Subareas.

9.4.21 Kitefin shark in the northeast Atlantic (ICES Areas I–XIV)

State of the stock

The assessment carried out on kitefin shark in 2002 showed a decline of the stock from the beginning of the time series and suggested that the stock was recently around half of the virgin biomass. In recent years, the catch of kitefin shark from targeted fisheries has been very low. Bycatches may have occurred, but the amount is unknown.

Reference points

In common with other deepwater stocks, U_{lim} is set at 0.2* virgin biomass and U_{pa} is set at 0.5* virgin biomass (ICES, 1998).

Single-stock exploitation boundaries

This stock is managed as part of the deep-sea shark fisheries. No targeted fisheries should be permitted unless there are reliable estimates of current exploitation rates and sufficient data to assess productivity.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Kitefin shark are long-lived, slow growing, have a high age-at-maturity, and are particularly vulnerable to fishing mortality. Population productivity is low, with low fecundity and a protracted gestation period. In the light of this, risk of depletion of the reproduction potential is high. It is recommended that exploitation of this species should only be allowed when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented.

Management considerations

A long-term management strategy for fisheries on this species would consist of an initial low scientific fishery. This initial low fishery level should aim to identify harvest rates that are sustainable in the long term. A gradual expansion of the fishery from the initial low level should only be allowed if harvest rates that are sustainable in the long term are clearly identified and a management strategy has been identified and decided upon. Such gradual expansion should be accompanied by close monitoring, enabling adjustment of the management plan according to the outcome of the fisheries.

At present, there are no directed fisheries for this species. There is the risk that sporadic small-scale target fisheries may develop in the Azores, as a function of the markets.

TAC for deep-water sharks (kitefin included), were implemented for 2005 and 2006 for EU member states in ICES Subareas V, VI, VII, VIII, IX, X (revised, Annex 2 of Council Regulation 860/2005) and XII (Annex I of Council Regulation No. 2270/2004).

Factors affecting the fisheries and the stock

The effects of regulations

Since 1998 the Azorean government has implemented management actions in order to reduce effort of demersal fisheries on shallow areas around the islands, including a licence threshold based on the requirement of the minimum value of sales. The EU deep-water sharks TAC may prevent the development of target fisheries. However, it cannot avoid by-catches. Low fishery mortality is expected due to the introduction of Regional management actions to reduce demersal effort on coastal areas (3-mile box) and EU management action to limit effort (100-mile box) on the sensitive area of the Azores (Reg EC 1954/2003). The first will redirect the effort to banks and seamounts from local fisheries and the second introduced a balance to avoid local depletions.

Changes in fishing technology and fishing patterns

Fluctuations in the prices of liver oil may have affected the fishing behavior and this needs to be taken into account when examining trends in landings and CPUE.

The environment

The Azores are considered as a seamount ecosystem area (medium/high abundance of seamounts in proportion to the total worldwide seamount abundance) and are thus considered a biologically sensitive area. Fishing areas are considered very limited, usually associated with such seamounts. Considering the pattern of the distribution of the species and of available habitat (banks and seamounts), it has been inferred that the species abundance must be limited.

Local depletions are likely to occur if target fisheries are concentrated on some particular seamounts. Information on stock identity, population structure and interactions between areas (coastal areas, seamounts and banks) on this particular ecosystem are lacking and must be obtained in order to have a better idea about its boundaries and dynamics. The abundance of this species on other seamounts is unknown.

Other factors

The fishery development seems highly influenced by markets and it is reflected in trends of the historical landings.

Scientific basis

Data and methods

There is still a lack of data that can accurately identify any different stocks of kitefin shark in the NE Atlantic. For the assessment purpose, the Azorean stock was considered as a management unit (ICES Subarea X).

Uncertainties in assessment and forecast

There are no recent CPUE data which can be used to monitor the development of the stock. In addition, the catches and landings are likely to be influenced also by market considerations, and fishery CPUE may not reflect real abundance trends, particularly in the last decade. This issue should be further investigated through the analysis of socio-economic data and its relation to CPUE temporal variation. Specific exploratory surveys on the areas considered depleted, in particular banks and seamounts, would be useful in order to better evaluate the actual state of the stock. Any modeling should also take sexual dimorphism of the species into account.

Comparison with previous assessment and advice

No assessment was carried out in 2006. The advice is consistent with last year.

Source of information

Report of the Working Group on Elasmobranch Fisheries (ICES CM 2006/ACFM:31).

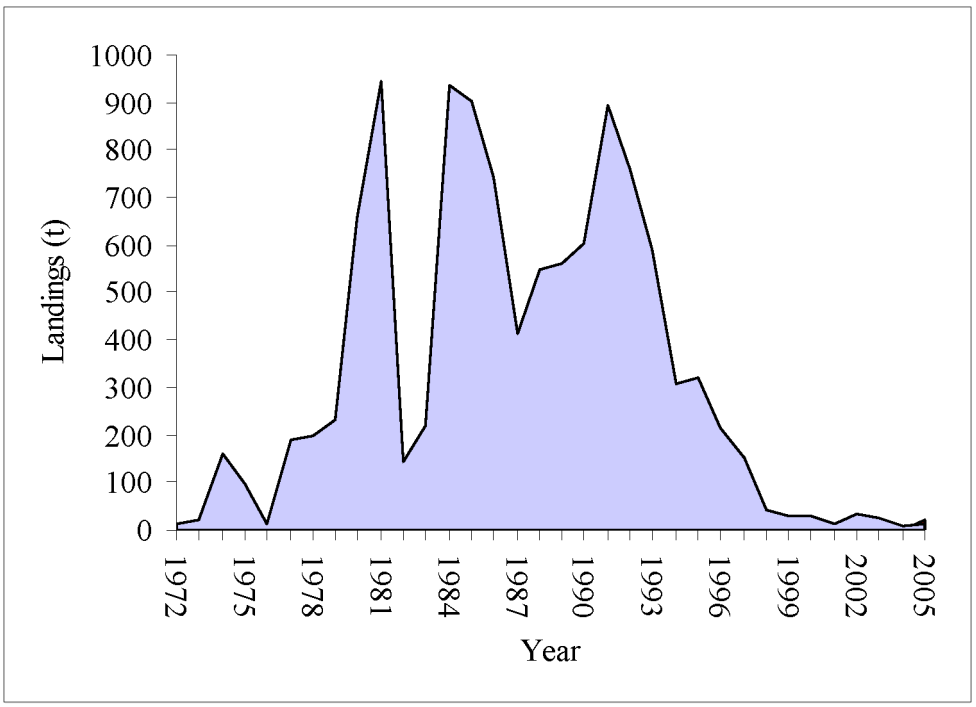


Figure 9.4.21.1 **Kitefin shark in the northeast Atlantic (ICES Areas I–XIV):** Landings of kitefin sharks from the Azores (ICES area X).

Table 9.4.21.1 Kitefin shark in the northeast Atlantic (ICES Areas I–XIV): Annual landings of kitefin shark by ICES statistical area.

Year	Landings (t)	TAC
1988	549	
1989	560	
1990	602	
1991	896	
1992	761	
1993	591	
1994	309	
1995	321	
1996	216	
1997	30	
1998	34	
1999	31	
2000	31	
2001	13	
2002	35	
2003	25	
2004	6	14+
2005	15	120+*
2006		120+*

- + Deepwater sharks combined.
- * 2005 and 2006 was revised by the Commission.